The 56th Annual Western Anesthesia Residents’ Conference could not happen without the support of our generous sponsors. A special thank you to Envision Physician Services for their sponsorship of our Friday evening Welcome Reception.

Welcome Reception Sponsorship

Envision
PHYSICIAN SERVICES

Gold Level

Masimo
WARC 2018                      May 4 - 6, 2018
San Diego Marriott Marquis & Marina

SCHEDULE OF EVENTS

Friday, May 4

4:00PM - 8:00PM  Registration  Marina Ballroom Foyer (3rd Floor of South Tower)

6:30PM - 8:30PM  Welcome Reception  South Pool Patio

7:30PM - 9:30PM  Chairs’ Dinner (Department Chairs only)  The Porch

Saturday, May 5

7:00AM - 12:00PM  Registration  Marina Ballroom Foyer (3rd Floor of South Tower)

7:00AM - 7:45AM  Breakfast  Marina Ballroom F/G and Marina Ballroom Foyer

7:45AM - 10:00AM  Visit Exhibits and Posters  Marina Ballroom D/E and Marina Ballroom Foyer

7:45AM - 10:00AM  Oral Presentations: Session 1  Marina Ballroom F/G

10:00AM - 10:30AM  Break  Marina Ballroom Foyer

10:00AM - 10:30AM  Visit Exhibits and Posters  Marina Ballroom D/E and Marina Ballroom Foyer

10:30AM - 12:30PM  Oral Presentations: Session 2  Marina Ballroom F/G

12:30PM - 2:00PM  Lunch & 7th Annual Eger Lecture  Coronado Terrace

2:00PM - 3:00PM  Poster Presentations & Judging: Group 1  Marina Ballroom D/E and Marina Ballroom Foyer

Visit Exhibits
3:00PM - 3:15PM Break

Marina Ballroom Foyer

Visit Exhibits and Posters

Marina Ballroom D/E and Marina Ballroom Foyer

3:15PM - 4:15PM Poster Presentations & Judging: Group 2

Marina Ballroom D/E and Marina Ballroom Foyer

Visit Exhibits

5:00PM - 5:15PM Awards Ceremony for Day 1

Marina Ballroom F/G

5:15PM - 6:30PM Reception

Marina Ballroom Foyer and Marina Ballroom F/G

6:30PM Dinner Around Town (stipend award provided)

Sunday, May 6

7:00AM - 8:00AM Breakfast

Marina Ballroom F/G and Marina Ballroom Foyer

Visit Exhibits and Posters

Marina Ballroom D/E and Marina Ballroom Foyer

8:00AM - 9:15AM Oral Presentations: Session 3

Marina Ballroom F/G

9:15AM - 9:30AM Break

Marina Ballroom Foyer

Visit Exhibits and Posters

Marina Ballroom D/E and Marina Ballroom Foyer

9:30AM - 10:45AM Oral Presentations: Session 4

Marina Ballroom F/G

10:45AM - 11:00AM Break

Marina Ballroom Foyer

Visit Exhibits and Posters

Marina Ballroom D/E and Marina Ballroom Foyer

11:00AM - 11:15AM Awards Ceremony for Day 2

Marina Ballroom F/G

11:15AM Meeting Adjourned
7th Annual Eger Lecturer

Saturday, May 5
1:00 PM

Michael A. Gropper, MD, PhD

Dr. Gropper is Professor and Chair of the Department of Anesthesia and Perioperative Care at UCSF. He is also Professor of Physiology and an Investigator in the Cardiovascular Research Institute. A San Francisco native, Dr. Gropper he received his undergraduate degree in Physiology from UC Davis. He then studied under Norman Staub in the CVRI at UCSF, receiving his PhD in respiratory physiology. He subsequently obtained his MD from UCLA. Dr. Gropper returned to UCSF and completed a residency in anesthesia and fellowship in critical care medicine, and has remained on the faculty. He works clinically in the operating rooms, specializing in thoracic anesthesia, and in the ICU’s at UCSF.

Dr. Gropper is internationally known for his work in improving outcomes in critically ill patients and has spearheaded successful efforts to reduce hospital-acquired harms in the ICU. His research interests are in the area of acute respiratory failure, severe sepsis, transfusion lung injury, and teamwork and communication in the ICU. He was Principal Investigator of Project EMERGE at UCSF, a comprehensive program to prevent harm and engage patients and families in their care in the ICU. Dr. Gropper has authored over 130 peer-reviewed publications, and has received both NIH and private foundation funding for his work.
Edmond “Ted” Eger II, M.D.
September 3, 1930 – August 26, 2017

Over 50 years ago while faculty at the University of California, San Francisco, Dr. Edmond “Ted” Eger II founded the Western Anesthesia Residents Conference (WARC), and in the subsequent years was its most staunch supporter and ever-present attendee. Dr. Eger made WARC richer by being a part of the conference each year, often asking the most insightful questions at oral sessions and posters, with his characteristic good humor and quick wit.

It is no exaggeration to say that Dr. Eger as a physician and scientist was a giant of anesthesia, as his home department at UCSF so eloquently described him upon his passing last year. Dr. Eger developed the concept of “minimum alveolar concentration” (MAC) and went on to extensively study and help bring to use the inhaled anesthetics we all know today. Dr. Eger’s concept of MAC is still utilized throughout the world for dosing and for research of all inhaled anesthetics. In his career, Dr. Eger published over 500 peer-reviewed articles, a number of them among the most highly cited in the field of anesthesiology. Dr. Eger was active in teaching as well, and trained some of our field’s top researchers over the past 50 years and many other academic leaders in anesthesiology, leaving behind a legacy of anesthesiology research and academics that is unsurpassed.

To get a sense of Dr. Eger’s experience as a part of anesthesia history, his sense of humor, and his wonderful personality, we encourage you to watch his 1990 interview for the Wood Library-Museum at https://www.woodlibrarymuseum.org/library/media where his interview is under the title Featured Media.

Dr. Eger at the Ether Dome with painting of the first public demonstration of ether anesthesia, Massachusetts General Hospital, Boston, MA 2007.
## Oral Presentations: Session 1

**Saturday, May 5, 7:45 AM – 10:00 AM**

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Institution</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:45 – 8:00</td>
<td>PAMELA CHIA</td>
<td>University of California, Los Angeles</td>
<td>Pulmonary Hypertension is Associated with Neuroinflammation in Rats</td>
</tr>
<tr>
<td>8:00 – 8:15</td>
<td>ALEC RUNYON</td>
<td>Loma Linda University</td>
<td>Impact Assessment of a Perioperative Point of Care Ultrasound Service: A Quality Improvement Initiative</td>
</tr>
<tr>
<td>8:15 – 8:30</td>
<td>JESSICA WILSON</td>
<td>Naval Medical Center, San Diego</td>
<td>A Curative Treatment For Severe Recalcitrant Unilateral Lower Limb Complex Regional Pain Syndrome (CRPS) Type I &amp; Type II By Implementing A Multi-Disciplinary Team Approach with Limb Amputation: A Case Series</td>
</tr>
<tr>
<td>8:30 – 8:45</td>
<td>FLORA LI</td>
<td>University of Washington</td>
<td>Percutaneous Left Atrial Appendage Occlusion: Comparison of 2 Dimensional versus 3 Dimensional Echocardiographic Quantitative Assessment</td>
</tr>
<tr>
<td>8:45 – 9:00</td>
<td>BRYAN CHOW</td>
<td>University of Southern California</td>
<td>Impact on surgical site infection using pre-operative chlorhexidine body wash prior to elective colorectal surgery</td>
</tr>
<tr>
<td>9:00 – 9:15</td>
<td>RAVI PATEL</td>
<td>University of Utah</td>
<td>Intraoperative Transesophageal Echocardiography to Predict Right Ventricular Failure After LVAD Implantation</td>
</tr>
<tr>
<td>9:30 – 9:45</td>
<td>NICOLE YIN</td>
<td>University of California, Los Angeles</td>
<td>Spinal Cord Stimulation Therapy Attenuates Activation of Dorsal Horn and Intermediolateral Nucleus Neurons During Acute Myocardial Ischemia</td>
</tr>
<tr>
<td>9:45 – 10:00</td>
<td>GREGORY CHINN</td>
<td>University of California, San Francisco</td>
<td>Voluntary Exercise Rescues a Spatial Memory Deficit after Early-Life Anesthesia Exposure</td>
</tr>
</tbody>
</table>
Oral Presentations: Session 2

Saturday, May 5, 10:30 AM – 12:30 PM

10:30 – 10:45  KELLY MICHAELSEN  
University of Washington  
Development and clinical testing of a compact, versatile and low cost mechanomyography device for quantitative train of four assessment

10:45 – 11:00  YINGQUI KIMBERLY ZHOU  
University of California, San Diego  
Neuron-Targeted Caveolin-1 Promotes Neuronal Plasticity in a Mouse Model of Alzheimer’s Disease

11:00 – 11:15  HANZI RUSSINO  
University of California, Los Angeles  
Intralipid Improves Left Ventricular Function in Rats with LPS-Induced Cardiac Dysfunction

11:15 – 11:30  BRETT ESCARZA  
Loma Linda University  
Anesthesiologists as Perioperative Hospitalists and Outcomes in Patients Undergoing Major Urologic Surgery: a Historical Prospective, Comparative Effectiveness Study

11:30 – 11:45  LEI XU  
University of California, San Francisco  
“Reverse to avoid the adverse”: Improving compliance to evidence based reversal of non-depolarizing neuromuscular blockade

11:45 – 12:00  HAMED SADEGHPOUR  
Cedars-Sinai Medical Center  
Evaluation of Cold Pain Response in Chronic Pain Patients On Opioid

12:00 – 12:15  DIOSDADO BAJA  
University of California, Davis  
Transversus abdominus plane block catheters vs liposomal bupivacaine for pain control after colorectal surgery: A prospective randomized control trial

12:15 – 12:30  SASSAN RAFIGADEH  
Harbor-UCLA Medical Center  
Targeting Calcium-Activated Potassium Channels as a Novel Approach to Treating Atrial Fibrillation
## Oral Presentations: Session 3

**Sunday, May 6, 8:00 AM – 9:15 AM**

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 – 8:15</td>
<td>WHITNEY CREED</td>
<td>Usage Patterns of Ketamine at the University of Utah</td>
</tr>
<tr>
<td></td>
<td>University of Utah</td>
<td></td>
</tr>
<tr>
<td>8:15 – 8:30</td>
<td>CHRIS RISHEL</td>
<td>Association between preoperative opioid weaning and postoperative outcomes among chronic opioid users: a retrospective analysis</td>
</tr>
<tr>
<td></td>
<td>Stanford University</td>
<td></td>
</tr>
<tr>
<td>8:30 – 8:45</td>
<td>ROBERT GITMAN</td>
<td>Novel Use of VA ECMO in the Treatment of Amniotic Fluid Embolism</td>
</tr>
<tr>
<td></td>
<td>Kaweah Delta Medical Center</td>
<td></td>
</tr>
<tr>
<td>8:45 – 9:00</td>
<td>ALEXANDER STOKER</td>
<td>Evaluation of patient characteristics and pharmaceutical factors associated with adverse drug events of low-dose ketamine infusions used for perioperative analgesia at Mayo Clinic Arizona</td>
</tr>
<tr>
<td></td>
<td>Mayo Clinic Arizona</td>
<td></td>
</tr>
<tr>
<td>9:00 – 9:15</td>
<td>FRANCHESCA RIVERA</td>
<td>Patient Satisfaction Following Video Education on Epidural Anesthesia</td>
</tr>
<tr>
<td></td>
<td>Harbor-UCLA Medical Center</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Speaker</td>
<td>Institution</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>9:30 – 9:45</td>
<td>MIROSLAV FIGURA</td>
<td>University of California, Los Angeles</td>
</tr>
<tr>
<td>9:45 – 10:00</td>
<td>ALEXANDRA CHANG</td>
<td>Loma Linda University</td>
</tr>
<tr>
<td>10:00 – 10:15</td>
<td>ANDREW WU</td>
<td>University of California, Los Angeles</td>
</tr>
<tr>
<td>10:15 – 10:30</td>
<td>ANGELA LEE</td>
<td>University of California, Irvine</td>
</tr>
<tr>
<td>10:30 – 10:45</td>
<td>MINH TRAN</td>
<td>University of California, San Diego</td>
</tr>
</tbody>
</table>
Complex Regional Pain Syndrome (CRPS) is a difficult enigmatic chronic pain condition that leads to severe unilateral (and in some cases multiple) limb disability. The pathophysiology is not completely elucidated, but current research describes CRPS as a form of “neuro-inflammation” that can spread to any limb or area of the body. A myriad of treatment options are directed at the symptomatology as there is no known curative therapy. In the majority of patients, these treatments can provide significant and prolonged pain relief that can be life-changing.

Unfortunately, approximately 16% of CRPS cases progress into recalcitrant cases where none of the conventionally accepted treatments provide any meaningful relief. These patients are left with limited options at leading an able-bodied life as their lives are dominated by immense daily pain and the loss of limb function. In these instances, patients and providers are willing to take extraordinary measures for any amount of even temporary relief. Limb amputation as a treatment for pain relief in the setting of CRPS has been described, but it remains controversial as the outcomes are unpredictable and rarely result in patients becoming successful ambulators.

We report on two curative cases of recalcitrant CRPS-I and CRPS-II with the novel approach of lower limb amputation in combination with multi-disciplinary treatment including: PM&R, PT/OT, Psychology, Psychiatry, Pain Management, and Orthopedics. We describe all treatments including medications, therapies, counseling, interventional techniques, and pre- and post-operative management that we believe led to the successful outcomes.

Both patients demonstrated improved functional status after amputation and were able to use a prosthesis to ambulate. The patient with CRPS-I was non-ambulatory and relied on a wheelchair for all mobility with a reported constant 8/10 pain pre-amputation. Six months following transfemoral amputation, this patient was able to ambulate using a prosthesis with reported 2/10 pain and was able to achieve a four square step test time of 18.34 seconds. Likewise, the pre-amputation functional status of the patient with CRPS-II was limited, though not as severely. Comparing pre-amputation and 4 months post-amputation gait analysis demonstrated improvement in all gait parameters. The functional improvements seen post-amputation in both patients indicate the complete return to community-level ambulation. In addition to each patient reporting decreased overall VAS pain scores, each patient had 100% reduction in daily opioid usage, improved depression scores, no evidence of systemic disease progression, and both patients indicated a score of 7 out of 7 on the Patient’s Global Impression of Change (PGIC) Scale at 4 months post-amputation.

Our results suggest that the novel approach of combining multi-disciplinary treatment with limb amputation could be a life-altering treatment for patients with severe recalcitrant CRPS-I and CRPS-II. Larger studies are warranted to investigate our findings.
A Structured Research Program During Residency Increases Academic Productivity of Graduates: The Stanford Experience

Saturday, 5th May - 09:15 - Marina Ballroom F/G - Oral

Ms. Elena Haight 1, Dr. Pedro Tanaka 1, Dr. John Brock-Utne 1, Dr. Alex Macario 1, Dr. Vivianne Tawfik 1

1. Stanford University School of Medicine

In 2006, Schwinn and Balser warned that the low number of anesthesiologist-scientists threatened the specialty of anesthesiology’s standing as a rigorous academic discipline1. Numerous residency programs have since established research electives to increase resident exposure to research methodology, but data is inconclusive regarding the programs’ success at increasing the long-term academic productivity of graduates. Using Emerick and Sakai’s scholarly activity point (SAP) method2 to score publications and grant submissions, we performed a quantitative assessment of the academic productivity of residents from each of Stanford’s three resident research programs, as well as a qualitative study of one of these programs to understand its potential benefits to trainees.

From 2006-2009, Stanford offered selected residents 6 months of research time through the ABA Clinician-Scientist Track (CST). In 2009, however, Stanford created a more rigorous research track, the Fellowship in Anesthesia Research and Medicine (FARM) program, providing committed residents up to 9 months of research during residency followed by a one-year research fellowship. Finally, in 2012, a research elective (RE) was formalized offering non-research track residents 1 to 3 months of research time after approval of a mentored project proposal.

We first determined that FARM yields the highest percentage of graduates in academic practice (92% for FARM vs. 80% for CST vs. 62% for RE). We next tracked the progression of SAP through different career stages (pre-residency, residency, and post-residency) and noted that academic productivity declines during residency in all groups. While graduates of the CST and RE had statistically insignificant differences in career SAP, FARM graduates had a mean career SAP nearly 6 times that of the other two programs. Notably, FARM graduates with an MD had similar SAPs to CST and RE graduates, while FARMers with an MD/PhD had SAPs four times higher than FARMers (MD only), CST, and RE graduates.

Given the increased academic productivity of FARM graduates, we conducted interviews with each of the 13 FARM graduates to qualitatively evaluate the program’s strengths and shortcomings. Graduates frequently cited protected research time and faculty mentorship as benefits of the program, while FARMers with an MD only indicated their lack of previous training in research methodology limited the program’s utility for them. Despite this limitation, the FARM program offers a formalized research track that produces graduates who lead their peers in scholarly activity. The program represents a model other anesthesia residencies might implement to promote research within their departments and facilitate continued commitment to training anesthesiologist-scientists.

References
Anesthesiologists as Perioperative Hospitalists and Outcomes in Patients Undergoing Major Urologic Surgery: a Historical-Prospective, Comparative Effectiveness Study

Saturday, 5th May - 11:15 - Marina Ballroom F/G - Oral

Dr. Brett Escarza, Dr. Gary Stier, Dr. Ronak Raval, Dr. Gary Shih, Dr. Joseph Soo, Dr. Eric Ogle, Dr. Bryan Halverson, Dr. Colin Garner, Dr. Davinder Ramsingh, Dr. Robert Martin

1. Loma Linda Anesthesiology, 2. Loma Linda Anesthesiology and Critical Care, 3. Loma Linda University Medical Center, 4. Loma Linda Anesthesiology

Background
Perioperative care has been identified as an area of wide variability in quality, with conflicting models, and involving multiple specialties. In 2014, the Loma Linda University Departments of Anesthesiology and Urology implemented a perioperative hospitalist service (PHS), consisting of anesthesiology-trained physicians, to co-manage patients for the entirety of their perioperative period. We hypothesized that implementation of this PHS model would result in an improvement in patient recovery. This service was launched as part of a quality improvement initiative and continued from 2015 to August 2017. Since August 2017 the PHS service has transitioned to other surgical lines. Review of the patient outcomes since the transition of the service allows for definitive assessment of this quality improvement process.

Methods
As a Quality Improvement (QI) initiative, the PHS service was formed of selected anesthesiologists who received training on core competencies for hospitalist medicine. The service was implemented following a co-management agreement to medically manage patients undergoing major urologic procedures (prostatectomy, cystectomy, and nephrectomy). Impact was assessed by comparisons to data from the year prior to PHS service implementation. Primary outcome marker was a reduction in length of stay. Secondary outcome markers included: complication rate, return of bowel function, number of consultations, reduction in total direct patient costs, and bed days saved. Additionally, review of these same markers after transition of the PHS are also currently being performed.

Results
Data was compared with and without propensity matching. Significant reductions in length of stay (p < 0.05) were demonstrated for all surgical procedures with propensity matching and were demonstrated for cystectomy and nephrectomy cases without propensity matching during the time of PHS service implementation. Significant reductions in complication rates and ileus were also observed for all surgical procedures during the PHS implementation phase. Additionally, reduction in total direct patient costs and frequency of consultations were also observed. Current analysis of the above markers post-PHS transition are currently underway. Descriptive statistics demonstrate an increase in length of stay for prostatectomy procedures.

Conclusions
Anesthesiologists can safely function as perioperative hospitalists, providing appropriate medical management and significantly improving both patient recovery and throughput. While still being analyzed, removal of the PHS service may be associated with a worsening in patient outcomes.
Association between preoperative opioid weaning and postoperative outcomes among chronic opioid users: a retrospective analysis

Sunday, 6th May - 08:15 - Marina Ballroom F/G - Oral

Dr. Chris Rishel 1, Dr. Martin Angst 1, Dr. Eric Sun 2
1. Stanford University Hospital and Clinics Department of Anesthesiology, Perioperative, and Pain Medicine, 2. Stanford Hospital

Background: Preoperative opioid use has been associated with worsened postoperative outcomes, including increased morbidity and mortality, increased costs, longer length of stay, and more readmissions, as well as postoperative pain that is difficult to control, requiring greater doses and duration of opioid therapy. Recent work suggests that there may be benefit to weaning patients’ opioid use prior to surgery, but the relationship between preoperative opioid reduction and postoperative outcomes (surgical complications, readmissions, costs) and postoperative opioid use has not been determined.

Methods: Using data from a large database of health insurance claims, we created a sample consisted of adults ages 18-89 undergoing primary total knee arthroplasty who used opioids chronically in the year prior to surgery, defined as having filled ≥10 opioid prescriptions filled or had 120 days of opioid use in the year prior to surgery. We defined “weaners” as patients whose average daily morphine milligram equivalents (ADMME) in the six months prior to surgery was at least 20% lower than the ADMME during the 7 to 12 months prior to surgery. In order to exclude adults with escalating opioid doses prior to their surgery, we excluded adults for whom the ADDME in the six-months prior to surgery was at least 20% higher than the ADDME in the 7 to 12 months prior to surgery. We then assessed the association between preoperative weaning and the following outcomes: length of stay, total medical spending during postoperative days 0-90, and long-term postoperative opioid use (opioid use during postoperative days 90-365), using multivariable regression to adjust for potential confounders including sex, age, medical comorbidities, and the absolute amount of opioid used in the six months prior to surgery.

Results: Our final sample consisted of 7,818 patients, 31.7% of which met the definition of weaning. The mean change in ADMME between preoperative months 7-12 and preoperative months 0-6 for weaned patients was -47.2% (interquartile range -60.6 to -29.0%). For the remaining patients, the mean difference was 0.8% (interquartile range -6.8 to 8.7%). Weaning was also associated with a reduced risk of any long-term opioid use (OR 0.64, 95% CI 0.52 to 0.78, p<0.001). However, for patients who did use opioids long-term after their surgery, weaning was not associated with a decrease in the quantity (ADMMEs) used. Similarly, there was no significant association between preoperative weaning and length of stay or medical spending.

Conclusions: Preoperative reduction of opioid use prior to total knee arthroplasty increases the probability of being opioid-free within 1 year postoperatively, but is not associated with further postoperative reduction in patients who continue to use some opioid. Additionally, decreased preoperative opioid use is not associated with a reduction in 90-day postoperative costs or length of stay.
Development and clinical testing of a compact, versatile and low cost mechanomyography device for quantitative train of four assessment

Saturday, 5th May - 10:30 - Marina Ballroom F/G - Oral

Dr. Kelly Michaelsen ¹, Dr. Bala Nair ¹, Dr. Srdjan Jelacic ¹, Mr. Logan Bussey ¹, Dr. Justin Hulvershorn ², Dr. T. Andrew Bowdle ¹

¹. university of washington, Department of Anesthesiology ². R8 Labs

Background: Mechanomyography (MMG) for quantitative assessment of neuromuscular blockade has been in existence since the 1960s, and has been considered the gold standard technique for evaluating muscle response to delivery of paralytic medications. MMG measures isometric muscle force in response to nerve stimulation. However, there are no commercially available systems on the market. Despite longstanding use in research, the technique never gained widespread clinical acceptance due to bulky design and cumbersome setup. Another technique, acceleromyography (AMG) has gained some traction in clinical use; however the baseline TOF ratio (T4/T1) obtained with AMG frequently exceeds 100% and even at a TOF ratio of 100%, impaired respiratory function has been observed. AMG also requires unrestrained thumb movement. Electromyography (EMG) is another technique that has shown good correlation with MMG and has the advantage that unrestrained thumb movement is not required, allowing monitoring with the arm tucked. New techniques using EMG based technology are currently in development but require comparison with gold standard MMG based techniques. The aim for this project is development and clinical testing of a compact, versatile and low cost MMG device for quantitative train of four assessment.

Methods: Electronic components were selected based on measurement precision, size, and cost. Components include a force transducer, an amplifier and an analog to digital signal converter. The force transducer is secured to the thumb via a custom 3D printed holder that slings around the palmer side of the digit. A second 3D printed part was created to hold the thumb in place and is adjustable for differences in size and flexibility. The hand is further immobilized using a commercial wrist splint. With this setup, it is possible to maintain the necessary preload force of 200-300g for accurate measurements that is easily assessed through custom built software (Labview, National Instruments Inc., Austin, TX).

Results: Leveraging technological advances since the earliest MMG systems we designed and built a new MMG device with a slim profile that can be easily customized for individual patients at a cost less than $1,000. The device can be used simultaneously with EMG for precise comparison and evaluation of a new EMG based system. The new MMG system demonstrates expected linearity in measurements with precision to 5g, sensitivity to 10g, and accuracy to 25g for measurements examined within a range: 0 to 5kg. In clinical testing on 13 patients spanning 100 time points during anesthetic care, linear correlation between MMG and AMG values is noted with an r-squared value of 0.72, overestimation of AMG TOF ratio up to 160% is seen for MMG>90%.

Conclusions: The objective of this project was to develop a compact, easy to use and low cost MMG system for side-by-side comparisons of AMG, EMG, MMG. Using this system, it will be possible to characterize existing & future commercial systems in terms of their measurement accuracy. Additionally, this system could be used for clinical quantitative assessment of neuromuscular paralysis as a stand-alone system.
Development of A Universal Design Dual Lumen Endobronchial Tube (DLT)

Sunday, 6th May - 10:00 - Marina Ballroom F/G - Oral

Dr. Andrew Wu, Dr. Jonathan Pang, Dr. Nir Hofman
1. UCLA Medical center

Authors: Andrew Wu, Jonathan Pang, Kaveh Navab, Yann Gricourt, Nir Hofman (P.I.)

Affiliated Institution: UCLA Department of Anesthesiology & Perioperative Medicine

Background:
One lung ventilation (OLV) is required in many thoracic surgical procedures, and dual lumen endobronchial tubes (DLTs) are considered the gold standard for lung isolation. Given the anatomic differences between left vs. right mainstem bronchi, current DLT designs require both a left and right sided tube. The L-sided DLT design is simple and effective, but incompatible with R-sided placement because its elliptical balloon occludes airflow to the RUL, which can cause significant hypoxemia during OLV. The R-sided DLT has an s-shaped bronchial balloon and lateral ventilation orifice, whose required alignment to the RUL takeoff can be cumbersome. This project's objective is to design a universal DLT that properly fits in either the right or left mainstem bronchus, thus eliminating the need for two competing designs while simplifying positioning in the RMB.

Methods:
We analyzed RMB airway anatomy from n=195 thoracic surgery patients’ CT scans and compared these measurements to published data. We then created an “ideal” DLT bronchial tip with balloon based on this data, designed to fit into all patients’ right (and left) mainstem bronchi. Several prototypes were built and bench tested, and a final design was approved for cadaver testing. This “universal DLT design” was then tested in 14 fresh (unembalmed) cadavers for: 1) orotracheal intubation, 2) LMB fit, 3) RMB fit, bronchial tip switching between LMB and RMB.

Results:
Airway dimensions in our data set were comparable to previously published results. Our proposed “universal DLT distal tip”, with asymmetrical angulation and bronchial balloon, theoretically correctly fit the RMBs of all 195 airways, exceeding performance of current R-sided DLTs. When tested on n=14 fresh cadavers, the universal DLT could be orotracheally intubated into all cadavers, and correctly fit into all normal RMBs (n=13) and LMBs (n=13). Switching between LMB and RMB via rotation of the device shaft was successful in all 14 cadavers. Two cadavers had abnormal mainstem bronchus pathology (one with LMB plastic stent, the other with a tracheal RUL take-off) that precluded correct positioning in the respective mainstem bronchi. In both cases, the device was easily inserted into the contralateral, non-pathologic mainstem bronchus and correctly positioned for lung isolation.

Conclusion:
The new “universal DLT design” correctly fit the LMBs and RMBs of n=14 fresh cadavers with normal anatomy, enabling proper lung isolation in most clinical scenarios using a single airway device.
Dynamic GFR as a Predictor of Peri-operative Mortality Compared to KDIGO AKI Classification

Sunday, 6th May - 09:30 - Marina Ballroom F/G - Oral

**Dr. Myroslav Figura** ¹, **Dr. Ira Hofer** ¹

¹ University of California Los Angeles

**Background:** Acute kidney injury (AKI) is a significant peri-operative complication. Perioperative AKI studies utilize criteria based changes in creatinine values (SCr), the most common of which is Kidney Disease: Improving Global Outcome (KDIGO) AKI classification system. SCr is an imperfect surrogate marker for GFR as it is delayed until the creatinine has accumulated post-injury, and thus may not account for acute changes in creatinine clearance. Dynamic GFR (DGFR) is rooted in principles of creatinine mass balance that solve for creatinine excretion from a creatinine production rate and observed rate of change in the plasma creatinine. We hypothesize that DGFR formula will perform better in predicting postoperative mortality than the KDIGO.

**Methods**
Adult patients that were admitted after surgical operations under general anesthesia at UCLA Health main operating rooms between 2014-2017 were identified in the perioperative database (PDW). Cardiac surgery and renal transplantation patients were excluded in addition to patients with a baseline GFR <15 mL/min/1.73m² or patients without available baseline creatinines. AKI was evaluated at 48 hours and at 7 days using KDIGO AKI criteria as well as DGFR stage change as categorical and continuous variables. Receiver operating characteristics (ROC) plots were constructed for each measure and stratified univariate logistic regression was constructed with mortality as an outcome.

**Results**
During the 3 year period 6,138 eligible operations were identified, at 48 hours, out of 4674 remaining patients, 641 (13.7%) patients were complicated with AKI by KDIGO criteria and 1159 (24.8%) by DGFR criteria, while at 7 days, out of 2006 patients, 190 (9.5%) were complicated by AKI by KDIGO criteria and 454 (22.6%) by DGFR. Inpatient mortality included 126 patients (2.1%). ROC curve at 48 hours showed all 3 measures were able to predict mortality with a trend towards continuous DGFR being the best. [DGFR as a continuous measure (AUC 0.63 (0.57-0.69), p<0.001), KDIGO (AUC 0.59 (0.53-0.64) p= 0.002), DGFR as a categorical variable (AUC 0.59 (0.53-0.65) p=0.001)]. At 7 days, both DGFR as a continuous (AUC 0.61 (0.53-0.68), p=0.001) and categorical model (AUC 0.61 (0.55-0.68), p<0.001) outperformed KDIGO (AUC 0.54 (0.47-0.60), p=0.266)(DeLong Test p=0.046 and p=0.003, respectively). Stratified by preoperative CKD stage, at 48 hours all three models were able to predict mortality for CKD stage 1 and 2 patients, however, only DGFR measures were able to predict mortality for CKD 3+ patients [Continuous DGFR AUC 0.65 (0.56-0.75) p=0.001 and categorical DGFR AUC 0.63 (0.54-0.72) p=0.004], with continuous DGFR being statistically different then KDIGO (DeLong = 0.047). At 7 days only DGFR measures were able to predict mortality for CKD 1 and 2 patients, [DGFR continuous (AUC 0.67 (0.59 - 0.75), p<0.001) and DGFR categorical (AUC (0.54-0.71, p=0.002)], both statistically different then KDIGO (DeLong p<0.001 and p=0.002). Neither model was statistically significant for CKD 3+ at 7 days.

**Conclusions**
DGFR, as both categorical and continuous variable, is a method of predicting mortality, and can be considered in models of AKI around periods when kidney function is expected to be rapidly changing.
Introduction: The purpose of this study was to evaluate the cold pain sensitivity between patients requiring daily dosages of opioid medication for chronic pain control and patient receiving only non-opioid pain management.

Materials and Method: In this IRB approved study, we are presenting the baseline data of the first 22 patients who have been involved in this ongoing project. After obtaining the informed consent, patients were divided into two groups. Opioid naive subjects, 14 patients, and opioid dependent patients, 8 patients. Cold pain responses, including pain threshold and tolerance, were measured using the cold-pressor test (CPT). Approximately one month later in their follow up visit patient repeated the CPT.

Results: The opioid dose ranged from 7.5mg to 45.0mg of morphine equivalents with the mean of 22.8mg. The blood pressure and heart rate did not substantially change among either groups of patients after conducting CPT. Patients in opioid group started to feel pain after immersing their non-dominant hand into the ice water (0 +/- 0.5 degrees Celsius) on average 5.4 seconds, meanwhile non-opioid group reported the first pain on average after 9.2 sec, with reported average pain level of 4.0 in opioid vs 2.6 out of ten in non-opioid group. The average pain tolerance was also higher in non-opioid group compared to opioid group of patients 90.6 seconds vs. 68.5 seconds, with almost identical pain score 9.2 vs. 8.9 respectively. Among 14 patients who completed their follow-up visit, only one patient changed from non-opioid to opioid treatment splitting the follow-up sample into two equal groups of seven. Five out of seven non-opioid group of patients had pain reducing procedure and two reported pain medication change. However, only one patient in opioid group had a procedure and two reported medication change. The non-opioid group of patients reported longer pain threshold (10.7 sec. vs 6.1 sec.) and tolerance (137.6 sec. vs 23.7 sec.) and lower pain score level compared to opioid group.

Conclusion: The analysis of the first 22 screened patients and 14 patients who completed their follow-up visits revealed that patients who are on regular opioid treatment demonstrate lower pain threshold and lower pain tolerance compared to non-opioid group of patients. We did not observe any consistent pattern between change in pain medication dose or procedure and pain tolerance and threshold change among those 14 patients. However, more data and more detailed analysis is necessary to compare the difference of the pain threshold and tolerance among different levels of opioid groups and non-opioid group, and assess the correlation of these variables with the pain medication and procedure change, as well as other clinical variables. CPT can be used experimentally as a pain induction method due to its reliability, cost effectiveness and minimal production of side effects. Our further goal is to assess if this test can be a reliable tool to be used in clinical practice to help better pain management of the chronic pain patients and predict outcomes of persistent or prolonged pain in this population.
EVALUATION OF PATIENT CHARACTERISTICS AND PHARMACEUTICAL FACTORS ASSOCIATED WITH ADVERSE DRUG EVENTS OF LOW-DOSE KETAMINE INFUSIONS USED FOR PERIOPERATIVE ANALGESIA AT MAYO CLINIC ARIZONA.

Sunday, 6th May - 08:45 - Marina Ballroom F/G - Oral

Dr. Alexander Stoker 1, Dr. Jeremy Alvord 2, Mr. Matthew Buras 1, Dr. Andrew Gorlin 3


Background: Ketamine is an N-methyl-D aspartate receptor antagonist with analgesic properties as well as common side effects including psychomimetic effects. Ketamine has shown promise in a number of clinical scenarios including reducing perioperative opioid consumption, treating pain syndromes such as CRPS and even in opioid addiction. This study was performed to evaluate the potential patient characteristics and pharmaceutical factors associated with ketamine adverse drug events in patients receiving low-dose ketamine infusions.

Methods: A retrospective chart review was performed on the first 95 patients receiving low-dose ketamine infusions for analgesia perioperatively or to treat intractable chronic pain syndromes at Mayo Clinic Arizona. For each patient it was recorded whether the patient had a prior diagnosis of chronic pain, depression or psychotic disorder. The patient's baseline daily morphine equivalent dose as well as 72 hour postoperative opioid consumption was recorded. Ketamine related adverse drug events (ADE), including hallucinations, dysphoria, dizziness, visual disturbance and notable sedation were recorded. It was also noted whether the patients were given any of several classes of adjunct medications including gabapentin, lyrica, SSRI, SNRI, TCA, trazodone, benzodiazepines, Tylenol, NSAIDs, cyclobenzaprine, baclofen, carisoprodol, methocarbomol, or dexmedetomidine. It was also noted how long the ketamine infusion was running and why it was discontinued.

Results: Of the 95 patients who received low dose ketamine infusions 57.9% underwent intraperitoneal surgery, 26.3% underwent spine surgery, 6.3% underwent orthopedic procedures, and 6.3% had no surgery but were given ketamine infusions to treat chronic pain syndromes. Among all patients, 54.7% were taking opioids prior to surgery. The average ketamine infusion dose was 12.2 mg/hr and was running for an average of 39.4 hours. The reason for ketamine infusion discontinuation was because of ketamine adverse drug events in 14.7% of patients. The overall incidence of ketamine related adverse drug events were 29.5%. Forty-six of the ninety-five patients had a prior diagnosis of chronic pain and 30.4% of those patients experienced a ketamine ADE. Of the forty-nine patients who did not have a prior diagnosis of chronic pain 28.6% experienced a ketamine ADE. Twenty-nine of the ninety-five patients had a prior diagnosis of depression and 10.3% of those patients experienced a ketamine ADE. Of the sixty-six patients who did not have a prior diagnosis of depression 37.9% experienced a ketamine ADE, which was statistically significant with a p value of 0.01. Of all patients who experienced a ketamine ADE, 14.3% received a benzodiazepine. Of patients who did not experience a ketamine ADE, 26.9% received a benzodiazepine.

Conclusions: A lower incidence of ketamine adverse drug events was seen in patients with a diagnosis of depression. It is possible that patient characteristics such as depression and chronic pain as well as pharmaceutical factors may be associated with the development of ketamine ADE.
Feasibility and Preliminary Results from the Use of a Non-invasive Wristband Device to Capture Heart Rate Variability Metrics Among Anesthesiology Resident Physicians During and After In-house Call Shifts

Sunday, 6th May - 09:45 - Marina Ballroom F/G - Oral

Dr. Alexandra Chang¹, Dr. Davinder Ramsingh², Dr. Brian Chung¹, Mr. Matthew Alschuler², Mr. Justin Pugh², Dr. Christianna Steely², Dr. Brett Escarza³, Dr. Gary Stier², Dr. Jason Gatling²

¹. Loma Linda University Medical Center, 2. Loma Linda Anesthesiology, 3. Loma Linda Anesthesiology and Critical Care

Background:
Evaluation of the clinical workload of anesthesiology residents is of key importance. Excessive workload may impact ones ability to process information during clinical practice, which may result in inaccurate situational awareness and impaired decision making. Recently, new biometric physiologic data points including: heart rate variability (HRV) and high frequency (HF) to low frequency (LF) heart oscillations ratio have been explored to provide more subjective assessment of workload. An optimal level of HRV and LF/HF ratio is associated with health as well as mental and physical performance. Similarly, evidence has supported a reduction of HRV and LF/HF ratio to be associated with stress conditions and poorer performance. This observational study sought to capture these biometric physiologic parameters during the senior anesthesiology resident in-house call (20 hours) and post-call (24hours) time periods.

Methods:
This pilot project included senior anesthesiology resident physicians who were in their second or third year of clinical anesthesia training (CA-2 or CA-3) during an in-house call shift (20 hours) and during the post-call period (24 hours). Data was gathered via a wearable photoplethysmograph wrist sensor (Wavelet Health, Mountain View, CA), which captured beat-to-beat data for the 44 hour study period (20 hours on-call and 24 hours post-call). Biometric data points HRV and LF/HF ratio data were calculated over an aggregate of 5 minutes resulting in a collection of up to 528 data points per session. In addition, residents completed surveys regarding stress and energy level at the end of the call shift. Biometric data was aggregated to 4 hour intervals for visual comparison and statistical comparison were performed between 8 hour blocks of both the on-call and post-call periods.

Results:
Preliminary data comparisons have been performed on 7 resident sessions. Average hours slept during call were 3 (+ 2) hours and post-call were 8 (+ 5) hours. Stress surveys suggested no states of feeling overwhelmed during call shift. Observation of the aggregate biometric data in 4 hour blocks demonstrated an increase in HRV during the first half of the call shift which declined over the last 8 hours. This decline continued into the post-call period and average HRV values were not returned to baseline until the last 4 hours of the post-call period. Comparison of aggregate data shows statistically significant declines in HRV when comparing two different time blocks of on-call to post-call (p<0.05). Additionally, a significant increase in HRV was observed when comparing the last 4 hours of the post-call block to early post-call time intervals (p=0.048). Analysis of LF/HF ratio shows similar results with an early decline into the on-call shift.

Conclusion:
Our preliminary results show that there were statistically significant differences in HRV and LF/HF ratio between the on-call and post-call periods. Additionally, these parameters remain reduced until the near end of the post-call period. The continuation of this pilot study will contribute to the growing body of literature on the utility of integration of the biometric parameters in the evaluation of resident workload and recovery.
Impact Assessment of a Perioperative Point of Care Ultrasound Service: A Quality Improvement Initiative

Saturday, 5th May - 08:00 - Marina Ballroom F/G - Oral

Dr. Alec Runyon, Dr. Davinder Ramsingh, Dr. Dustin Wailes, Dr. Mohammed Hassanian, Mr. Jaron Yang, Mr. Justin Pugh, Mr. Matthew Alschuler, Dr. Michael Benggon, Dr. Jason Gatling, Dr. Gary Stier

1. Loma Linda Anesthesiology, 2. Loma Linda University Medical Center

Background:
Recently, point-of-care ultrasonography (POCUS) for the perioperative setting has demonstrated growing utility for the acute assessment of cardiovascular, airway, pulmonary, gastric, abdominal, and neurologic pathology. The rapid growth of this bedside examination tool has lead to “a call to action” for incorporation of perioperative POCUS (P-POCUS). In 2015, successful implementation of a comprehensive P-POCUS curriculum, abbreviated FORESIGHT (Focused periOperative Risk Evaluation Sonography Involving Gastro-abdominal, Hemodynamic, and Thoracic ultrasound) was demonstrated at a single academic center. This project sought to further evaluate the utility of P-POCUS with two primary aims: 1) To assess the ability to successfully train the FORESIGHT curriculum to attending and resident physicians at another academic center via an online platform (www.foresightultrasound.com) and 2) Once training was achieved, to evaluate the clinical impact of launching a perioperative point of care ultrasound service as a quality improvement (QI) initiative.

Methods
This study was supported by General Electric (Fairfield, CT). After nine months (03/2016-11/2016) of weekly sessions utilizing the online platform, a group of attending (N=10) and resident physicians (N=20) completed training. From that time (12/2016 to present), the perioperative point of care ultrasound service (P-POCUS) was launched as a quality improvement (QI) initiative. The P-POCUS service was available for any perioperative event and specific triggers were also identified. All exams were documented on a previously validated datasheet to capture reasons for the exam, patient history, US findings, and impact on perioperative management. In addition, comparisons of the P-POCUS exams to data from patients’ electronic medical records (EMR) were also performed.

Results
Preliminary review of P-POCUS exams shows a total of 426 exams performed. Exams were performed most often intraoperatively (49%), followed by pre-operatively (33%), in the post-anesthesia care unit (14%), and lastly in intensive care areas (4%). Triggers for POCUS exams were as follows: significant past medical history (54%), questionable NPO status (19%), respiratory failure (14%), and hemodynamic instability (12%). Cardiac exams were the most commonly performed (45%) followed by pulmonary (24%), abdominal (15%), difficult vascular (6%), airway (5%), urinary (3%), and neurological (2%) exams. POCUS exam findings altered patient care management at a rate of 44%. Explanations for altering patient care were as follows: new diagnosis (35%), verification of current diagnosis (32%), and confirmation of normal findings (32%). Only 16% of patients who received a P-POCUS exam had abnormal physical exam findings.

Review of FORESIGHT exam topics that impacted perioperative management indicated that the majority involved the cardiovascular system (57%), followed by pulmonary (25%), abdominal (10%), airway (3%), difficult vascular (3%), urinary (2%), neurological issues (1%).

When formal diagnostic results were available P-POCUS exam findings showed the following levels of agreement: cardiac = 92% (n=239), pulmonary = 80% (n=156), with 100% agreement for pneumothorax, and abdominal = 90%
(n=50).

**Conclusion:** This project demonstrates that a P-POCUS service can be developed after implementation of a validated training curriculum. Preliminary data suggests that when implemented as a QI initiative the service does positively impact perioperative care.
Impact on surgical site infection using preoperative chlorohexidine body wash prior to elective colorectal surgery

Saturday, 5th May - 08:45 - Marina Ballroom F/G - Oral

Dr. Bryan Chow¹, Dr. Mohamed Eloustaz¹, Dr. Carly Wachi¹, Dr. Linda Rever¹

¹University of Southern California

Background: Surgical site infection (SSI) is one of the most common complications of colorectal surgery, resulting in increased morbidity, readmission rates, and overall costs. SSIs are responsible for costs of $3.5 to $10 billion annually in the USA. Colorectal resection, in particular, is associated with the highest share of SSI relative to other surgical subspecialties, with a reported incidence of up to 30%. Multiple studies reveal that superficial SSIs make up 67.5% of all infection following colorectal surgeries. In response to the high prevalence of SSIs in colorectal patients, multiple trials have been conducted using chlorhexidine body washing preoperatively as a SSI reduction strategy, showing positive result.

On September 2013, LAC+USC implemented preoperative chlorhexidine body washing as standard of care. Patients were instructed to wash their bodies with chlorhexidine three days prior to elective colorectal surgery. Our objective is to determine the impact preoperative chlorhexidine body washing has on SSI rates postoperatively after its implementation. In addition, we also evaluated other comorbidities that may play a role in SSI.

Method: This retrospective study involved a review of records to determine the impact preoperative chlorhexidine washing has on surgical site infection after its implementation on September 1, 2013. Data collection was supplemented with an institutional review board-approved chart review.

Patients were divided into two study arms: a pre-chlorhexidine group (January 1, 2010 - August 31, 2013) and a post-chlorhexidine group (September 1, 2013 - June 30, 2016).

Our primary endpoint is determining the incidence of SSI rate after implementation of chlorhexidine preoperative washing on September 2013. The secondary endpoints include identifying other risk factors that can contribute to SSI among colorectal patients.

Pearson’s Chi Square test was utilized to compare non-parametric data to test for statistical significance. Statistical significance was set at p < 0.05.

Results: Of 432 patients, 235 patients were in the pre-chlorhexidine arm and 197 in the post-chlorhexidine arm. The implementation showed no significant reduction in SSI rates (7.23% vs. 5.08%, p = 0.36). Further analysis revealed that SSI rate was higher among patients who have a classification of ASA III or higher vs. ASA II or lower (10.8% vs. 4.5% p=0.015). Additionally, SSI incidence is significantly higher among smokers vs. non-smokers (15% vs. 5%, P = 0.004) and patients who have pulmonary comorbidities compared to none (20.8% vs. 5.4%, P=0.0002).

Conclusion: The implementation of preoperative chlorhexidine body washing resulted in no significant reduction in SSI rates following elective colorectal resection. However, further analysis revealed that SSI rates are higher among patients who have an ASA class III or higher, smokers, and those with pulmonary comorbidities.
Intralipid Improves Left Ventricular Function in Rats with LPS-Induced Cardiac Dysfunction

Saturday, 5th May - 11:00 - Marina Ballroom F/G - Oral

**Dr. Hanzi Russino**¹, **Dr. Soban Umar**¹

¹ UCLA

Authors: Hanzi Russino, MD, Trixie Le, Matthew Mikhael, Christian Makar, Nancy Cao, BA, Mylene Vaillancourt, M.sc, Siamak Rahman, MD, Soban Umar, MD, PhD

Affiliated Institution: UCLA David Geffen School of Medicine

Background

Sepsis-induced cardiomyopathy contributes significantly to mortality and morbidity in humans. Despite more than five decades of basic science research delineating multiple molecular pathways and mediators leading to the manifestation of myocardial dysfunction in sepsis, a dearth of novel therapeutic targets still remains. As a result, traditional treatment modalities - which include a regimen of antimicrobial therapy, fluid resuscitation, vasopressors, corticosteroids, and other supportive measures - still represent the “gold standard” of treatment in the Intensive Care Units. Intralipid emulsion has been demonstrated in animal models and humans to mitigate the cardio-depressant effects of local anesthetics, possibly via restoration of metabolic dysfunction, activation of cardioprotective signaling cascades, and augmentation of contractility secondary to cytosolic calcium release. However, its potential role in septic cardiac dysfunction has yet to be elucidated. In this study, we examine whether intralipid emulsion improves left ventricular dysfunction secondary to lipopolysaccharide (LPS) endotoxemia in rat models.

Methods

Female Sprague-Dawley rats (n=3) weighing 250-350g received a single injection of LPS (20mg/kg) via the intraperitoneal route. Transthoracic echocardiography (VisualSonics Vevo2100) was performed on the rats at baseline prior to injection of LPS, then again 6 hours post-LPS treatment, in order to assess left ventricular ejection fraction (EF, %). The left femoral vein was then cannulated with a 24 gauge angio-catheter and the rats were given 20% Intralipid emulsion as a 5ml/kg bolus followed by a 0.5 ml/kg/min infusion for 10 minutes via the left femoral vein and echocardiography was conducted at 5 and 10 minutes after initiation of intralipid to reassess EF. Values are expressed as mean±SEM. P<0.05 is considered as statistically significant.

Results

Mean baseline systolic function as measured by EF in the treatment group before LPS injection was 74.7±1.58%. Six hours after exposure to LPS, left ventricular ejection fraction was significantly decreased compared to baseline (EF = 47.3%±2.98, p<0.05 vs. baseline EF). Rats treated with 20% intralipid demonstrated improvement of systolic function at 5 minutes (EF = 65±3.98% p<0.05 vs. 6h post LPS EF) and peak improvement at 10 minutes (EF =72.0±2.55% p<0.05 vs. 6h post LPS EF).

Conclusion

LPS-treated rats demonstrates a profound reduction in left ventricular systolic function, which is significantly improved with 20% intralipid rescue therapy, suggesting a potentially important role for intralipid as a novel treatment modality in the setting of sepsis-associated cardiac dysfunction.
Intraoperative Transesophageal Echocardiography to Predict Right Ventricular Failure After LVAD Implantation

Saturday, 5th May - 09:00 - Marina Ballroom F/G - Oral

Mr. Ravi Patel 1, Dr. Natalie Silverton 1, Dr. Candice Morrissey 1, Dr. Joshua Zimmerman 1
1. University of Utah Hospitals and Clinics

Background
Right ventricular (RV) failure after LVAD placement is a common problem [1-4] associated with increased morbidity [1,5], decreased survival to transplant [1,2], and decreased survival after transplant [6]. Planned BiVAD placement has shown to have improved outcomes compared to LVAD to BiVAD conversion [7]. Predicting RV failure (RVF) for LVAD placement could be a valuable resource in improving outcomes. The echocardiographic assessment of RV function both before and after LVAD placement may be an important tool in predicting RVF after LVAD placement. RV dysfunction as measured by RV strain using transthoracic echocardiography has been associated with RVF after LVAD [3,4]. RV strain is a relatively new technology that is not routinely measured by cardiologists. In addition, hemodynamic changes may make the day of surgery assessment of RV function more valuable than any pre-operative evaluation days or weeks prior. Intraoperative echocardiography measurements of RV function can be used to predict RVF after LVAD transplant.

Methods
With IRB approval, intraoperative TEE imaging of all patients receiving LVADs at University of Utah between April 2010 and June 2016 were reviewed. Patients were excluded if intra-operative images were inadequate, right ventricular assist device (RVAD) or BiVAD was planned or already in place, or the patient was scheduled for LVAD exchange or concomitant tricuspid valve repair. Intraoperative RV systolic measures of TAPSE, FAC, S', RV free wall and RV global longitudinal strain (GLS) were retrospectively measured and analyzed using Epsilon Echo-Insight software. These measurements of RV function were then compared to the primary outcome measure of RVF after LVAD which was defined as subsequent RVAD placement or prolonged inotrope requirement of greater than or equal to 14 consecutive days. Secondary outcome measures were mortality, extubation times, ICU LOS, and hospital LOS.

Results
Of the 188 patients screened, 100 patients were included in the final analysis. 19% of patients receiving LVADs had RVF. Post-bypass FAC was the only measure of RV function that distinguished between the RVF and non-RVF groups (21.2% vs 26.5%; p = 0.04). The sensitivity, specificity, and area under the curve of an abnormal RV FAC (< 35%) for RVF after LVAD were 84%, 20%, and 0.52 respectively. RV strain and all other intraoperative measures of RV function were not associated with subsequent RVF. RV Failure increased ventilator time, ICU and hospital LOS, and mortality.

Discussion/Conclusion
RVF after LVAD implantation is common and results in increased ventilator time, ICU and hospital LOS, and mortality. Findings from this study suggests traditional and new measures of intraoperative RV function such as TAPSE, S', and FAC and RV strain were not associated with RVF after LVAD implantation. Decreased post-bypass FAC was significantly associated with RVF but showed poor discrimination.
Neuron-Targeted Caveolin-1 Promotes Neuronal Plasticity in a Mouse Model of Alzheimer’s Disease (AD)

Saturday, 5th May - 10:45 - Marina Ballroom F/G - Oral

Dr. YingQiu Zhou ¹, Dr. Shanshan Wang ², Dr. Piyush Patel ², Dr. Brian Head ²
1. University of California San Diego, 2. UCSD/VA Medical Center San Diego

Authors
Kimberly (Ying Qiu) Zhou, Shanshan Wang, Piyush M. Patel, Brian P. Head

Affiliated Institution
University of California San Diego and VA Medical Center San Diego

Background
Alzheimer’s disease (AD) is the most common neurodegenerative disease in patients over 65 years of age. Patients develop severe cognitive deficits (learning and memory), sleep and attention disorders, and poor executive function. AD brains exhibit decreased synapses and synaptic function as well as deficits in neuroplasticity (i.e., the ability to form new functional neuronal processes). Cognitive impairment in AD patients is closely correlated with decreases in synapses and neuron loss. Caveolin-1 (Cav-1) is a scaffolding protein within plasmalemmal membrane/lipid rafts (MLRs), signaling microdomains that are necessary for dendritic and axonal growth and synapse formation. Neuron-targeted overexpression of Cav-1 (termed SynCav1) improves learning and memory in adult and aged mice, promotes neuroplasticity, and increases excitatory synapse formation in vivo. It is therefore conceivable that SynCav1 may prevent loss of neuroplasticity and development of cognitive dysfunction in AD.

Methods
Cav-1 expression was increased by viral (adeno-associated virus serotype 9) transfection of caveolin-1 gene under control of synapsin promoter (AAV9-SynCav1). Control mice received red fluorescent protein under control of synapsin promoter by viral transfection (AAV9-SynRFP). A transgenic mouse model of AD, APPswe/PS1dE9, was employed. Wild type (WT) mice received hippocampal injections of AAV9-SynRFP(n=9) and APPswe/PS1dE9 (AD) mice received hippocampal injections of either AAV9-SynCav1 (n=7) or AAV9-SynRFP (n=8) at 10 weeks of age. Cognitive function was evaluated by fear-conditioning at 9 months of age. Structural neuroplasticity was evaluated by MAP2 and SMI-31 (neuronal cytoskeletal markers) immunofluorescence (IF) microscopy and immunoblot (IB) assays.

Results
AD-SynRFP mice exhibited decreased fear learning on Day 1, with no difference in contextual (Day 2) or cued (Day 3) recall, in comparison to WT-SynRFP mice. In contrast, AD-SynCav1 mice exhibited preserved fear learning on Day 1 (no difference vs WT-SynRFP), and enhanced cued recall compared to both WT-SynRFP and AD-SynRFP mice on Day 3. IF microscopy showed that AD-SynCav1 mice exhibited increased Cav-1 and MAP-2-positive neuronal processes in cortical regions (sensory and parietal) and in hippocampal CA1, CA3 and DG neurons compared with WT-SynRFP and AD-SynRFP mice. IB assays showed decreased Cav-1 and SMI 31 (axonal marker) in AD-SynRFP compared to WT-SynRFP mice, while AD-SynCav1 mice displayed increased Cav-1 in comparison to AD-SynRFP and WT-SynRFP mice and increased SMI 31 compared to WT-SynRFP mice.

Conclusions
Neuron-targeted Caveolin-1 overexpression augments neuronal growth and neuroplasticity, and prevents the development of learning deficits in AD mice. This data shows that Cav-1 may serve as a potential therapeutic molecular target to promote neuroplasticity and restore cognitive function in AD.
NOVEL USE OF VA ECMO IN THE TREATMENT OF AMNIOTIC FLUID EMBOLISM

Sunday, 6th May - 08:30 - Marina Ballroom F/G - Oral

Dr. Robert Gitman
1. Kaweah Delta Medical Center

BACKGROUND: Amniotic Fluid Embolism (AFE) is a rare and life-threatening obstetric complication, occurring with an incidence of 1 in 40,000 births, accounting for 13.7% of all maternal deaths.1,2 The etiology is hypothesized to be an acute hypersensitivity reaction secondary to amniotic material entering maternal circulation, leading to an immediate release of vasoactive and procoagulant substrates.1 This cascade rapidly progresses to acute pulmonary vasoconstriction and right heart failure, ultimately resulting in the triad of systemic hypotension, hypoxemia, and coagulopathy.

CASE PRESENTATION: A 42 year old nulliparous female at 34 2/7 weeks gestation presented with hypertension and proteinuria. She was diagnosed with preeclampsia with severe features and was delivered by urgent cesarean delivery. Soon after delivery, the patient became unresponsive and rapidly progressed to PEA arrest. After resuscitation with ACLS, persistent refractory hypotension was managed with infusions of epinephrine, vasopressin, and norepinephrine. The intraoperative TTE showed an extremely dilated right ventricle (RV) with septal bowing and a pericardial effusion with cardiac tamponade physiology. In the absence of cardiac comorbidities, this combination of acute cardiac arrest and RV dilation presenting immediately after delivery was highly suspicious for AFE. The cardiothoracic surgeon performed a pericardial window, relieving 400 mL of blood from the pericardial sac and cannulated the femoral vessels for VA ECMO. Within 12 hours of surgery, the patient went into fulminant disseminated intravascular coagulopathy (DIC) and underwent an emergent hysterectomy as well as an exploratory laparotomy for unabating intraabdominal hemorrhage. In the presence of DIC, the concern that the ECMO circuit was further consuming clotting proteins led to ECMO decannulation after 26 hours. On post-operative day 5, the patient was successfully extubated and slowly regained full cognitive ability with no obvious neurological deficit or renal insufficiency. After a 26-day hospital course the patient was discharged to rehab.

DISCUSSION: Although numerous cases of AFE have been reported, no research has proven one definitively superior treatment modality. Current guidelines stress supportive measures such as pressor therapy with norepinephrine and/or dobutamine, decreasing pulmonary afterload with nitric oxide or prostacyclin, and correcting the associated coagulopathy. There are few case reports using VA ECMO to successfully bridge the acute anaphylactoid phase of AFE. This approach may provide superior hemodynamic control while the transient pulmonary vasoconstriction resolves. Additionally, since 83% of AFE is associated with fulminant DIC, we hypothesize that prolonged ECMO usage can potentially worsen the coagulopathy by consuming and/or damaging necessary plasma proteins.3 This case supports the use of VA ECMO, in conjunction with additional supportive measures, to treat the acute manifestations of AFE.

**Background:** Obtaining informed consent for obstetric patients is challenging because of the high-stress and frenetic environment of labor and delivery. The process an anesthesiologist undertakes to obtain informed consent is time-consuming and may be tedious. Labor pain, anxiety, and fear of needles can also act as a barrier for women to fully understand what they are consenting to. The goal of video education via iPads was to expedite the informed consent process in a manner that was still thorough, and to enhance the patient experience throughout their birthing process.

**Methods:** Upon admission to L&D suite, 15 primigravida women in early labor were randomly provided with a short animation video on an iPad discussing the process of placing an epidural with risks, benefits, and alternatives illustrated. If a parturient later requested an epidural, an anesthesiologist of various training level would come in to obtain informed consent. Length of time needed to obtain consent in person was recorded. Post operatively, patients were also administered a 10 question survey to evaluate their anesthetic management and experience and satisfaction with the consent process and video education. Inclusion criteria for this analysis included primigravida females, age range 16-38 years old, race (Hispanic, white or African American), no prior personal history of neuraxial anesthesia and level of education.

**Data:** 15 women in early labor were sampled, and all received epidural analgesia. 5/15 eventually underwent Cesarean section under neuraxial anesthesia due to fetus distress. 0 out of 15 women underwent general anesthesia. 15/15 women underwent successful delivery with Apgar scores of 8 and above.

**Results:** The results showed that 15/15 women indicated that they prefer video education over physician driven explanation. Additionally, time to obtain consent was an average of 2 minutes less than physician driven education.

**Conclusions:** For laboring women, the process of labor is a high stress environment that plays a role during delivery. Education is critical for epidural request and placement. The use of an interactive epidural educational video provides the patient the comfort of standardized care and increases receipt of neuraxial anesthesia from the national average of 61% to 100%. The flexibility of the anesthesiologist to oversee multiple patients at the same time is an added benefit. Additionally, video education is overall preferred by patients to current physician driven explanation of anesthesia methods. In modern practice, anesthesiologists should use tools available to positively impact patient care.

**References:**

Percutaneous Left Atrial Appendage Occlusion: Comparison of 2 Dimensional versus 3 Dimensional Echocardiographic Quantitative Assessment

Saturday, 5th May - 08:30 - Marina Ballroom F/G - Oral

**Dr. Flora Li¹, Dr. Kei Togashi¹, Ms. Lara Gruye¹, Dr. Mark Reisman², Dr. Burkhard Mackensen¹**

¹. University of Washington, Department of Anesthesiology, ². University of Washington, Department of Cardiology

**AUTHORS:** Flora Li MD, Kei Togashi MD, MPH, Lara Gruye BA, Mark Reisman MD, G. Burkhard Mackensen MD PhD FASE

University of Washington, Department of Anesthesiology and Pain Medicine, Division of Cardiothoracic Anesthesiology

**BACKGROUND:** Atrial fibrillation (AF) is associated with a high risk of thromboembolic cerebral events. Current medical management of patients with AF involves lifetime anticoagulation. While oral anticoagulant therapy is generally well tolerated, some patients are at high risk of adverse bleeding events. Percutaneous occlusion of the left atrial appendage (LAA) with the Watchman™ (Boston Scientific, MN) device has evolved as an alternative to prevent embolic events in these patients. Watchman™ device placement requires intra-procedural imaging guidance to assess anatomic LAA variations, select appropriate device sizes, guide the procedure, and evaluate the final device position. The most common imaging modality for this is multiplanar 2D transthoracic echocardiography (TEE). In this study, we aim to compare the clinical value of real-time 3D TEE based quantitative assessments of the LAA to the standard 2D TEE based methods.

**METHODS:** Complete 2D and 3D TEE datasets from 54 patients with a history of AF undergoing the Watchman™ procedure in our institute were reviewed and used for quantitative analysis. We performed multiplanar 2D TEE measurements during the procedure for guidance in device sizing. We then measured 3D TEE datasets post-procedure using TomTec Image-Arena™ (TomTec Imaging Systems, Munich). LAA measurements were first obtained in 4 viewing planes corresponding to those used in multiplanar 2D TEE, then made at the widest diameter of the LAA, as visualized on the 3D dataset. Post-procedural follow up data were collected via chart review.

**RESULTS:** All but two patients underwent the Watchman™ procedure successfully. One case was cancelled for a LAA clot, and the other for intra-procedure small pericardial effusion [BM1]. 9 patients required replacement or repositioning of the initially selected Watchman™ device due to poor device seating and compression. We found that there was no significant difference in LAA width as measured using intraoperative 2D TEE versus postoperative 3D TEE. In addition, the widest diameter of the LAA, as measured on the 3D dataset, was not significantly different from the maximum 2D width obtained using multiplanar 2D TEE.

**DISCUSSION:** Percutaneous LAA occlusion devices play an important role in preventing cerebrovascular accidents in AF patients with contraindications to systemic anticoagulation. Currently, intraoperative measurements for sizing and placement of the Watchman™ device are performed using multiplanar 2D TEE. We found that measurements using a high quality 3D dataset could accurately replicate 2D intraoperative measurements. In addition, the maximum width, which is used to size the device, can be obtained with a single measurement using the 3D dataset. The method we describe may represent a more efficient way and equally accurate method to perform intraoperative sizing for Watchman™ device placement without needing to measure at all 4 standard 2D TEE planes.
Don't think that the LAA was perforated. I think we had a small pericardial effusion during the transseptal puncture...
Background
Pulmonary hypertension (PH) is a chronic cardiopulmonary disease characterized by elevated pulmonary vascular resistance leading to right ventricular (RV) failure and eventually death. The pathogenesis of PH is not fully understood though it is likely multifactorial with involvement from the autonomic nervous system, renin-angiotensin-aldosterone system, and immune system. Inflammation has been shown to be a key contributor to the progression of PH, and studies have demonstrated elevated levels of inflammatory markers in patients with PH. Inflammation in the central nervous system (CNS) is known specifically as neuroinflammation, and microglia cells are important players in the immune response of the brain and spinal cord. We hypothesize that lung inflammation associated with PH leads to increases in neuroinflammation, contributing to disease progression.

Methods
Adult male rats (200-250 g) were injected with a single subcutaneous dose of monocrotaline (MCT, 60 mg/kg, n=8) to induce PH or saline as control. Four rats were followed for 21 days and 4 rats were followed for 30 days. Animals were monitored daily and fed ad libitum. At the end of the experiment, direct RV catheterization was performed to assess RV systolic pressure (RVSP), and rats were sacrificed. Spinal cords were isolated, fixed in 4% paraformaldehyde, embedded in O.C.T. and sectioned at 6µm. Sections were affixed to slides and stained using standard immunohistochemical protocols. Briefly, spinal cord sections were incubated overnight at 4°C with primary antibodies for angiogenesis marker CD31 (1:100), chemokine CCL3 (1:20) or GFAP (1:100), and co-stained with MAP2 (1:1000). Sections were washed and stained with fluorescently-conjugated secondary antibodies. Images were acquired with a confocal microscope (Nikon) and quantified with Image-J software. Statistical analysis was performed using a two-way mixed ANOVA to compare relative fluorescent signal between control and MCT-treated PH animals.

Results
MCT treated rats developed severe PH when measured at day 21 (RVSP=59.5±15.5 vs. 34.2±7.97 mmHg in controls; p<0.05) and day 30 (RVSP=97.6±13.2 vs 37.1±2.59 mmHg; p<0.05). When we analyzed spinal cord sections at day 21, we found an overall increase in expression of angiogenesis marker CD31 (control = 1±0.15, MCT = 1.83±0.66, p=0.0089) and activated astrocyte marker GFAP (control = 1±0.29, MCT = 3.60±1.59, p=0.0098), as well as a trend for microglial marker CCL3 (control = 1±0.63, MCT = 2.58±1.34, p=0.0621) in the MCT-induced PH rats compared to controls. A similar increase in CD31 (control = 1±0.07, MCT = 2.13±0.58, p=0.0004) and GFAP (control = 1±0.17, MCT = 1.64±0.47, p=0.0031) was observed at day 30. Values represent mean±SD.

Conclusions
Increases in microglial infiltration, vascularization, and astrocyte activation were observed in MCT-induced PH rat spinal cords. Our results suggest that rats with MCT-induced PH exhibit increased neuroinflammation in the spinal cord compared to control animals. Future studies aimed at assessing neuroinflammation in the brain in response to MCT-induced PH will allow us to determine if the increases in inflammatory markers extends to other regions of the CNS. Additionally, the increase in neuroinflammation may have implications for disruption of blood spinal cord barrier and possibly impaired autonomic nervous system control.
Skipping out on SCIP measure -10 may be a skip, hop and jump in the right direction.

Sunday, 6th May - 10:30 - Marina Ballroom F/G - Oral

Dr. Minh Tran¹, Dr. Swapnil Khoche¹, Dr. Rodney Gabriel¹, Dr. Urlich Schmidt¹, Dr. Albert Nguyen¹

¹ University of California San Diego

INTRODUCTION:
In 2011 the surgical care improvement project added the SCIP-Inf-10 measure to mandate that all surgical patients have perioperative temperature management. The aim was to achieve core body temperature ≥ or equal to 96.8°F/36°C intraoperatively and especially on arrival to the post anesthesia care unit. (PACU) This quality improvement guideline was instituted in response to a study on colorectal surgical patients which demonstrated increased rates of surgical site infections with perioperative hypothermia [1] and increased length of hospital stay [2]. We hypothesized that this finding could be extrapolated to thoracic surgical patients. Our primary endpoint was the number of surgical site infections within 30 days. Secondary endpoints were duration of stay in the PACU, hospital admission length of stay and associated mortality.

METHOD: Single center retrospective pilot study examining thoracic surgical patients over a two year period for the incidence of surgical site infections within 30 days. Patients with decortication procedures and/or pre-existing infections were excluded. Data were collected from EPIC medical records with IRB approval.

RESULTS: Our study included 369 patients. 62% of patients had intraoperative temperature measurements of <36°C. No temperature data was recorded in 15% of the population. The average intraoperative temperature was 35.4 ± 0.8°C with the nadir temperature average being 35.0 ± 0.9°C. A warming device was utilized in 98% of the population. There were 4 surgical site infections in the study with 3 cases from the <36°C group. There was no significant association between the group that had intraoperative temperatures <36°C and the group with >36°C. (p=1.0) Comparing the rate of surgical site infections from <36°C group with the group of patients that had no intraoperative temperatures measured also showed no significant difference between these two groups in regards to surgical site infections. (p=1.0) Average PACU arrival temperatures were 36.3 ± 0.4°C with average PACU length of stay in the intraoperative temperature <36°C group of 227.3 ± 115.0 minutes compared with 217.9 ± 103.8 for those that had temperature >36°C. Intraoperative hypothermia was not found to be associated with increased PACU length of stay. (p=0.54). Average hospital length of stay was 5.5 ± 5.2 days in the <36°C group and 8.6 ± 12.8 in the >36°C group with (p=0.0024). There was only one in hospital mortality which occurred in the <36°Celsius group.

CONCLUSION: This study did not demonstrate any significant association with surgical site infections and perioperative hypothermia in thoracic surgical patients examined over a 2 year period. Intraoperative hypothermia was not associated with increased PACU length of stay. Hospital length of stay on average was longer in the patients that had average intraoperative temperatures >36°Celsius.

2. RONA F. LEVIN, P., RN; FAY WRIGHT, PhD, RN, APRN-BC; and M. KATHLEEN PECORARO, RN, CPAN; WENDY KOPEC, BSN, RN, CNOR, Maintaining Perioperative Normothermia: Sustaining an Evidence-Based Practice Improvement Project. 2016. 103(2).
Spinal Cord Stimulation Therapy Attenuates Activation of Dorsal Horn and Intermediolateral Nucleus Neurons During Acute Myocardial Ischemia

Saturday, 5th May - 09:30 - Marina Ballroom F/G - Oral

Dr. Nicole Yin 1, Dr. Kim Howard-Quijano 2
1. University of California Los Angeles, 2. UCLA Department of Anesthesiology and Perioperative Medicine

BACKGROUND: Better preventative therapies are needed for lethal ventricular arrhythmias, which are the leading cause of sudden cardiac death. Spinal cord stimulation (SCS), a well established in the treatment of neuropathic pain, has been shown to reduce ventricular arrhythmias during acute ischemia/reperfusion (I/R) by attenuating myocardial excitability. However, specific neuronal pathways through which SCS modulates ventricular excitability have yet to be elucidated. Cfos is a cellular proto-oncogene that is an established marker of neuronal activity that can be used to identify specific cells stimulated in neural pathways. The goal of this study is to establish neuronal pathways involved in ischemia induced myocardial sympathoexcitation and the effect of SCS, through acute I/R evoked immunoreactivity of cfos in porcine spinal cord. We hypothesize that myocardial I/R increases afferent signaling to the thoracic spinal cord and evokes cfos expression in dorsal horn and intermediolateral nucleus (IML) neurons, with resultant increased efferent sympathetic output and myocardial excitability. Further, we hypothesize that SCS therapy will reduce cfos immunoreactivity in the thoracic spinal cord and attenuate myocardial excitability and ventricular arrhythmias.

METHODS: Yorkshire pigs were anesthetized and randomized into 3 groups: 1) control- no I/R (n=4), 2) acute I/R- 1 hour of myocardial ischemia with LAD ligation at the 3rd diagonal branch followed by 3 hours reperfusion (n=8), and 3) I/R+SCS therapy with SCS 4 pole stimulating catheter placed in the epidural space (T1-T4) with stimulation prior to 1hr ischemia and 3 hours reperfusion (n=8). SCS of 50Hz at 200μsec duration, current 90% of motor threshold was applied 30min prior to ischemia. Ischemia was confirmed with ST segment elevations in ≥ 5 contiguous ECG leads. High fidelity cardiac electrophysiology mapping, including activation recovery intervals (ARI) and dispersion of repolarization, was used simultaneously to monitor changes in sympathetic excitability and arrhythmogenicity. At the end of experimental protocol, spinal cord tissue was harvested from T1-T4 and immunostained for cfos protein and microtubule associated protein (MAP2), a neuronal specific marker.

RESULTS: Ischemia induced myocardial sympathoexcitation was demonstrated by decreased ARI (373±14 to 334±13ms) and increased dispersion of repolarization (532±54 to 5792±1014ms 2, p<0.0002). SCS therapy reduced the ischemia induced increase in dispersion (527±65 to 3896±727ms 2, p<0.002). SCS therapy also reduced incidence of ischemia induced ventricular fibrillation: Ischemia 55%, Ischemia+SCS 33% p<0.05. Immunostained thoracic cord sections for cfos and MAP2 in the DH and IML showed increased expression of cfos+neurons after I/R, and significant attenuation with SCS therapy, p<0.05 (Figure 1).

CONCLUSIONS: Myocardial I/R intensifies afferent signaling to the DH of the thoracic spinal cord, and increases IML efferent sympathoexcitation and potentially fatal ventricular arrhythmias. Neuronal cfos expression identified distinct networks of neurons stimulated during ischemia, primarily located in the superficial laminae of the DH and IML of the thoracic spinal cord. SCS therapy attenuated cfos expression in DH and IML activation in this pathway, which was associated with decreased myocardial sympathoexcitation and arrhythmogenesis after I/R. This data begins to define the location of the cardiospinal neural network regulating myocardial sympathoexcitation during ischemia and the therapeutic mechanisms of SCS.
Sugammadex Decreases Cost Associated with Post-Operative Reintubations

Sunday, 6th May - 10:15 - Marina Ballroom F/G - Oral

Dr. Angela Lee¹, Dr. Darren Raphael¹, Dr. Joseph Rinehart¹
¹. UCI Medical Center

Introduction: Sugammadex is a new pharmacologic agent used to reverse the action of aminosteroid neuromuscular blocking agents. It was approved for use by the United States FDA in December 2015. There are many advantages to using Sugammadex compared to using neostigmine, such as predictability, fast onset, and positive side effect profile. Despite its many advantages, Sugammadex is not used as a first-line reversal agent at our institution. The most commonly cited reason for this is the high cost of the drug. This study seeks to show that using Sugammadex as a reversal agent does not have increased cost compared to reversal with neostigmine and glycopyrrolate, and in fact can save cost associated with postoperative pulmonary complications, namely post-operative reintubations.

Methods: In this retrospective study, all general endotracheal anesthesia (GETA) cases were identified over the last 3 years at UCI Medical Center. Patients were divided into two groups: pre-sugammadex (“Pre” group; those patients receiving GETA before Sugammadex was available) and post-sugammadex (“Post” group; GETA cases after Sugammadex was available). All cases with unplanned re-intubations were identified in both groups. The re-intubations were further divided as post-anesthesia care unit (PACU) and intraoperative. Outcomes between groups were analyzed using chi square test to test statistical significance.

Results: A total of 31,184 cases were identified over the three years, 20,242 in the two-year Pre group and 10,942 in the one-year Post group. The overall annual re-intubation rate in the Pre group was 24, and in the Post group was 18, a non-significant overall difference (p=0.23). The number of PACU reintubations per year, however, was 9.5 in the Pre group (0.094% of cases) and 2 in the Post group (0.018% of cases), a statistically significant difference (p=0.026; 95% CI = 0.02-0.13%). Using a PACU time cost of $601.15, the institution would save approximately $4508.63 yearly from the decrease in PACU reintubations with the use of Sugammadex.

Discussion: Though the total re-intubation rate comparing pre and post Sugammadex was not statistically significant, since adding Sugammadex to formulary at UCI there has been a statistically significant decrease in PACU reintubations after GETA. Given the similarity of cost of Sugammadex reversal to neostigmine and glycopyrrolate reversal at our institution, this would result in a decrease in cost due to PACU reintubations since the introduction of Sugammadex. Given the safety profile and many advantages of Sugammadex compared to neostigmine and glycopyrrolate, we believe Sugammadex should be considered a first-line reversal agent at our institution.
Targeting Calcium-Activated Potassium Channels as a Novel Approach to Treating Atrial Fibrillation

Saturday, 5th May - 12:15 - Marina Ballroom F/G - Oral

Dr. Sassan Rafizadeh 1, Dr. Zheng Zhang 2, Dr. Hyo Jeong Kim 2, Dr. Clinton Kakazu 1, Dr. Nipavan Chiamvimonvat 2, Dr. Ebenezer Yamoah 2

1. Harbor-UCLA Medical Center, 2. University of California Davis

Authors: Sassan Rafizadeh 1& 2, Zheng Zhang 1, Hyo Jeong Kim 1, Clinton Kakazu 2, Ebenezer N. Yamoah 1, Nipavan Chiamvimonvat 1

Affiliated Institutions: 1. Harbor-UCLA Medical Center, 2. UC Davis School of Medicine

Background: Recent estimates suggest that up to 16 million people will have atrial fibrillation (AF) in the United States by 2050. Given the significant morbidities associated with AF and lack of optimal therapies, novel therapeutic approaches are urgently needed. The normal mechanical function of the heart depends on normal action potential morphology, which in turn is reflective of the proper function and precise membrane localization of channel proteins. Small-conductance, Ca$^{2+}$-activated K$^+$ channels, subtype 2 (SK2) are expressed in human atrial myocytes and are responsible for shaping atrial action potential and not the ventricular action potential, therefore, targeting SK channels represents a novel approach to treating AF.

Methods: Immunofluorescence confocal microscopy, total internal reflection microscopy, whole-cell electrophysiological patch-clamp recordings and in-vivo electrophysiological recordings in mouse animal models as well as cell-lines were utilized.

Results: We demonstrate that SK2 channels are differentially expressed in the atria compared to the ventricles. Furthermore, we establish that filaminA, a cytoskeletal protein, augments the trafficking of SK2 channels to the cell membrane and that the trafficking of SK2 channel is Ca$^{2+}$-dependent. Further, the Ca$^{2+}$ dependence relies on another channel-interacting protein, α-actinin2, revealing a tight, yet intriguing assembly of cytoskeletal proteins that orchestrate membrane expression of SK2 channels in cardiac myocytes.

Conclusions: We show that trafficking of SK2 channels to the membrane is dependent on two cytoskeletal proteins, filaminA and α-actinin2 and that changes in SK2 channel trafficking would significantly alter atrial action potential and consequently atrial excitability. Identification of therapeutic targets to manipulate the subcellular localization of SK2 channels is likely to be clinically efficacious. The findings here may transcend the area of SK2 channel studies and may have implications not only in cardiac myocytes but in other types of excitable cells.
Transversus abdominus plane block catheters vs liposomal bupivacaine for pain control after colorectal surgery: A prospective randomized control trial

Saturday, 5th May - 12:00 - Marina Ballroom F/G - Oral

Dr. Diosdado Baja ¹, Dr. Zar Baqai ¹, Dr. Jon Zhou ¹, Dr. Stephen Macres ¹, Dr. Richard Applegate ¹
1. UC Davis Department of Anesthesiology & Pain Medicine

Introduction
Pain control after abdominal surgery involves multiple components of somatic and visceral pain. The US-guided transversus abdominus plane peripheral nerve block (TAP) decreases somatic pain and opioid consumption after abdominal surgery by infiltrating local anesthetic between the internal oblique and transversus abdominis muscles where the T7-L1 nerve roots terminate. TAP blocks have decreased 24-hour morphine consumption and resulted in earlier discharge and bowel function time in colorectal surgery patients compared to patient controlled analgesia

TAP catheters (0.2% ropivacaine) are commonly placed for colorectal surgery patients, remaining in place until somatic pain is controlled and oral intake is tolerated. TAP catheters have risks including infection, nerve irritation, and possible falls due to tethering to pumps. Liposomal bupivacaine is an extended duration local anesthetic recently approved for use in TAP blocks. Although there have been smaller reports of liposomal bupivacaine TAP block efficacy, there is currently no prospective study that evaluates the efficacy of single injection TAP blocks with liposomal bupivacaine compared to ropivacaine TAP catheters for colorectal surgery patients. Our primary objective is to compare the total 48-hour opioid use in the aforementioned groups.

Material and Methods
After IRB approval and informed consent, eligible patients were randomized to receive either preoperative bilateral TAP blocks using single injection liposomal bupivacaine (group 1) or TAP catheter (group 2) in the holding area. Both procedures were performed by the Acute Pain Service comprised of an Anesthesiology faculty member and resident at least 30 minutes prior to surgical incision. Group 1 received 10cc of 0.25% plain bupivacaine to open up the TAP space followed by 133mg (10cc) of liposomal bupivacaine diluted with 10cc saline on each side. Group 2 received 30 cc of 0.25% ropivacaine on each side and TAP catheter placement, with subsequent catheter infusion for 2 days. Patients received standard IV analgesic care in PACU and ward. Total PACU time and opioid consumption in IV morphine equivalents at multiple time points (intraoperative, POD 0, 1, 2) were compared for the two groups using standard paired t-tests.

Results
The sample population had 15 patients enrolled in each group, with results summarized below.

Discussion Results show statistically higher intraoperative opioid consumption in the liposomal bupivacaine group despite using plain bupivacaine bridge. This may be due to the delayed onset of extended release liposomal bupivacaine. However, POD 0, 1, and 2 opioid as well as total 48-hour postoperative opioid requirements were not statistically significant different between groups. TAP blocks with liposomal bupivacaine may decrease the need for TAP catheters which may lead to a decrease in infection and fall risk. However, our recruitment goal of 100 total patients is ongoing to determine if the differences in opioid consumption are statistically different at timelines other than intraoperatively. Although liposomal bupivacaine has a higher cost than ropivacaine, this may be offset by eliminating the costs associated with catheter kits and physician, nursing, and pharmacy resources required for infusions. Limitations of the study include lack of a control group.
Usage Patterns of Ketamine at the University of Utah

Sunday, 6th May - 08:00 - Marina Ballroom F/G - Oral

Dr. Whitney Creed ¹, Dr. Emily Hagn ¹, Dr. Joseph Biskupiak ¹

¹ University of Utah Hospitals and Clinics

Current guidelines by the ASA recommend a multimodal analgesic approach using combinations of opioids, regional techniques, NSAIDS, acetaminophen, ketamine and gabapentin to target different aspects of the pain pathway. Previous studies evaluating the efficacy of ketamine as an adjunct to opioids, in reducing perioperative pain, are mixed, mostly due to the variance of dosing, timing, administrations and duration.

In our study we set out to determine how ketamine is used at the University of Utah. We reviewed all inpatient anesthetics performed from July 2014-Decemeber 2016 and sought to determine: How often is ketamine used during inpatient surgeries, on what type of patients is ketamine used (ASA, surgical specialty, anesthesia type) and how much ketamine is being used?

Over the course of our 30 month study period there were 28,055 anesthetics performed on inpatients, of which 12,646 used ketamine. After exclusion criteria (missing data, age <18, IM delivery and ketamine infusions) our data set included 8,868 encounters (95.7% of original data). We found that 33% of all inpatient surgeries used IV ketamine with an increase in use over the course of the study period (from 22.9% to 31.3%). The most common types of surgery using ketamine (by percentage use) were cardiothoracic, gynecology, plastics and pain. When breaking down usage by ASA status it was very comparable across ASA status 1-4 (27.6 – 35.1% of cases). Ketamine was used in 34% of general anesthetics, 44% of regional cases and 7% of MAC cases. Average ketamine dosage per surgery was 37.4 mg with a mean of 19.4 mg per hour of surgery.

Overall we were surprised by the frequency of ketamine usage and the increasing trend over time. We hypothesize that the increasing usage comes from improved awareness of the importance of multimodal analgesia as well as factors specific to the University of Utah such as grand grounds and/or senior thesis presentations which correlate with increasing/decreasing usage. We are continuing to evaluate the data over the past year and hope to be able to include updated information in our presentation as well.
Voluntary Exercise Rescues a Spatial Memory Deficit after Early-Life Anesthesia Exposure

Saturday, 5th May - 09:45 - Marina Ballroom F/G - Oral

**Dr. Gregory Chinn**, **Dr. Jeffrey Sall**

1. UCSF

**Background**

Early-life exposure of anesthesia is associated with a life-long neurocognitive deficit that has been reproduced in multiple animal models. Previously, our lab has shown that environmental enrichment which includes social housing, free access to toys and access to an exercise wheel, was sufficient to rescue spatial memory deficits after early-life anesthesia exposure in rats. Given that exercise has been shown in other studies to be the key neuroprotective factor in environmental enrichment, we hypothesized that voluntary exercise is sufficient to rescue spatial memory in anesthesia exposed rats.

**Methods**

Seven day old male rats were exposed to Isoflurane for 6hrs (at approximately 1MAC), then returned to their Dams with their non-exposed (Control) littermates. At postnatal day 20, the animals were weaned and were singly housed in voluntary exercise wheel cages or cages without a wheel (Sedentary). This created four groups, Iso/Exercise (n=14), Iso/Sedentary (n=12), Control/Exercise (n=13) and Control/Sedentary (n=11). Daily distances were recorded. After 2 months of exercise, the animals were subjected to a spatial memory task, Barnes maze. Animals were trained to find an escape box around a circular table with 20 holes over a period of 4 days. A week after the last day of the Barnes maze training, the animals were subjected to a “Probe” trial to assess their memory retention in which escape box was removed. During the Barnes maze, the animals movements were recorded with a camera and analyzed using Noldus tracking software. Statistical analysis was completed using Graphpad Prism software.

**Results**

Isoflurane exposed animals and Control animals ran on average 2.6 km/day and 2.9 km/day respectively (t(21)=0.34 p=0.77). All groups decreased latency to finding the escape box demonstrating that they all learned the task during the training of the Barnes maze. Two-way ANOVA demonstrated no significant difference between groups, but confirmed effect of learning over four days of training (F(4,164)=13.17 p<0.0001). A Dunnet's multiple comparison test was performed for the probe trials, comparing the amount of time spent in the goal hole to the time exploring the other non-goal holes. The Control/Sedentary animals spent significantly more time at the goal than 18 out of 19 holes. The Control/Exercise animals did essentially the same distinguishing 18 of 19 holes. The ISO/Sedentary animals only distinguished 7 of 19 holes from the goal. The ISO/Exercise animals were comparatively better and able to distinguish 11 of 19 holes from the goal.

**Conclusions**

Here we demonstrate that a single early-life exposure to anesthesia can result in a spatial memory deficit, as the ISO/Sedentary animals were unable to distinguish the goal from most other holes in the probe trial of the Barnes maze, compared to Control/Sedentary animals which could distinguish between all but one hole. Interestingly, this spatial memory seems to be encoded appropriately in the short term as all groups learn the correct hole by the end of the training sessions. This deficit is partially rescued with voluntary exercise as the ISO/Exercise animals are able to distinguish 11 of 19 holes from the goal.
“Reverse to avoid the adverse”: Improving compliance to evidence-based reversal of non-depolarizing neuromuscular blockade

Saturday, 5th May - 11:30 - Marina Ballroom F/G - Oral

Authors: L. Xu, J. Jeng, J. Cecil, S. Lee, T. Wang, J. Libaw, A. Anderson, L. Liu, and M. Braehler
Institution: Department of Anesthesia, UCSF

Background
The benefits of non-depolarizing neuromuscular blocking drugs (NMBDs) are accompanied by the potential for adverse respiratory events in the postoperative period in the setting of residual partial blockade. A review of the literature demonstrates that after patients are given a non-depolarizing NMBD, monitoring for adequate recovery requires the use of a quantitative neuromuscular monitor showing a TOF ratio ≥ 0.9. Patients that have not met this threshold should remain intubated or have their residual blockade reversed using a reversal agent (e.g. neostigmine or sugammadex) prior to extubation. We implemented a resident quality improvement initiative to increase compliance with evidence-based monitoring and reversal of non-depolarizing NMBDs in adult patients.

Methods
Inclusion criteria were patients ≥ 18 years of age who received a non-depolarizing NMBD. Exclusion criteria included children and patients with a medical contraindication to reversal or for whom it would be clinically inappropriate. We defined appropriate treatment of patients receiving non-depolarizing NMBDs as giving a reversal agent before extubation, demonstrating neuromuscular recovery through a quantitative TOF ratio ≥ 0.9, or leaving the patient intubated. Quantitative TOF ratio was monitored using E-NMT or Stimpod devices. Residents were educated on appropriate monitoring and reversal of neuromuscular blockade using department-wide presentations, email reminders, and reference cards placed on anesthesia carts in operating rooms. Bi-weekly reminder pages reinforced project objectives. Data on successes and failures were collected on a quarterly basis and shared with the department.

Results
In the calendar year 2016 the baseline rates of appropriate treatment were 75% for 8054 eligible cases by residents and 68% for 6137 eligible cases by non-residents (CRNAs or attendings). The QI project started July of 2017. In the first quarter of academic year 2017-2018, 2137 resident cases met inclusion criteria, and residents treated patients appropriately 90% of the time by administering reversal (82%), leaving the patient intubated (13%), or demonstrating quantitative TOF ratio ≥ 0.9 (5%). In the second quarter, 2109 resident cases met inclusion criteria and residents treated patients appropriately 89% of the time by administering reversal (83%), leaving the patient intubated (11%), or demonstrating quantitative TOF ratio ≥ 0.9 (6%). In comparison, non-resident cases meeting inclusion criteria during those quarters were treated appropriately 84% of the time. Sugammadex was the preferred reversal agent and used in 86-90% of the cases.

Conclusions
Residual neuromuscular blockade from inadequate reversal can result in postoperative complications. These include rare yet serious respiratory events after extubation, prolonged PACU stays, unintended ICU admissions,
and an increased risk of pneumonia. Our goal was to decrease these adverse outcomes and improve patient care through provider education on evidence-based monitoring and reversal after the administration of non-depolarizing NMBDs. Through our interventions, we exceeded the aim of our quality improvement initiative and improved our compliance from 75% to 90.
Posters
Introduction:
Loeys-Dietz syndrome is an autosomal dominant connective tissue disorder which was first described in 2005. It is characterized by enlargement of the aorta and aortic root leading to aneurysm and dissection. Other key syndromic feature includes craniosynostosis, scoliosis, clubfoot, and bifid uvula. The prevalence of Loeys-Dietz syndrome is unknown. Many of these patients require surgical and advanced technology like cardiopulmonary bypass is crucial for cardiac surgery and equipment failure is potentially a lethal scenario during these procedures.

Case Description:
The patient is a 31-year-old male with a history of Kawasaki's vascular disease diagnosed at the age of 8. He has moderate mitral regurgitation with mitral valve prolapse, atrial septal defect, and atrial fibrillation and an aortic root aneurysm. The patient had been genetically tested Loeys-Dietz syndrome. The planned surgery was valve-sparing aortic root replacement with root reimplantation and coronary button reimplantation and subsequent aortic valve replacement, complex mitral valve repair, MAZE procedure, and repair of atrial septal defect. Arterial line and central line with PAC were placed preoperative and cerebral oximetry connected prior to induction. After central cannulation, being on full flow cardiopulmonary bypass and right before the aortic cross clamp being applied it was noted that the cerebral oximetry dropped from the baseline levels of 70-73% to 38-40%. The mean arterial blood pressure decreased from 60-70's mmHg to 50-60's mmHg. The perfusionist was unable to oxygenate blood passing through the bypass machine. It was quickly noted that the vaporizer was impeding the flow of oxygen to the bypass machine and thus limiting the ability of bypass machine to oxygenate the blood. After review of the bypass machine an external oxygen tank was connected directly to the oxygenator of the bypass machine and oxygenation was achieved. The vaporizer was replaced and gas flow through the device was tested using an in-line gas flow meter. The oxygen tank was then removed from the circuit, and the gas line from the vaporizer reattached to the oxygenator. Bypass was again started and the system was able to maintain oxygenation and use of volatile anesthetic was sufficient for the remainder of the bypass time. The remainder of the surgery proceeded without further complication.

Discussion:
Oxygenation failure during bypass is a major adverse event that has been recognized a potential source of injury during cardiopulmonary bypass. The two most common causes of oxygenation failure during cardiopulmonary bypass are oxygenator or vaporizer failure. During our case the perfusionist quick called for help after noting the inability to oxygenate. The surgeon had not placed the aortic cross clamp, patient's heart was beating and circulation was intact and the anesthesia team was able to ventilate the patient while the perfusionist replaced the vaporizer. Events such as the one described above has lead perfusion teams to develop checklists to help reduce risk overall. Even with check list there is the possibility for equipment failure.
A case of pituitary apoplexy: an unusual case of postpartum headache after neuraxial anesthesia

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Margaret Chiu 1, Dr. Larry Weinstein 1
1. UCSD

Headache is one of the most common symptoms women experience in the postpartum period. Anesthesiologists are frequently consulted to evaluate postpartum headaches given that postdural puncture headaches can cause debilitating but often treatable headaches. While postpartum headaches in a patient that receives neuraxial anesthesia is commonly attributed to post dural puncture headache (PDPH), the differential for the headache is broad including primary headache, preeclampsia associated headaches, posterior reversible encephalopathy syndrome and pituitary apoplexy. This case involves a 29 yo F G4P2012 at 39w1d with pregnancy complicated by fetal osteogenesis imperfecta. She had an uncomplicated spinal administered for vaginal delivery. She subsequently developed severe headache with movement on postpartum day 0. While the anesthesia team was consulted to perform an epidural blood patch because her headache was initially attributed to PDPH, her constellations of symptoms did not follow the pattern seen with typical PDPH. Further workup performed included MRI brain, which revealed that she had developed acute pituitary hemorrhage and pituitary apoplexy. She was subsequently evaluated by endocrinology, neurosurgery, ophthalmology. Since she did not have significant neuro-ophthalmic findings, her pituitary apoplexy did not require surgical decompression. Endocrinology continued to follow the patient for hypothalamic–pituitary–adrenal axis suppression and treated her with hydrocortisone and levothyroxine.
A case of rapid growth of tumor thrombus into right ventricle detected by transesophageal echocardiography during surgical resection of renal cell carcinoma with IVC extension

Dr. Elise Uthlaut, Dr. Kyota Fukazawa
1. University of Washington, Department of Anesthesiology

Introduction: Renal cell carcinoma (RCC) with tumor thrombus extension into inferior vena cava (IVC) is a medical condition that, if untreated, invariably results in death. The only curative option is complete local resection of tumor, but this procedure is associated with significant perioperative morbidity and mortality and poses significant clinical challenges to the anesthesiologist. We describe a patient with renal cell carcinoma with IVC extension (Level II) who developed pulmonary embolism (PE)/intracardiac thrombus (ICT) during caval assessment of tumor invasion rescued by immediate thrombectomy via atriotomy with CPB.

Case Description: 53yo M with RCC with IVC thrombosis (Level II/Mayo criteria) presented for nephrectomy with IVC thrombectomy for renal mass and recent history of symptomatic PE. His past medical history was unremarkable. During workup for new onset dyspnea, the patient was found to have bilateral sub-massive PE with 8 cm right renal mass. PE was acutely treated with twice daily doses of Enoxaparin with symptomatic relief. Imaging study 6 weeks prior to surgery revealed 2 cm caval extrusion of tumor (Level II). [Figure 1A] There was no cardiac workup after the episode of PE. In addition to standard ASA monitors and CVP, transesophageal echocardiography (TEE) was used to monitor tumor extension, right/left ventricular function, survey ICT/PE, aid in volume management, and actively guide surgical resection. Initial TEE before incision showed interval growth of IVC thrombus to 3 cm below hepatic vein confluence (Level II). [Figure 1B] Coagulation profiles showed high fibrinogen level (824mg/dL). After incision, colon and duodenum were mobilized to expose IVC. The IVC thrombus extension was assessed by palpation and TEE. During this IVC assessment, a rapid growth of the caval thrombus into the right atrium was identified by TEE. [Figure 1C] Cardiothoracic service was urgently consulted and patient was immediately placed on CPB for extraction of ICT. Throughout this time, the thrombus maintained connection to the renal tumor and patient remained hemodynamically stable. CPB (on pump beating) was initiated after establishment of ascending aortic and double caval cannulation. After atriotomy and opening of IVC, ICT fragment was successfully removed from the right atrium [Figure 1D] and kidney/tumor were removed en bloc. Thrombectomy was uneventful and there was no residual tumor or thrombus. Total CPB time was 45min. Patient was transferred to the CT-ICU for postoperative monitoring. Patient was extubated next day and discharged home on postoperative day 7.

Discussion: We report a case of intraoperative ICT/PE in a patient undergoing nephrectomy for renal cell carcinoma with a level II IVC tumor thrombus. Compromised IVC flow with preexisting hypercoagulable state from cancer may contribute to the rapid growth of tumor thrombus during procedure. Our separate study (IRB#-2583) in UWMC between 2014 and 2017 revealed an incidence of perioperative ICT/PE was 10.5% (6/57) with on-table mortality of 33.3% during IVC thrombectomy. Early diagnosis and treatment play a pivotal role in preventing on-table mortality. Monitoring level of tumor thrombus, early diagnosis of ICT/PE, careful monitoring of coagulation, and communication with the surgical team played important roles in the patient’s positive outcome.
A Case of Severe ARDS and Refractory Hypoxemia Despite VV-ECMO After Scrotal and Penile Silicone Injections

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Hooman Golfeiz
1. Cedars-Sinai

**Background:** ARDS is an acute, diffuse, inflammatory lung injury that leads to increased pulmonary vascular permeability, increased lung weight, and a loss of aerated tissue. Clinical hallmarks of ARDS are hypoxemia and bilateral radiographic opacities, while the pathological hallmark is diffuse alveolar damage. It is associated with a variety of risk factors and etiologies. This case report describes a case of severe ARDS after scrotal and penile silicone injections in an otherwise healthy young male.¹

**Case Description:** Our patient was a 30-year-old gentleman with a history of anxiety, who initially presented to an outside hospital for increasing shortness of breath. Per patient, he was recently having silicone injections into his scrotum and penis. He shortly thereafter developed progressive shortness of breath, cough, and hypoxia. He was admitted to an outside hospital. He continued to deteriorate and was placed on VA-ECMO. He was then transferred to Cedars-Sinai Medical Center for a higher level of care. Per report, a CT pulmonary angiogram was negative for PE, but did show patchy bilateral airspace disease, especially in the left lower lobe felt to be consistent with silicon emboli. A TTE done at the time showed preserved LV and RV function, so it was decided to take him to the OR for removal of his VA ECMO and placement of a Protek Duo cannula in the RIJ for VV ECMO as this was deemed to be primarily respiratory failure. Throughout postoperative day 1, the patient’s oxygenation remained adequate on full support. However the next day his oxygenation and ventilation declined abruptly. At that time mild to moderate hemoptysis was noted in the endo-tracheal tube. Bedside bronchoscopy was done that showed bilateral diffuse bleeding in the airways, but not significant enough to support the hypoxia. A TEE was also done at the bedside and was found to be negative for intra-cardiac shunting, pericardial effusions and, furthermore, the catheter was found to be in proper placement. A CT scan was done which showed extensive confluent diffuse consolidation occupying the entire lungs bilaterally. Despite full support his PaO2 continued to decline to the 30’s. At that time a discussion was made with the family regarding the patient’s poor prognosis, he was made DNR and transitioned into comfort care. Patient expired on POD #2 of being placed on V-V ECMO.

**Discussion:**
The injection of silicone by lay persons for cosmetic purposes is gaining more and more popularity in the U.S. There have been many case reports of silicone injection induced ARDS in the literature in the recent years. Silicone injection causes spillage of silicone liquid into the alveolar space after embolization to the lung. Localized cell-mediated inflammation that occurs with the influx of neutrophils, eosinophils, and alveolar macrophages plays an important role in the pathogenesis of silicone embolism.²
A Case of Spurious Hypoxemia on Blood Gas Analysis During Hyperleukocytosis Secondary to Chronic Myelogenous Leukemia

Our patient was a 30-year-old male with a history of Chronic Myelogenous Leukemia (CML), who was non-adherent to his chemotherapy regimen. He presented to our Neurological Intensive Care Unit (NICU) from an outside facility with new onset seizures in the setting of an extensive multifocal intraparenchymal hemorrhage, white blood cell count (WBC) of 614,000 cells/µL and platelet count of 50,000 cells/µL. Upon arriving, the patient was swiftly taken to the Operating Room (OR) for decompressive craniectomy and hematoma evacuation.

During the procedure, repetitive arterial blood gas (ABG) analysis revealed a persistently low arterial oxygen tension (PaO2) of 40-60 mmHg, despite lack of an apparent respiratory cause and a consistent pulse oximetry reading (SpO2) of 96-100%. These results were confirmed on two different blood gas analyzers in our OR laboratory. The patient was maintained on high PEEP and 100% FiO2 for presumed hypoxemia but these interventions failed to increase the PaO2 beyond 59 mmHg. Carboxyhemoglobinemia was ruled out before the patient was transferred back to the NICU. During the course of his hospitalization, his leukocytosis was treated with hydroxyurea and imatinib. Once his WBC declined, his PaO2 improved significantly. However, given the patient’s refractory intracranial hypertension and worsening prognosis, his family ultimately opted for comfort care.

Hypoxemia is a common but serious condition frequently encountered in both the OR and ICU setting. While the differential diagnosis for hypoxemia is extensive, the amount of conditions that may cause an inaccurately low PaO2 in the setting of a normal pulse oximetry (often termed “pseudohypoxemia” or “spurious hypoxemia”) is quite low. Possible etiologies of spurious hypoxemia in this setting include a presence of bubbles in the sample, delayed sample analysis, failure to cool the sample, or blood gas analyzer malfunction. Additionally, spurious hypoxemia, first described as “leukocyte larceny” in 1979 [Fox et al, 1979], has been reported in patients with a WBC > 50,000 cells/µL. This phenomenon is secondary to the large number of metabolically active cells, particularly blasts, present in the sample that utilize the oxygen via aerobic metabolism prior to blood gas analysis. It is worth mentioning that carboxyhemoglobinemia and methemoglobinemia are additional conditions that may cause a discordance between the PaO2 and SpO2; however, in these circumstances, it is the SpO2 which is falsely elevated.

Patients with hematologic malignancies may certainly have other causes of hypoxemia, but these should have a correlating low PaO2 and SpO2. A high index of suspicion and sound clinical judgement are necessary to detect a spurious hypoxemia in this group of patients. Rapid cooling of the blood sample or bedside analysis could limit the administration and adverse effects of high oxygen fractions or high PEEP to this patient population, as well as decrease the need for invasive testing to determine a cause for this spurious hypoxemia.
A Case of Undiagnosed Subglottic Stenosis Managed During Intubation

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Derek Djavaherian 1, Dr. Sachin Jha 1
1. University of Southern California

Background:
Subglottic stenosis is a condition comprising narrowing of the trachea inferior to the vocal cords. It is associated with a variety of conditions, including prolonged intubation, polytrauma to the airway, GERD, and Wegener’s Granulomatosis. One case report also describes its rare association with particular infectious diseases. Subglottic stenosis is thought to develop due to abnormal wound healing in patients who are chronically in proinflammatory states, including both obesity and diabetes mellitus. We present here a case of subglottic stenosis diagnosed and managed during intubation.

Case:
A 51 male presented with a history of massive lymphedema of the right lower extremity which developed after a motorcycle crash in 1992. He was to undergo a Charles’ Procedure, during which the edematous skin tissue is stripped from the muscle and then used to create skin grafts that are subsequently placed back over the muscle tissue without the edematous subcutaneous elements. He also had a history of obesity, a hiatal hernia, obstructive sleep apnea (on CPAP), and asthma. He denied prolonged intubation for his previous accident during preoperative evaluation. He had pronounced wheezing preoperatively presumed to be an asthma exacerbation and was given breathing treatments with partial resolution of his symptoms. Upon induction of anesthesia, a grade 1 view with a MAC4 laryngoscope was achieved but the endotracheal tube (ETT) would not pass the vocal cords. Intubation was attempted first with an 8.0 ETT, then 7.5, and finally 7.0, however all were unsuccessful. A bougie was then utilized and passed easily through the chords and down the tracheal rings. Intubation via the bougie with a 7.0 ETT was then attempted but also unsuccessful. Then a fiberoptic scope was placed, for suspicion of subglottic stenosis or a mass. Upon passing the vocal chords, an area of subglottic stenosis was immediately visualized. The patient had large body habitus and it was unlikely he could be adequately ventilated with a smaller ETT. Therefore, the decision was made to wake up the patient and abort the procedure.

He later saw an outside ENT provider and was sent back for surgery without intervention. His procedure was completed successfully under a combined spinal/epidural, thus avoiding the difficulty with intubation.

Discussion:
This case highlights the importance of preoperative examination. In hindsight, the “wheezing” noticed preoperatively and the “asthma” diagnosis the patient brought with him represented stridor from his subglottic stenosis. He also had multiple risk factors, including previous intubation, obesity, and a hiatal hernia with esophageal reflux. It also displays the importance of being able to control the airway without an endotracheal tube, as this patient had adequate ventilation through the bag-mask technique throughout each trial at intubation, and therefore any catastrophic consequences were avoided. The case was eventually done with neuraxial anesthesia, and as anesthesia providers it is important to be able to carry out a particular case using multiple modalities depending on the needs of the patient.
Mast cell activation syndrome (MCAS) is a heterogenous group of disorders that can present with a variety of different phenotypes. MCAS is thought to be caused by a genetic mutation that causes over-activity of c-kit, a transmembrane protein with intrinsic tyrosine kinase activity that plays a role in mast cell activation and survival. MCAS patients present an interesting challenge to anesthesiologists in the peri-operative period because these patients are prone to aberrant mast cell activation and immediate hypersensitivity reactions. These reactions may be of varying severity ranging from mild cutaneous rash to complete cardiovascular collapse. The peri-operative setting can be a dangerous time for MCAS patients as there are many factors that may trigger mast cell activation. Furthermore, determining the trigger of peri-operative mast cell activation may be difficult as many potential triggers are administered concurrently within a small period of time. Because of this, we utilized a multimodal approach to prophylactically treat and prevent aberrant mast cell activation, third spacing of fluids, and anaphylactic shock. This approach involved the utilization of mast cell stabilizing agents (low-dose IV and subcutaneous epinephrine, magnesium, solumedrol), prevention of fluid third-spacing (nitroglycerin, mannitol), administration of histamine receptor antagonists (benadryl, famotidine), and avoidance of common potential triggers of mast cell activation (avoidance of histamine releasing anesthetic agents, abrupt changes in temperature, mechanical skin irritation, emotional stress). This multimodal approach effectively prevented aberrant mast cell activation and resulted in a stable intra-operative course with minimized post-operative ICU and hospital length of stay.
BACKGROUND: Clinically significant subcutaneous emphysema and pneumomediastinum are recognized as rare complications following laparoscopic abdominal surgery. They occur via dissection of carbon dioxide gas insufflated into the peritoneal cavity to the subcutaneous tissue, which can occur at the trocar site or through a defect in the diaphragm. Significant hypercarbia and acidosis may develop, ultimately leading to cardiovascular compromise.

CASE REPORT: We present a case of a 68-year-old male with a history of a renal mass who underwent robotic-assisted laparoscopic left partial nephrectomy. Past medical history was notable for COPD, polysubstance abuse, abdominal aortic aneurysm status post endovascular repair, and hypertension. After induction with lidocaine, propofol, fentanyl, and rocuronium, the patient was intubated without difficulty. Maintenance anesthesia was delivered with sevoflurane in addition to propofol, lidocaine, and ketamine infusions. The initial intraoperative course was unremarkable, but as the case progressed, the patient became progressively difficult to ventilate. Although the patient was oxygenating well, the patient's PETCO2 levels began to rise during the third hour of surgery. Adjusting ventilator settings and bronchodilator therapy minimally helped, and the patient's PETCO2 levels continued to rise to the 70's. The surgeon was notified, the insufflation pressure was decreased, and work proceeded more quickly. Arterial blood gas analysis revealed a significant acidosis with a pH of 7.0 and hypercarbia with a PaCO2 > 100 mmHg. At this point, extensive crepitus was appreciated across the patient's face, chest, and neck. Desufflation at the end of the case slightly improved the patient's acidosis and hypercarbia, but the patient remained intubated and was admitted to the intensive care unit. As expected, post-operative chest x-ray revealed extensive subcutaneous emphysema across his chest and neck, but no pneumothorax. The patient's acidosis and hypercarbia improved, and he was extubated a few hours later. His post-operative course was further complicated by shortness of breath and hypoxemia. A CT with contrast revealed a pneumomediastinum but was negative for pulmonary embolism. The patient's subcutaneous emphysema and pneumomediastinum was managed conservatively with supportive treatment as he was hemodynamically stable throughout his post-operative course, and he was discharged home on post-op day #5 after resolution of his symptoms.

DISCUSSION: The patient was difficult to ventilate likely as a result of positioning in steep trendelenburg, COPD, subcutaneous emphysema, and pneumomediastinum. Prolonged surgical time likely led to the clinically significant subcutaneous emphysema, which contributed to severe hypercarbia and acidosis, causing the patient to remain intubated and admitted to the ICU. Pneumomediastinum can also occur after laparoscopic surgery, but it is rare following laparoscopic nephrectomy and resolved with conservative management. It is important to be cognizant of crepitus that can result from laparoscopic surgery, as it can contribute to acidosis and hypercarbia that can lead to cardiovascular compromise and poor patient outcomes. The major risk factors include prolonged surgical time (greater than 200 minutes), high insufflation pressures, improper trocar placement, and the number of trocars used.
A retrospective review spanning 6 months of renal transplant patients at UC Davis Medical Center was performed with the goal of evaluating the effect of Transversus Abdominis Plane (TAP) catheters versus single shot TAP blocks on perioperative opioid use in renal transplant patients over four days. Morphine equivalent doses (MED) were calculated for each phase of the hospital-stay. These calculations were based on nationally recognized opioid conversion tables and were calculated through post-operative day (POD) number three. Post-op day zero (the day of surgery) was divided between the intraoperative environment, the PACU (post anesthesia care unit) stay, and their time on medical/surgical floor after PACU discharge. Total MEDs from each phase of stay were then combined for a total perioperative MED value. Analysis revealed a statistically significant reduction in total perioperative MED for the patients who received TAP catheters with continuous infusions compared to those that received single-shot blocks.
A Safe and Practical Method for Teaching Bedside Percutaneous Tracheostomy

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Anthony Clark 1, Dr. Arthur Lam 1

1. UCSD

Airway management is a core competency of anesthesia training and upon graduation residents are expected to master all steps of the difficult airway algorithm, including the final step of a surgical airway. Most training programs provide surgical airway training on mannequins or didactic teaching. However, few anesthesia residents feel competent in performing a surgical airway when faced with the real life-threatening situation.

At our institution the neuro critical care unit provides a unique opportunity for anesthesia residents to learn the technique of percutaneous dilational tracheostomies (PDT) due to the presence of high number of ventilator dependent patients and availability of anesthesiologists trained in the procedure. We have developed a safe and practical approach to bedside percutaneous dilational tracheostomies in which anesthesia residents can actively participate and gain the skills and confidence necessary to be comfortable performing a surgical airway.

Our method, using the Ciaglia Blue Rhino percutaneous tracheostomy set, involves optimal positioning, continuous use of video bronchoscopy and transillumination which allows for precise needle, dilator, and tracheostomy placement which are key steps that are often the source of major complications. The average BMI of the cases performed this past year was 30 (n=10) with no patient incurring any complications. This method has allowed an opportunity for anesthesia residents to become comfortable in managing a surgical airway and it also saves resources because of its ease to be performed bedside. We encourage anesthesia educators to become proficient in performing this valuable procedure to improve resident education and comfort in difficult airway scenarios.
A Unique Management of a Known Difficult Airway

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Arran Seiler 1, Dr. David Dorsey 1
1. University of Utah

The scenario of cannot intubate, cannot ventilate is one which we rehearse in our minds over and over again because it can be one of the scariest and most dangerous scenarios in the operating room. When a patient is known to have a difficult airway that is advantageous in that the provider can better prepare for the case through the use of additional equipment and/or additional personnel to assist. In the more severe scenarios one can perform an awake fiberoptic intubation, but what does when do when the previous awake fiberoptic intubation for this patient was also extremely challenging. Here I present a new technique for the management of a known difficult airway, who also had a documented difficult awake fiberoptic.
Acute hypoxemia during the neohepatic stage of liver transplantation in a patient with a patent foramen ovale

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Catherine Chiu¹, Dr. Tina Yu¹, Dr. Joyce Chang¹, Dr. Michael P. Bokoch¹
¹ University of California San Francisco

Background:
Patients undergoing liver transplantation (LT) are at increased risk of developing perioperative pulmonary complications. Specific intraoperative risk factors include high transfusion requirements that can lead to transfusion-related acute lung injury (TRALI), hemodynamic changes during the anhepatic stage, and reperfusion syndrome during the neohepatic stage.

Case Description:
A 60 year-old male with decompensated cirrhosis was scheduled for orthotopic LT (MELD score 35). His medical history was notable for right hepatic hydrothorax and multifocal embolic strokes. A patent foramen ovale (PFO) was discovered during his stroke work-up and subsequently repaired via percutaneous catheter-based technique. He was admitted prior to transplant for hypoxemic respiratory failure despite large volume paracentesis and thoracentesis, which improved with hi-flow nasal cannula and chest tube placement.

During the preanhepatic stage, the surgeon drained 1.5L of additional pleural fluid through the diaphragm. Intraoperative transesophageal echocardiography (TEE) confirmed a repaired PFO with trace intracardiac shunting and normal right ventricular function. The anhepatic stage was managed with a piggyback inferior vena cava clamp and lasted 35 minutes.

Shortly after reperfusion of the liver, the patient developed marked bradycardia to 25bpm, requiring 200mcg of epinephrine and 1mg of atropine. One hour after reperfusion, peak inspiratory and plateau pressures rose to 39 cmH2O and 27 cmH2O at tidal volumes of 7mL/kg, and his PaO2:FiO2 ratio worsened to 180. Copious, frothy, bile-tinged fluid suggestive of pulmonary edema was suctioned from the endotracheal tube with mild improvement in airway pressures. Central venous pressure monitoring did not suggest volume overload, and TEE did not reveal changes in cardiac function or intracardiac shunting. The patient was maintained on lung protective ventilation for the remainder of the case and on transfer to the ICU. In total, he received 8 units of packed RBCs, 14 units of FFP, and 4 units of platelets.

Postoperative chest X-ray showed decreased size of the right pleural effusion but persistent airspace opacities. Over the next 8 hours, the patient’s oxygenation and ventilation improved, and he was extubated onto nasal cannula.

Discussion:
The differential diagnosis for cardiogenic pulmonary edema in this case included volume overload or left ventricular dysfunction. Patients with an underlying PFO are at higher risk of intracardiac shunting, air embolus, and thrombotic embolus – particularly when pulmonary artery pressures rise significantly after liver reperfusion. As mentioned, invasive monitoring did not suggest a cardiogenic origin for hypoxemia.

The differential diagnosis for noncardiogenic pulmonary edema in this case included TRALI, severe reperfusion syndrome, and re-expansion pulmonary edema. Despite an ambiguous clinical picture, we believe this was a case of TRALI. The development of TRALI has been attributed to a two-hit model, and in liver transplantation, inflammation during reperfusion of the liver is implicated as the first hit. This patient may have had three “hits” predisposing him to the development of TRALI, including his hepatic hydrothorax, profound reperfusion syndrome, and large-volume transfusions. While the clinical course of TRALI may vary, it is usually a self-limiting process with a low
long-term morbidity.
Acute Intraoperative Hepatic Failure During Cardiac Surgery: A Complex Case

Dr. Raymond Machi¹, Dr. Emily Methangkool²
1. UCLA Anesthesiology & Perioperative Medicine, 2. UCLA

Background:
Intraoperative liver failure is an extremely rare occurrence that presents with a constellation of non-specific but fatal complications. In this medically challenging case, we present a patient undergoing cardiac surgery who developed acute hepatic failure and subsequent multisystem organ failure.

Case Presentation:
A 66 year-old gentleman with a history of bicuspid aortic valve, severe aortic stenosis, and ascending aortic aneurysm presented for replacement of the aortic valve and ascending aorta. His past medical history was significant for hypertension, paroxysmal SVT, moderate pulmonary hypertension, asthma, JAK2+ polycythemia on chronic anticoagulation, and portomesenteric vein thrombosis c/b ascites and esophageal varices s/p TIPS procedure. Induction of anesthesia and cardiopulmonary bypass (CPB) was initiated uneventfully. However, the patient required a vasopressin drip to maintain MAP in the 50s. Urine output dropped during CPB, and the patient became anuric despite administering furosemide. In addition, the patient was noted to have worsening hypoglycemia despite administration of D10 cardioplegic solution, with glucose in the 40s. The patient was weaned from CPB after 175 minutes on vasopressin, norepinephrine, and epinephrine drips. However, the patient continued to be anuric and hypoglycemic with worsening metabolic acidosis. Decision was made to initiate intra-operative dialysis. While attempting hemostasis, the patient became profoundly coagulopathic. Labs revealed INR 2.7, Fibrinogen 39, platelet 154, and elevated LFTs. Resuscitation with blood products was initiated. Despite starting intraoperative dialysis, the patient remained acidotic with pH ranging from 7.19 – 7.28. Approximately 1 hour after initiating intraoperative dialysis, the patient had a PEA arrest. CPR was initiated, and patient achieved ROSC in 20 minutes. The patient was subsequently placed on VA-ECMO. After receiving 16 units of pRBC, 7 units of FFP, 8 units of cryoprecipitate, and 6 units of platelets, the bleeding eventually stabilized. He was taken to the ICU intubated and on VA-ECMO.

Discussion:
There is limited data regarding the epidemiology of perioperative liver failure after cardiac surgery, but studies have reported an incidence of 1.1 - 3.2%. Acute liver failure that presents intraoperatively during anesthesia is extremely rare, and its incidence and mortality is poorly understood. Intraoperatively, acute liver failure may manifest in non-specific ways including coagulopathy, hypoglycemia, electrolyte abnormalities, metabolic acidosis/alkalosis, seizures, and acute kidney injury/failure. Our patient presented with hypoglycemia, metabolic acidosis, coagulopathy, and acute renal failure. Given that the patient had a patent TIPS stent and no underlying parenchymal liver disease, the likely etiology was ischemic liver injury. The hepatic reticuloendothelial system plays a role in clearing activated coagulation factors, thromboplastic materials, and fibrin split products released from tissue. As a result, liver failure has the potential to disturb this balance leading to DIC.

Our patient also had a history of JAK2+ polycythemia vera, which can lead to micro- and macro-vascular thrombosis as well as hemorrhagic tendencies. His diagnosis likely increased the risk of developing DIC, as it is known that many patients with polycythemia vera have clinical and laboratory findings consistent with a chronic, compensated DIC process.
Adequate Pain Control in Pediatrics: Making a Surgical Procedure a Personal and Cost Effective Success

Ms. Olivia Valencia 1, Dr. Peter Lichtenthal 2, Dr. Francisco Valencia 3
1. University of Arizona/College of Medicine, 2. University of Arizona/Dept. of Anesthesiology, 3. University Orthopedic Specialist

Background
Pediatric pain control has long been a neglected area of care. Recently, the satisfactory control of post-operative pediatric pain has seen a resurgence of interest as medicine seeks alternatives to narcotics. However the secondary benefits of this care (reduction in anxiety and patient costs) also bear interest. It is the object of this study to examine these parameters.

Methods
 Originally 154 pediatric patients were enrolled in an IRB approved study examining whether steroids prolonged regional blocks. Additionally, questionnaires were given to parents and/or children regarding their opinions on pain relief, anxiety and their surgical experience. Data was collected on cost savings due to same day rather than overnight admissions.

Results
The improvement and duration in quality pain control were reflected in the surveys, which showed high satisfaction for both patients and parents. Parents rated pain relief as 3.6/4.0, (Figure 1) overall surgical experience as 3.7/4.0 and anxiety over future surgeries 0.8/5.0 (0= no anxiety). Children rated pain relief at 3.4/4.0, (Figure 2) overall experience at 3.6/4.0 and anxiety over future procedures at 1.0/5.0. Elimination of an overnight hospitalization at our institution generated a cost savings estimated at $2800.

Conclusion
We found discharging patients home with good pain control on the day of surgery, minimizes family disruption, decreases situational anxiety, and reduces overnight hospitalization costs to both families and the institution where the procedure was performed. In summary, this study showed that adequate pain control generated increased psychosocial satisfaction as well as a significant potential for reduction in hospital costs.
Aggressive and Early Extubation in Super Obesity

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Alexander Maglunog Jr 1, Dr. Aren Nercisian 1, Dr. Jessica Lee 1, Dr. Duraiyah Thangathurai 2
1. Keck School of Medicine of USC, Department of Anesthesiology, 2. Keck School of Medicine of the University of Southern California

Background:

While obesity is commonly encountered in 18% of ICU patients, severe obesity (BMI > 40) accounts for just 3%. In our literature search, super obesity, where BMI > 50, is infrequently distinguished. Obesity imposes altered physiology on multiple organ systems. We describe a case of aggressive and early extubation following surgery in a super obese patient in the ICU, leading to improved pulmonary status and hemodynamics.

Case Description:

A 46 year old man with hypertension, super obesity with BMI 71 (weighing 251 kg) was admitted to the ICU following a 9 hour scrotectomy for massive scrotal lymphedema. Blood loss was 2 liters, and he received IV fluids, blood products, and norepinephrine infusion to maintain adequate blood pressure during the case. He remained intubated upon arrival to the ICU. An arterial line and central line were placed, and resuscitation was continued postoperatively. He was difficult to mechanically ventilate. Initially, he was placed on SIMV, but was dyssynchronous with the ventilator. He was placed on CPAP 20 with PEEP 10. On 40% FiO2, his oxygen saturation varied from 92% to 94%. His blood pressure was maintained with norepinephrine infusion. Urine output proved minimal after 6 hours, and did not respond significantly to fluid boluses, likely from the high level of positive pressure and PEEP. Considering his comorbidities, it was decided to proceed with early extubation which would minimize postoperative complications. He was given 10 mg decadron IV, and sedation was stopped. After ensuring adequate cooperation, he was extubated, and immediately administered racemic epinephrine. He was encouraged to cough and perform incentive spirometry, and he cooperated well. Oxygen saturation improved to 98% on 40% FiO2 face mask. Urine output resumed, indicating improvement in cardiac output with spontaneous respirations. This patient's post-operative course was uneventful after extubation.

Discussion:

Low tidal volume ventilation is recommended as lung protective and is the preferred strategy in treatment of ALI/ARDS. However, super obese patients may require larger tidal volumes. Smaller tidal volumes are linked with atelectasis, and the obese population is already predisposed given a decreased FRC and higher closing capacity. Larger tidal volumes on the other hand are more associated with atelectrauma. Pressure support may be more appropriate because larger tidal volumes can be delivered without increasing airway pressure. Early extubation minimizes atelectasis, ventilator induced complications, pulmonary embolism, and allows for early mobilization.
Airway Fire in Cardiac Surgery: Case Report

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Tiffany Kim¹, Dr. Carin Mascetti¹, Dr. Davinder Ramsingh¹
1. Loma Linda Anesthesiology

Case reports of airway fire in head and neck surgery are plentiful, however a PubMed search for cases of airway fire in intrathoracic or cardiac surgery revealed just one similar scenario. Presented is an unexpected airway fire during coronary artery bypass graft surgery thought to be related to the patient's history of previous (decannulated) tracheostomy. The case description is followed by a brief discussion of operating room fires and their management.
Background:
Cleft lip and palate are the most common of the craniofacial anomalies, with an incidence of ~1/700 live births. Patients presenting for cleft repair are at increased risk of airway complications due to anatomic difficulty in placement of laryngoscope blade, younger age, and the presence of associated facial deformities. While many studies have reviewed the incidence of difficult laryngoscopy and identified the associated risk factors of difficult airway management in the pediatric population with cleft pathology, minimal data exists for adults. We report a case of difficult airway management in an adult with traumatic cleft palate.

Case Presentation:
A 38-year-old male presented for unintelligible hypernasal speech and nasal regurgitation. The patient reported a traumatic incident occurring fourteen years prior in which a firecracker ignited inside his oral cavity, after which he underwent many restorative facial surgeries. Examination revealed a 2.5 cm x 1.5 cm oval-shaped midline perforation of the hard palate. Airway examination was notable for limited mouth opening, large tongue, Mallampati score of 3, thyromental distance of 3 fingerbreadths, large neck, and normal neck range of motion. Surgical plan was to proceed with repair of traumatic cleft palate/fistula. The patient was pre-oxygenated and anesthesia was induced with lidocaine, propofol and fentanyl. When the patient was shown to have adequate ventilation via face-mask, succinylcholine was administered. Direct oral laryngoscopy with a Macintosh 4 blade revealed a grade 4 view. Indirect laryngoscopy with a videolaryngoscope revealed a grade 3 view, however due to limited mouth opening and large tongue, there was difficulty passing the 7.0 mm ETT. Awake fiberoptic intubation was pursued, and the fiberoptic bronchoscope was easily advanced past the vocal cords and into the trachea. Intubation was successfully performed with a 7.0 mm cuffed ETT. There were no anesthetic or airway complications.

Discussion:
Palatal perforations have been reported in the literature with etiologies including infectious, autoimmune, neoplastic, drug-related, and iatrogenic. Airway management during the surgical correction of palatal perforations has rarely been described in the literature; specifically, airway management of traumatic palatal perforations has not yet been described. To avoid adverse outcomes associated with difficult airway including hypoxic brain injury, cardiopulmonary arrest, and death, the ASA “Practice Guidelines for Management of the Difficult Airway” recommends evaluation of the airway with thorough history and physical examination. A prior history of difficult intubation or a history of congenital, acquired, or traumatic disease states may indicate the presence of a difficult intubation. Given suspicion for difficult intubation in this traumatic disease state and the association between cleft palate and difficult tracheal intubation in the pediatric population, it is reasonable to consider various backup airway modalities such as video laryngoscope, flexible fiberoptic bronchoscope, and intubating laryngeal mask airways in adult patients with palatal perforations. This case report raises clinician awareness about the possibility of difficult airway management in adults with traumatic hard palate perforations.
Background: A thyroid goiter is an abnormal growth of the thyroid gland. Benign nodular goiter is a common disease affecting 5% of the general population in non-endemic areas. Patients with longstanding goiters may develop symptoms of obstruction secondary to compression of the trachea. The most common obstructive symptom, present in 30-60% of the cases, is dyspnea on exertion and will likely occur if the trachea diameter is less than 8mm. Other symptoms may include shortness of breath, wheezing or coughing. Airway management can be difficult in patients with obstructive goiters. They may have narrowed and deviated trachea, may develop tracheomalacia postoperatively, and may pose a surgical challenge when emergency tracheostomy is needed due to the location of the goiter.

Case description: This is a 73 year-old male admitted for dyspnea and shortness of breath. He was found to have a large thyroid goiter extending to the mediastinum causing obstruction and respiratory failure. His past medical history includes a thyroid goiter removed twenty years earlier. He also has a history of neurofibromatosis requiring cervical laminectomy and a history of hypertension. He underwent a revision total thyroidectomy. Pre-operative anesthetic evaluation showed a Mallampati III airway with adequate mouth opening and an ASA class IV. He was premedicated with midazolam, glycopyrrolate and famotidine. Propofol was used for anesthetic induction and paralysis with rocuronium. Patient was intubated after induction. Initially, a video assisted D blade was used, but airway was anterior. A bougie was unable to be passed through vocal cords. A fiberoptic scope was used to enter the vocal cords under direct visualization from the video MAC. Maintenance of anesthesia was done with sevoflurane and adequate analgesia with fentanyl. Patient remained hemodynamically stable throughout the case and was successfully extubated. Patient’s post-operative course was unremarkable.

Discussion: When approaching a potentially difficult airway, a thorough history and physical examination is a crucial first step in guiding airway management. When preparing for a difficult airway one must have readily available airway equipment, designated individual to assist with airway management, and adequate preoxygenation via mask. Furthermore, one may also consider various other interventions pre-induction if a difficult airway is anticipated, including an awake intubation, video-assisted laryngoscopy, etc. The exact strategy one will take to a difficult airway will depend on the anticipated surgery, the patient, and the skills of the anesthesiologist. However, all strategies must consider what aspect of the airway is difficult (difficult mask ventilation vs supraglottic airway placement vs intubation) and basic management choices (such as awake intubation vs post-induction intubation, etc. When extubating, one must consider general principles such as awake vs asleep extubation or an airway management plan that can be done if the patient becomes compromised. The patient above had multiple risk factors for difficult airway, including prior neck surgery and large thyroid mass. Because of the high risk of airway compromise post-induction an awake fiberoptic intubation would mitigate many of the risks an asleep intubation would incur and would allow the patient to adequately protect the airway throughout the intubation process.
An Analysis of the Role of Anesthesiology Providers in Hospital Deficiencies Published by CMS

Dr. Reihaneh Forghany 1, Dr. Joseph Antognini 1
1. UC Davis Department of Anesthesiology & Pain Medicine

Background: A vital component of delivering healthcare in the United States has revolved around ensuring quality and safety for patients. Soon after the start of Medicare, the Joint Commission, in conjunction with Center for Medicare and Medicaid Services (CMS), began surveying hospitals to determine compliance with CMS's Conditions of Participation (CoPs). These CoPs include: nursing, physical environment, surgical services, and anesthesia services. Survey data from thousands of healthcare facilities has recently been published on CMS's website, including “deficiencies”, which are assigned to specific CoP “tags”. The most critical deficiency is “immediate jeopardy”, in which patients are at high risk for harm, injury, or death. The aim of this study was to analyze the deficiencies and determine the degree of impact that anesthesiology providers had on these deficiencies, with a special emphasis on immediate jeopardy cases.

Methods: The data was obtained from the CMS website, which is publicly available, and contains no patient identifying information (1). After conversion to Excel format, the deficiency tags were separated based on their associated CoP. The involvement of Anesthesiology providers was determined by searching for the word root “anesth” in the specific text comments. Immediate jeopardy cases were also explored, by searching for the term “immediate jeopardy”.

Results: 34,522 hospital deficiencies were reported over a ten-year period (2007-2017). Of those 34,522 deficiencies, 30,808 were assigned specific tags, with 77% related to one of the following CoPs: patient rights, quality improvement, nursing, medical staff, pharmacy, emergency care, and medical records. The Anesthesia Services CoP was cited in <0.5% of tags. The word root “anesth” was found in 1531 tags. Preliminary review of tags associated with “anesth” did not show substantial involvement of Anesthesiology providers. Immediate jeopardy was found in 730 of 30,808 tags; 79 of the 730 tags also had “anesth”, and 30 of those 79 tags indicated an involvement of anesthesia, with most having other contributing factors, such as surgical fires; few were the direct result of anesthesia events or personnel.

Conclusions: Ensuring quality and safety is a key pillar for hospitals acquiring accreditation. Preliminary review of survey data published by CMS, including immediate jeopardy cases, has shown minimal involvement of anesthesiology providers. Further analysis categorizing the extent of anesthesia involvement in these deficiencies will be beneficial.

References:
An Awakening, Breathing, Delirium Screening, and Mobility Program for Mechanically Ventilated Patients Changes Daily ICU Practices but Not Patient Outcomes

Background
Survivors of critical illness experience high rates of physical, cognitive, and emotional impairments which can last months to years post-ICU discharge. Spontaneous awakening and breathing trials, early mobilization, and interventions to reduce ventilator-associated events may improve outcomes such as delirium, duration of mechanical ventilation, length of stay, or mortality among intensive care unit (ICU) patients. This quality improvement project assesses the effectiveness of a bundled initiative in changing these practices and outcomes for mechanically ventilated patients in the ICU.

Methods
Prospective cohort quality improvement project in two adult medical-surgical ICUs. In May 2015, an interdisciplinary team of physicians, nurses, respiratory and physical therapists began rolling out an 18-month initiative aimed at increasing six daily process measures for mechanically ventilated patients: spontaneous awakening trials, spontaneous breathing trials, delirium screening, early mobilization, elevated head of bed, and use of endotracheal tubes with subglottic suction ports.

Results
Run charts illustrated significant improvements in the performance of all six of our daily process measures, with questionable sustainability in performance of spontaneous breathing trials. Only 3 mobilization-related adverse events (out of 1,783 patient-days of mobilization) were reported during the implementation period. However, we saw no significant downward trend in our rates of ICU mortality, average duration of mechanical ventilation, average hospital length of stay, or rates of ventilator-associated events.

Conclusions
Through education of care providers, updated protocols and electronic documentation, dedicated staff and equipment, and routine project assessment, a multidisciplinary team succeeded in effecting several changes in our ICUs. However, there was no significant impact on our measured patient outcomes. Inadequate magnitude of practice changes, too brief a follow up period, or inadequate sustainability may have contributed to this lack of impact on patient outcomes.
Anesthesia for Vegans

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Jimmy Kim¹, Dr. Robert Hsiung¹
1. Virginia Mason Medical Center

Authors: Kim, Jin Young (Jimmy), Hsiung, Robert.
Affiliated institution: Virginia Mason Medical Center

Background
A vegan describes a person who does not eat or use animal products. With the ever increasing dissemination of medical information, our patients are gaining increased capacity to define, select, and protect their interests in their care. Here we describe a vegan patient and our anesthetic care compatible with her wishes.

Case description
A 40-year-old female with no significant past medical history presented for esophagogastroduodenoscopy, endoscopic ultrasound and colonoscopy for a 4 year history of persistent abdominal pain and bloating. Her social history was remarkable for a distant history of smoking, heavy alcohol use and strict adherence to vegan diet. During her pre-anesthesia assessment phone call, patient expressed her desire to avoid anesthetic plan involving animal products. Risks and benefits of multiple anesthetic plans were discussed including induction with etomidate, ketamine and inhaled anesthetics. The patient opted for inhaled anesthetics at the conclusion of the phone conversation.

On the day of the procedure, the patient advocated for the avoidance of intravenous catheter or endotracheal intubation; she voiced her concern for receiving unnecessary IV fluids, specifically colloids, and sore throat from an intubation. To address the concern of receiving unnecessary IV fluids, a 500 mL IV fluid of normal saline was hung in place of a 1000 mL lactated ringer as a reminder to providers to limit the use of IV fluids. In accordance with patient's wish to avoid an endotracheal intubation, a 30 Fr nasal cannula was fitted to a standard 15 mm connector piece from an endotracheal tube. After mask induction with sevoflurane, this nasal cannula was inserted to her right nare, and the 15 mm connector was linked to the ventilator on spontaneous ventilation mode. General anesthesia was achieved with the open circuit delivery of sevoflurane for the case. The procedure concluded with findings of anal fissure and hemorrhoids, and the patient emerged from anesthesia with no particular complications.

Discussion
As the patient alluded to in the preop assessment, the most commonly used induction agent, propofol, indeed contains egg lecithin or yolk phospholipid in all three formulations from FDA approved manufacturers. We summarize a list of commonly used drugs perioperatively in Table 1.

Table 1
Name of drug
Comment
Vegan safe?
Propofol (4 FDA approved manufacturers)
With the exception of Watson Labs (data unavailable), 3 other FDA approved manufacturers use egg lecithin or yolk phospholipid (Fresenius Kabi, Hospira and Sagent pharms)
No, Cleofol (Themis Medicare, Vapi, Gujarat, India) supposedly vegan but data unavailable
Etomidate
<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Synthetic</th>
<th>Example Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthetic Halogenated gas</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Synthetic Ketamine</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Synthetic Dexmedetomidine</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Synthetic Neuromuscular Blocking Agents</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Synthetic Local anesthetics</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Synthetic Insulin</td>
<td>Variable</td>
<td>Some older formulations derived from bovine and porcine origin but most derived from rDNA, therefore these are vegan safe</td>
</tr>
<tr>
<td>Synthetic Glucagon</td>
<td>Variable</td>
<td></td>
</tr>
<tr>
<td>Synthetic Heparin, LMWH, Heparinoid-Danaparoid, Hidurin drugs, Abciximab</td>
<td>No</td>
<td>All porcine or murine derived</td>
</tr>
<tr>
<td>Synthetic Argatroban</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Synthetic Albumin</td>
<td>Yes</td>
<td>Cohn-Oncley cold ethanol fractionation of FFP</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
Anesthesia in Postpolio Syndrome: A Case Report

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. Donald Luna ¹, Dr. Brian Starr ¹**

1. University of New Mexico Anesthesiology and Critical Care Medicine

Background:
Poliomyelitis has been described historically as early as 1600 BC but peaked in North America from 1952-53. Polio is caused by a single stranded RNA enterovirus which is transmitted by fecal-oral spread. The risk of paralytic polio in the infected person is 1-2% due to the destruction of anterior horn motor neurons. Polio was limited to 22 cases worldwide in 2017. Even though there are few new polio cases, postpolio syndrome (PPS) affects thousands. Many individuals infected with polio have a recovery phase. This phase involves recovery of motor units, nerve sprouts to reinnervate orphaned muscle fibers and muscle hypertrophy. PPS is described as a gradual or abrupt onset of new muscle weakness, fatigue, atrophy or generalized fatigue after a recovery period. The pathogenesis of PPS is believed to be the overuse or premature aging of polio affected motor units.

Case Description:
A 73-year-old man with a PMH of polio and HTN presented to the OR for a left hepatectomy due to the presence of a left hepatic mass. In pre-op the patient was found to have left lower extremity paralysis and generalized fatigue. He had polio in his youth of which his only sequelae was left lower extremity paralysis and recent generalized weakness. He described no other significant medical issues.

The patient was taken to the operating room where he was induced with 100mcg fentanyl, 80mg lidocaine, 150mg Propofol and 50mg rocuronium. The patient's baseline train of four (TOF) twitches were a full TOF without fade. Intubation was uneventful. An arterial line and central line were placed after induction without incident. The patient was provided maintenance of anesthesia with an enhanced recovery protocol of Propofol 100mcg/kg/min, dexmedetomidine 0.3mcg/kg/hr and Ketamine 0.3mg/kg/hr. The surgery was successfully performed and prior to extubation 2mg of Dilaudid IV was given and bilateral TAP blocks were placed using 0.25% Bupivacaine. The patient was found to have 3/4 TOF twitches and reversed with 200mg of sugammadex. After, the patient had a full TOF and appropriate minute ventilation. The patient was extubated uneventfully.

The patient was transported to the trauma surgery ICU for post-op monitoring due to the risk of respiratory depression and pain management. The patient had no episodes of respiratory depression during his stay in the ICU and his pain was managed well with a Dilaudid PCA and transitioned to PO oxycodone. The patient was discharged on post op day 5.

Discussion:
Even though polio is near eradication, its sequelae (postpolio syndrome) is not encountered uncommonly. Patients with PPS have a high risk of respiratory dysfunction due to damaged motor units. Those with PPS commonly have central and obstructive sleep apnea. The post op period can have the highest risk of morbidity if the patient is not monitored appropriately. Anesthesiology providers with knowledge of PPS can optimize medical care and help prevent morbidity and mortality in these patients.
In patients with single ventricle physiology unsuitable for biventricular repair, Fontan palliation allows pulmonary blood to passively flow directly from the right atrium to the pulmonary artery without an intervening ventricle. Despite serious long-term sequelae, this procedure has allowed for increased long-term survival of patients, including women who reach childbearing age. The physiologic changes of pregnancy add strain to the already tenuous cardiopulmonary system posing a number of problems during pregnancy, labor and delivery. Here we present the case of a 19 year-old G1P0 female at 37w gestation with complex congenital heart disease with single ventricle physiology and Fontan palliation who presented in labor. The team opted for forceps assisted vaginal delivery with an early lumbar epidural, non-invasive monitoring, and anesthesia standby in the labor and delivery suite. Delivery of a healthy infant proceeded without incident. Approximately ten minutes after delivery, patient became increasingly anxious, agitated, and dyspneic with accompanied sinus tachycardia to the 180s and hypoxia to the mid-80s. This case provides an example of the increased risk during the peripartum period in parturients with complex congenital heart disease and the importance of a multidisciplinary approach and development of an anticipatory complex care plan.
Background: We present a case report highlighting the benefit of perioperative management consultation in the care of the high-risk neurosurgical patient scheduled for a complicated surgery. As the physicians who safely guide patients through surgical procedures, Anesthesiologists are uniquely qualified to create perioperative management plans. These recommendations ensure medical and procedural optimization in light of the many risks associated with undergoing surgery. This model is especially pertinent in the care of high-risk patients undergoing high-risk surgical procedures.

Case Description: Our patient was a 50-year-old female with a past medical history of atrial fibrillation status post cardiac ablation and morbid obesity with a body mass index of 52.7 who presented with new neurological symptoms. She was found to have a 2.3cm by 1.5cm extra-axial mass in the premedullary cistern extending below the foramen magnum. The patient was scheduled for an urgent posterior fossa craniectomy, C1 and C2 laminectomy and expansive patch duraplasty to be performed in the sitting position.

Following a detailed discussion with the surgical team regarding the patient's co-morbidities and the surgical risk profile of a craniectomy in the sitting position, the patient was admitted two days in advance and underwent a preoperative evaluation guided by Neuroanesthesiology recommendations. This workup included routine labs and a baseline arterial blood gas to establish goals for ventilation settings given the likelihood of obesity hypoventilation syndrome. We recommended cardiology evaluation with transesophageal echocardiogram (TEE) with bubble study to rule out the presence of a patent foramen ovale, an absolute contraindication for a craniectomy in the sitting position. Finally, we proposed interventional radiology guide the placement of a subclavian central venous catheter to ensure reliable venous access and proper positioning for aspiration in the event of venous air embolism.

Intraoperatively, hemodynamic perfusion goals were achieved by placing the arterial line transducer at the level of the external acoustic meatus, and the subclavian central venous line pressure waveform was transduced at the level of the right heart. Intraoperative TEE was performed to confirm the results of the preoperative TEE, and a precordial doppler was positioned to allow for the detection of venous air embolism. Hemodynamic stability was maintained throughout the procedure and the patient was successfully extubated at the end of the case with an intact neurologic exam per her baseline. She had an uneventful postoperative course in the ICU and was discharged home on postoperative day four.

Discussion: Based on this comprehensive perioperative management, this patient was able to have a safe, efficient, and uneventful hospital course. The literature supports this care model and reports consistent and significant positive findings related to perioperative care pathway initiatives. These studies, both within and outside the US, stress the central role of Anesthesiologists as the perioperative physicians. In the trend toward medically sicker patients undergoing high-risk surgical procedures, it is crucial that we embrace an Anesthesiology-driven perioperative care model that allows for the systematic safe management and thereby avoidance of potentially catastrophic outcomes.
Anesthetic Considerations in a Patient with Marfan’s Syndrome and Known Thoracoabdominal Aortic Aneurysm Undergoing Laparoscopic Appendectomy – A Case Report

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

\textbf{Dr. Brock Thorup} \textsuperscript{1}, \textit{Dr. Emily Hagn} \textsuperscript{2}

\textsuperscript{1}. University of Utah, \textsuperscript{2}. University of Utah Hospitals and Clinics

Background
Marfan's Syndrome is an autosomal dominant connective tissue disorder. It has a reported incidence of 2-3 per 10,000 individuals with 90% of cases being caused by a mutation in the \textit{FBN1} gene. Commonly involved systems include skeletal (long bone overgrowth, joint hypermobility), cardiovascular (aortic root dilation and mitral valve prolapse), and ocular (lens dislocation). Many patients will also have chest wall (pectus excavatum) and lung involvement, predisposing to spontaneous pneumothorax. These physical abnormalities must be considered carefully when planning anesthetic management for these patients, including limb manipulation, inspiratory pressures, and blood pressure monitoring.

Case Description
A 32-year-old 57kg man with known diagnosis of Marfan’s syndrome presented for treatment of acute appendicitis. During workup, abdominal CT demonstrated a 7.0cm thoracoabdominal aortic aneurysm (TAAA). In a prior workup 6 months ago, the aneurysm was only 5.0cm in size. The patient had a history of mechanical aortic and mitral valve repairs and was subsequently on warfarin with goal INR 2.5-3.5. He was taken for urgent laparoscopic appendectomy with the intent to repair the TAAA one month later.

On pre-op assessment, the patient demonstrated classic phenotypic features of Marfan’s syndrome including arachnodactyly, kyphoscoliosis, pectus excavatum, and joint hypermobility. Transthoracic echocardiography showed normal LV systolic function, as well as mild gradients and trivial regurgitation across the mechanical valves. The large descending thoracic aneurysm was visualized with a dissection flap and thrombus present.

Perioperative goals included reducing shear stress over the known TAAA and minimizing barotrauma with positive pressure ventilation. In the OR, an awake arterial line was placed for hemodynamic monitoring. Intravenous lidocaine and fentanyl were administered 5 minutes prior to laryngoscopy to blunt the tracheal response. For induction, we slowly titrated propofol to avoid a significant drop in afterload. In an effort to minimize increase of systolic blood pressure beyond 120mmHg, general anesthesia was maintained with isoflurane, remifentanil infusion, and rocuronium. Two incidences of surgical stimulus raised the systolic pressure above goal, with a maximum reading of 140mmHg. These lasted 15-20 seconds each and were observed after discontinuing the remifentanil infusion due to unavailability of more remifentanil and moving to management with intermittent, bolused fentanyl. Blood pressure did not decrease beyond 20% below baseline and the patient received no vasopressors during the case. He was mechanically ventilated without incidence. We administered IV labetalol 15mg prior to emergence to optimize blood pressure for extubation, which was uneventful. The patient did well on the surgical floor post-operatively and was discharged on post-operative day 6.

Discussion
Spontaneous pneumothoraces and pathologic changes to the aorta resulting in aneurysm and dissection pose the
greatest threat to life in patients with Marfan’s syndrome (4). Anesthetic goals in such patients should include preventing sudden increases in myocardial contractility, and systemic pressure, leading to an increase in aortic wall tension as well as minimizing barotrauma. This case demonstrates that a safe general anesthetic can be performed for urgent laparoscopic appendectomy in a patient with known Marfan’s Syndrome and a TAAA large enough to require surgical repair.
Background
Myopathic type carnitine palmitoyltransferase II deficiency (CPT II), a fatty acid oxidation disorder (FAOD), is an autosomal recessive inborn error of metabolism. The functional CPT II enzyme exists on the inner membrane of the mitochondria, and facilitates the disruption of the acyl-carnitine complex, allowing mobilization of the free fatty acid for metabolism within the mitochondria. CPT II deficiency results in increased reliance on carbohydrate and protein metabolism. Patients are predisposed to rhabdomyolysis, hypoglycemia, liver dysfunction, cardiomyopathy, myalgias, and myoglobinuria. The most common triggers for these manifestations include strenuous exercise and physiologic stress states including fasting, lack of sleep, infection, fever, and hypothermia.

Case
A 23 year old primigravid parturient presented at 40 weeks for a planned vaginal delivery. At the time of presentation to labor and delivery it was noted in chart review and patient interview that she had CPT II deficiency. The patient identified exercise, fasting and hypothermia as previous triggers for episodes of rhabdomyolysis and elevated creatine kinase (CK), resulting in acute renal injury and prior hospital admission. An epidural for labor analgesia was placed. The operating room was warmed, and fluid warmers as well as forced air warming devices were available to prevent hyperthermia should cesarean delivery be needed. A relative anabolic state was preserved with administration of D10W+LR for maintenance of hydration while the patient was in the L&D ward. The patient proceeded to the operating suite due to fetal intolerance of labor, and surgical epidural block was achieved with 2% lidocaine. Cesarean delivery was performed and the patient returned to the L&D floor without incident. Plasma CK level was monitored postoperatively, and peaked 36 hours postpartum. Renal, hepatic, and cardiac function was not impaired, and the patient was discharged with standard follow up.

Discussion
Balancing the conflicting interests of optimizing the patient for a safe anesthetic, with the avoidance of triggering a CPT II related event required unique consideration for this case. Multidisciplinary discussion including the patient’s geneticist, obstetrician, anesthesiologist and labor nurse guided clinical care. We proceeded with labor epidural for spontaneous vaginal delivery, with a goal to prevent hypothermia, labor pain, unopposed catabolism or any further augmentation of an already increased sympathetic state. Many of the stresses of labor (increased metabolic rate, poor caloric intake due to NPO status, pain, lack of sleep, chorioamnionitis) are possible triggers for CPT II deficiency. By establishing early and effective neuraxial anesthesia, we avoided the possible trigger that general anesthesia posed. Multidisciplinary planning with attention to detailed care are critical to a successful labor and delivery without additional organ morbidity.
A 15 year old female with history of Spinal Muscular Atrophy II (molecular genetic testing with deletions of exons 7&8 of SMN1 gene and 3 copies of SMN2 gene) complicated by severe restrictive lung disease presented for Ommaya Reservoir Placement with Laminotomy.

Spinal Muscular Atrophy is a debilitating genetic disease which causes weakness of muscles throughout the body due to a deficiency of the motor neuron SMN. It is the most common genetic disease and a leading cause of death for infants worldwide. However, due to advances in technology, patients are often able to live to adulthood.

At baseline, our patient is wheelchair bound with limited movement of her extremities. Functionally, she is also able to eat and write with limited assistance. The patient was approved for intrathecal spinraza therapy which is why she was having an ommaya reservoir placed. Spinraza is the first US FDA approved treatment for SMA which is seen to slow/halt progression of the disease and preserve motor function in up to 40% of patients who receive it. Her history of spinal muscular atrophy posed a number of different anesthetic challenges including IV placement, drug selection, and airway management which required considerable planning and unique tailoring of her anesthetic.

Case

This patient had previous anesthesia for her lumbar fusion surgery which was complicated by infection at the incision site. Patient had a history of difficult IV access during previous anesthetics requiring IV access on her chest wall but had no other complications with anesthesia. This patient's medical history was significant for her spinal muscular atrophy which was complicated by her severe restrictive pulmonary disease requiring BiPAP at night. Her airway exam was also significant for a mallampati IV view with severely limited neck motion and extremely limited ROM.

Due to her history of difficult IV access, we planned for IV access to be obtained with Ultrasound in the OR under nitrous. Because of her airway exam, our anesthetic consisted of utilizing a C-Mac with D-Blade as well as fiberoptic ready in the room for backup. Although, we were able to obtain a grade 1 view with the C-Mac, her anterior airway and limited mouth opening made it impossible to pass the tube. We attempted to intubate with a bougie and were unsuccessful so we switched to the fiberoptic which enabled us to intubate successfully. For our anesthetic agents, we elected to forego any long-acting medications due to the possibility of unpredictability and potential prolongation of effects. We also decided to not utilize neuromuscular relaxants unless absolutely necessary due to the increased risks of side effects and prolonged recovery. We elected to induce with Propofol and Remifentanil and to maintain anesthesia with a TIVA to avoid long acting medications. Morphine was titrated in towards the conclusion of the case.

Patients with SMA have many unique considerations when considering what approach to take for their anesthetic. Careful attention should be especially placed on anesthetic drug choices, airway management, and to induction and emergence.
Anesthetic management of an obstetric patient with Evans syndrome

Background: Evans syndrome is a rare autoimmune disorder defined by a combination of Coomb's positive autoimmune hemolytic anemia and immune-related thrombocytopenia. Evans syndrome can be exacerbated during pregnancy and improve following delivery.

Case description: Patient is a 24-year-old female, G2P101 at 39w5d who presented to the Labor and Delivery unit for elective induction of labor. Patient denied any major complications during pregnancy, however did endorse some light bleeding after a scheduled vaginal exam the day prior to admission for medical induction of labor. Initial noteworthy labs were a platelet count <6 k/uL, hematocrit of 22.2%, and a positive Coomb's test. Upon further review of the patient's chart, her previous delivery was an emergent cesarean section complicated by severe thrombocytopenia with resultant DIC, respiratory failure secondary to pulmonary edema, and wound abscesses. The hematology service was consulted and recommended initiation of dexamethasone 40 mg IV x4 days, IVIG, and a continuous platelet infusion of ½ unit over 4 hours. By hospital day (HD) 3, patient's labs showed no improvement in platelet count. Following discussion with the obstetric, hematology, and anesthesiology services, cesarean section under general anesthesia was agreed on and scheduled on HD3.

Once in the operating room, an awake radial arterial line and large bore IV access were established and connected to a rapid infusion machine. Induction of general anesthesia was accomplished with etomidate and succinylcholine and maintenance of anesthesia was achieved with ½ MAC of isoflurane and N2O. Intraoperatively, the patient received tranexamic acid 1000 mg, pitocin infusion, 3 units pRBC, 2 units FFP, and continuous platelet transfusion. The baby was delivered within 3 minutes of skin incision. Patient was taken to the Surgical ICU intubated postoperatively and continued to receive pRBC, FFP, platelets, and cryoprecipitate transfusions guided by ROTEM analysis. By HD4, the hematology service considered the thrombocytopenia refractory to medical therapy and recommended splenectomy. The patient underwent laparoscopic splenectomy on HD5 without complication. By HD7 patient's platelet count began to rise and platelet infusion was discontinued. Patient was discharged home on HD10 with platelet count of 11 k/uL.

Discussion: Guidance of anesthetic management of obstetric patients with Evans syndrome is limited. Coordination of care between anesthesiology, obstetric, and hematology services is essential for patient safety. Ideally, the hematology service should be consulted early and timing of a scheduled delivery occur only after a risk/benefit discussion with the aforementioned specialties has occurred. Our decision to proceed with cesarean section on HD3 was made based on marginal response to medical therapy, as well as limited staffing to the upcoming holiday weekend. The preferred method of anesthesia is general endotracheal due to the absolute contraindication to regional anesthesia secondary to severe thrombocytopenia. The care of these patients is resource intensive, requiring a robust blood bank storage, full operating room staffing, and post-operative ICU care.
Anesthetic management of congenital heart disease with cor triatriatum sinister and anomalous pulmonary venous drainage in an adult

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

*Dr. Margaret Chiu*¹, *Dr. Swapnil Khoche*¹

¹ University of California San Diego

Perioperative management of adult congenital heart disease is complicated by the unpredictable and complex nature of defects as well as the longstanding effects the disease has on function. Multimodal imaging modalities may be required to characterize, elucidate, and differentiate it from other cardiac anomalies. Perioperative concerns and approaches to perioperative anesthetic management are different in cor triatriatum sinister (CTS) and dexter. CTS is a rare congenital heart disease characterized by the presence of a membrane that divides the left atrium, which is typically diagnosed in childhood. This is an unusual case of 27-year-old female who presented with shortness of breath and was found to have fenestrated CTS as well as total anomalous pulmonary venous drainage. Further investigation revealed pulmonary hypertension, tricuspid valve regurgitation due to right ventricular dilation, and a bridging vein connecting left and right sided venous drainage. She underwent a scheduled surgical repair with resection of triatrium membrane, tricuspid repair, and establishment of pulmonary venous drainage to the left atrium. Her preoperative Qp:Qs ratio of 4 was confirmed by intraoperative TEE. Her anesthetic course was uneventful and a post repair Qp: Qs of 1.4 was obtained. She was extubated on day 0 and made a full recovery. Anesthetically, CTS symptomatically mimics mitral stenosis, and may affect forward flow. Long-standing inflow obstruction to the left ventricle leads to pulmonary venous hypertension, pulmonary arterial hypertension, right ventricular hypertrophy, and right ventricular dysfunction. All of these tend to get augmented in case of anomalous pulmonary venous return, which increases right sided-flow. Our goal for the case was to avoid tachycardia, elevation in pulmonary vascular resistance, and drastic increase in systemic vascular resistance. Intraoperative TEE provides vital information regarding volume status, shunt dynamics and cardiac contractility.
Anesthetic Management of Lower Tracheal/Carinal Airway Stenosis from Tumor Encroachment

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Henry Wu ¹, Dr. Alejandro Ibarra ¹, Dr. James Knepler ², Dr. Sam Afshar ¹
1. University of Arizona/Dept. of Anesthesiology, 2. The University of Arizona

The anesthetic and airway management for tracheobronchial interventions in patients with lower tracheal or carinal stenosis present a unique challenge that deviates from the ASA difficult airway algorithm considering the area in question is located distal to the vocal cords. To date there exists no definitive emergency management for treatment of tracheal stenosis. In this case report we present a 58 year-old male with a remote smoking history who had a computed tomography [CT] scan that revealed a significant right upper lobe mass with mass effect and invasion into the trachea suggestive of critical lower tracheal/carinal airway stenosis. In this report we highlight and discuss the thorough preoperative preparation, studies, anticipated intraoperative complications and anesthetic planning involved in achieving a successful operative course in such a patient undergoing bronchoscopy interventions.
Anesthetic management of midgut volvulus in the obstetric patient requiring emergent abdominal surgery.

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. Nell Forman**, **Dr. Stephanie Lim**

1. *UCSF*

**Background**: Non-obstetric abdominal surgery during pregnancy presents a unique challenge to the anesthesia provider. Common indications include appendicitis, bowel obstruction, biliary disease, and ovarian disease. Bowel obstruction occurs at a rate of approximately 1 in 1500 to 3500 deliveries and can be caused by adhesions, intussusception and volvulus. The number one cause of a bowel obstruction in pregnancy is sigmoid volvulus due to the displacement and compression of redundant sigmoid colon by the gravid uterus, making it most common in the third trimester.

**Case presentation**: 25 year old G1P0 with history of Charcot-Marie-Tooth at 25 weeks and 5 days gestation presented to an outside hospital with a 3 day history of abdominal pain and nausea. After initial evaluation, the patient was diagnosed with constipation and discharged to home. She presented 10 days later with recurrent abdominal pain and failure to have a bowel movement for 2 days. CT scan at the time revealed high-grade small bowel obstruction with a 360 degree twist within the root of the small bowel mesentery. A focal transition point was present and there was decompressed distal small bowel and decompressed colon. Past medical history was pertinent for Charcot-Marie-Tooth for which she had undergone multiple prior foot surgeries and had significant muscle wasting in her lower extremities. Obstetric history had been unremarkable.

The patient was scheduled for emergency exploratory laparotomy as an ASA 2E. Pre-operatively, a T8/9 epidural was placed under local anesthesia. A rapid sequence induction with cricoid pressure maintained. She was intubated orally with the use of a Glidescope and a 6.5mm endotracheal tube was placed.

Intraoperative findings revealed midgut volvulus at the level of ileum and 28 cm of small bowel was resected. 3000 L of plasmalyte and 1500 mL of albumin were administered. Estimated blood loss was 30 mL. Post-operatively she was left intubated and transferred to the ICU for acidosis that was unable to be corrected throughout the operative case. She was extubated on POD #1. Her recovery was complicated by ileus and intermittent obstruction requiring TPN. On POD #66 she underwent attempted external cephalic version in the operating room. ECV attempt failed and the case converted to c-section under general anesthesia with subsequent lysis of adhesions. She was ultimately discharged on POD #78.

**Discussion**: This patient’s presentation was unique in that her volvulus occurred at the level of the ileum, likely caused by congenital malrotation around the superior mesenteric artery. There are rare case reports of midgut malrotation first presenting as acute bowel obstruction in adulthood, however presentation is most common by one year of age. The decision to keep the patient intubated to treat her acidosis is supported by studies that show small changes in maternal pH can cause fetal distress and acidosis. This case describes a rare etiology for bowel obstruction in pregnancy and highlights the special anesthetic considerations when managing a pregnant patient during non-obstetric abdominal surgery.
Anesthetic Management of Patient with Right Atrial Angiosarcoma

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Cecilia Wang 1, Dr. David Li 1
1. UC Davis Department of Anesthesiology & Pain Medicine

Cardiac angiosarcoma is a rare type of endothelial cell tumor that comprises 8% of primary cardiac tumor. It is most commonly found in the right atrium. The tumor is characterized by rapid growth and has a high rate of recurrence. It frequently interferes with neighboring structures, such as the vena cava and tricuspid valve, causing obstruction to blood flow. It frequently invades the pericardium producing pericardial effusion. Tumor fragments can embolize to the lung causing catastrophic pulmonary emboli, while myocardial involvement can lead to refractory arrhythmias due to conduction defect. Given these potential complications, it is critical that anesthesiologists are familiar with and are able to tailor their care to patients with this disease.

Here we discuss a case of a 73 year old female with right atrial angiosarcoma presenting for mass excision under cardiopulmonary bypass. She initially presented to the ED complaining of palpitations from atrial fibrillation. An echocardiogram revealed the presence of a moderate pericardial effusion with 800cc of serosanguineous fluid drained. A follow-up CT chest revealed an infiltrative multilobulated mass involving the right atrial wall, which biopsy later confirmed to be angiosarcoma. Despite this, the patient was largely asymptomatic. Her preoperative TTE demonstrated normal biventricular function with moderate tricuspid regurgitation. Given the patient's clinical status and need for continuous hemodynamic monitoring, a preoperative arterial line was placed. The patient underwent a slow induction with propofol, lidocaine, fentanyl, and rocuronium, and was intubated without complications. A central venous catheter was carefully placed in the right internal jugular vein under TEE guidance, while a pulmonary artery catheter was avoided given the location of the mass. TEE revealed a large intra-atrial mass extending from the entrance of IVC to the posterior annulus of the tricuspid valve, with the largest dimension measuring 3.6cmx2.7cm. Unfortunately, the mass was not completely excised under cardiopulmonary bypass, as the tumor extended into the right ventricle. Shortly after resection, the patient developed third degree heart block. Surgeons were notified and epicardial leads and permanent pacemaker were placed. On postoperative TEE, patient was noted to have good biventricular and tricuspid valve function. She was taken directly to CTICU intubated on norepinephrine and dexmedetomidine infusions and extubated the same day. She was discharged to SNF a week later.

This case highlights several factors that need to be considered in patients with intracardiac mass. Cardiac function and morphology should be reviewed prior to administration of anesthesia, particularly focusing on the degree of obstruction. The optimal position should be determined for induction since certain positions will lead to worsening obstruction. A slow, titrated induction is preferred. Hypotension produced by a decrease in SVR and venodilation can lead to decreased right atrial filling and collapse around the tumor, producing complete obstruction. Arrhythmias, as seen in our patient, are common and need to be carefully monitored and treated. Finally, a central venous catheter should be placed with extra caution. Entry into the right atrium may cause tumor embolization, therefore a pulmonary artery catheter is typically avoided.
Anesthetic management of patients with Mitochondrial Disease

Dr. Syeda Quadri
1. University of California Irvine

Background
Mitochondrial disorders (MD) represent a clinically and biochemically diverse group of conditions caused by dysfunctional mitochondria, the intracellular organelles involved in generation of ATP and ß-fatty acid oxidation. Thus, mitochondrial disorders can affect organ systems with high metabolic demands such as CNS, heart, GI tract, and the musculoskeletal system. The clinical manifestations of MDs are wide-ranging and include seizures, cerebellar ataxias, cardiomyopathies, gastrointestinal disease, and myopathies. The incidence is 1 per 4000 live births, and may be caused by mutations in mitochondrial DNA, or mutations in nuclear genes that code for mitochondrial components, or be acquired due to adverse effects of drugs, infections, or environmental influences. Increased survivorship from earlier diagnosis and treatment has made it increasingly common for MD patients to present for surgeries and anesthesia. While many different anesthetics have been used successfully, there have been several case reports of serious and unexpected complications during and after anesthetic exposure. Therefore management of MD patients requires a thorough preoperative evaluation, consultation with a geneticist, and implementation of perioperative preventative measures. Here, we describe management of two patients with MD.

Case Description
The first case is a 30 year-old female G3P2 at 38 weeks GA with POL G mutation MD associated with seizures, autonomic dysfunction, and carnitine deficiency in active labor. Management included early epidural analgesia to prevent increases in metabolic demand with intrapartum pain, minimal NPO time with initiation of D10½NS, continuation of L-carnitine, and stress dose steroids. Patient remained hemodynamically stable throughout labor and had a successful NSVD with discharge on postpartum day two. The second case is a 53 year-old male with POL G MD associated with dysphagia, myopathy, ataxia, hearing loss and ophthalmic complications presenting for cholecystectomy. Preoperatively, 3g intravenous L-carnitine was started along with D5NS maintenance fluids at 100cc/hr. IV Induction was performed with etomidate, rocuronium, and fentanyl. Patient was easily mask ventilated and direct laryngoscopy was uncomplicated. Anesthesia was maintained with sevoflurane (MAC 0.4 to 0.8) and a remifentanil infusion with BIS monitoring. Intraoperatively, patient required intermittent ephedrine but otherwise remained hemodynamically stable. He was successfully extubated after sugammadex reversal, however he displayed emergence delirium.

Discussion
MD presents an increased risk for adverse events to patients undergoing neuraxial or general anesthesia. In our case reports, patients underwent successful anesthetics due to multidisciplinary planning and implementation of preventative measures. The goal is to avoid increased metabolic burden by minimizing fasting duration, preventing hypoglycemia and hypovolemia with dextrose containing fluids, continuation of home supplements, and implementing therapies to avoid PONV, hypothermia, and acidosis. Propofol was not used due to mitochondrial suppression. Ketamine, lactate, and succinylcholine were avoided per guidelines. Careful consideration was given to titrating maintenance anesthetics while monitoring anesthetic depth as MD patients can have sensitivity to them. Lower doses of neuromuscular blockers were used to prevent potentiation of muscle weakness and opioid sparing
techniques were employed to avoid respiratory depression.
Anesthetic Management of Severe Pulmonary Hypertension Undergoing Major Non-Cardiac Surgery

Dr. Philip Petrou\(^1\), Dr. Jennifer Basarb-Tung\(^1\)

\(^1\) Perioperative and Pain Medicine, Stanford University School of Medicine, Stanford, CA

BACKGROUND: Patients with severe pulmonary hypertension are at a high risk of cardiovascular collapse and death during anesthesia, mechanical ventilation, and major surgery. The object of this report is to describe the anesthetic management of severe pulmonary hypertension in a major non-cardiac surgery. CASE DESCRIPTION: A 68 year old obese male with a past medical history of hepatitis B and C cirrhosis s/p liver transplant on immunosuppressants complicated by post-transplant proliferative disorder, post-transplant severe WHO group I PAH (NYHA class II) secondary to portopulmonary hypertension, HTN, CKD Stage III was scheduled for L3-L5 decompression with instrumentation and fusion for spinal stenosis. A preoperative right heart catheterization demonstrated: RPAP = 78/31/46 mmHg, CO/CI= 5.07/2.34, and PVR/PVRI= 6.7/14.5 WU. A nitroprusside study was aborted due to hypotension. The patient underwent a pre-op dobutamine stress echocardiogram that demonstrated moderate RV enlargement with RVSP = 65 mmHg and LVEF 59%. Coronary angiogram showed nonobstructive disease. The patient had been previously followed in pulmonary hypertension clinic, where he was initiated on sildenafil, but suffered from decompensated liver disease due to interaction with tacrolimus. After refusing both inhaled iloprost due to time constraints and endothelin receptor antagonists due to concerns for hepatic toxicity, the patient was lost to follow up and no longer on treatment for pulmonary hypertension on day of surgery. After discussion with the surgical team, the decision was made to take a more conservative approach consisting of a L3-L5 laminectomy. A pre-induction arterial line was placed and the patient was initiated on low-dose epinephrine, vasopressin and norepinephrine and demonstrated an appropriate hemodynamic response prior to anesthetic induction. The patient was adequately preoxygenated and underwent a slow induction for GETA with small boluses of propofol and fentanyl with MAPs maintained above 70 mmHg. A post-induction pulmonary arterial catheter was placed with initial RPAP reading of 105/35/55 mmHg. Inhaled epoprostenol was initiated under anesthesia prior to surgical incision, but the mPAP remained unchanged at around 55 mmHg throughout the case. The patient was maintained on 0.5 MAC sevoflurane combined with propofol and remifentanil infusions. Intra-operative monitoring demonstrated a CO ranging from 3.0-3.7 with a CI = 1.8. The patient tolerated the surgery well and ultimately extubated on only two vasopressor infusions for recovery in ICU. DISCUSSION: The perioperative management of severe pulmonary hypertension can be complicated by hemodynamic instability resulting in severe hypoxemia, acute right heart failure, and death. Meyer et al observed a 6% risk of major complications and 3.5% risk of perioperative mortality in a prospective study from 114 patients with PAH undergoing non-cardiac and nonobstetric surgery [1]. Predictors of major complications during non-cardiac surgery include emergency surgery, elevated right atrial pressures, six-minute walking distance, and perioperative use of vasopressors. Herein, we described the safe anesthetic management for severe PAH during major non-cardiac surgery with multiple risk factors for major complications. We emphasize the importance of multidisciplinary collaboration between cardiologists, anesthesiologists, and surgeons to devise the safest possible perioperative plan. REFERENCES: 1. Eur Respir J. 2013 Jun;41(6):1302-7
Antepartum uterine rupture with placental abruption at 29 weeks of gestation

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Jeffrey Hamilton\textsuperscript{1}, Dr. Larry Weinstein\textsuperscript{2}, Dr. Wendy Abramson\textsuperscript{1}

1. University of California San Diego, 2. UCSD

Background
Uterine rupture is a rare obstetric emergency associated with high maternal and fetal morbidity. The overall incidence of uterine rupture in women with a prior cesarean delivery is approximately 325 per 100,000 women undergoing trial of labor after previous cesarean delivery. The antepartum incidence is even more unusual. Here we present an exceptional case of antepartum uterine rupture with placental abruption in the setting of a possible placenta accreta.

Case Description
38-year-old F G4P2 at 29w6d with past medical history notable for fibroids requiring myomectomy, and two previous cesarean deliveries (with vertical midline uterine incisions) who presented to Labor & Delivery for abdominal pain and non-bloody emesis after eating pancakes. Pregnancy history was notable for a preliminary ultrasound concerning for possible placenta accreta. The patient described the pain as severe, sharp, with cramping in lower abdomen that was exacerbated with movement. Pt denied any LOF, VB, regular/painful contractions, dysuria, or pre-eclampsia symptoms. Physical exam was unremarkable except for diffuse abdominal tenderness. Fetal heart rate was reassuring, and tocometry showed irregular uterine contractions. Patient was given acetaminophen and fluids with improvement in her symptoms. Approximately 3 hours later, the OB anesthesia team received a page for “STAT C-SECTION”. The obstetric team informed us they were concerned for possible placental abruption with fetal compromise given the sudden increase in pain and fetal bradycardia to the 60s. Decision was made by surgical team to proceed with emergent cesarean delivery, therefore additional IV access was quickly obtained. When the obstetric team was ready, we performed a RSI with ketamine and succinylcholine. Upon incision, 1L of blood was immediately encountered in the abdomen. The Belmont Rapid Transfuser was assembled and 5 units of PRBCs and 2 FFP were given. Hemodynamic stability was achieved after resuscitation and anesthesia was maintained on ~0.8 MAC of sevoflurane and nitrous oxide. Intraoperative findings included a vertical anterior fundal rupture estimated to be approximately 8-10 cm in size with partial extrusion of the placenta through the rupture. Additionally, multiple fibroids were noted in the uterus with evidence of degeneration. No evidence of accreta was found on visual inspection of the placenta which was corroborated later on pathologic examination. The baby was delivered breech with APGARS 1/7 and transferred to the NICU. Decision was made by the surgical team not to perform a hysterectomy during the procedure given adequate hemostasis and uterine tone. Patient was left intubated and transferred to SICU where she was extubated POD#1. Patient did not require any further transfusions for the remainder of her hospital course.

Discussion
The incidence of antepartum uterine rupture has not been explicitly measured given its unusual occurrence. However, our patient had multiple risk factors for uterine rupture that certainly increased her risk: including two previous vertical hysterotomy incisions, and a previous myomectomy. Thus, in patients with multiple risk factors, heightened awareness for the potential of uterine rupture, even in non-laboring women, is important for timely surgical management and resuscitation.
Approach to airway management in an infant with osteogenesis imperfecta

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Steven Maler 1, Dr. Niroop Ravula 1
1. UC Davis Department of Anesthesiology & Pain Medicine

Background: Osteogenesis imperfecta (OI) continues to be an anesthetic challenge due to a variety of comorbid factors that need to be considered for safe management of any patient who presents for elective or urgent surgery. OI is a rare (1 in 50,000 births), autosomal hereditary disorder of collagen formation, which may consist of several phenotypes, including bone fractures from minimal manipulation or trauma, joint laxity, mitral valve prolapse, platelet dysfunction with an elevated bleeding risk, upper airway obstruction, short necks, brittle teeth, and rib cage dysmorphology. Hyperthermia, hyperkalemia, and reactions to paralytics are also of concern. Airway management in such a vulnerable patient population will also continue to be of critical importance.

Case description: This case involved a five-month-old, 6.1 kg infant male, who was 23 inches (small for age), born at term, with a history of OI Type III. Additional medical history also consisted of a small PDA with bidirectional shunting as well as a PFO with left to right atrial level of shunting found at his birth echocardiogram. The patient also had a history of known microfractures, managed by a pediatric orthopedist at an outside institution. His endocrinologist recommended initiation of bisphosphate therapy with pamidronate for chronic management of his OI. It was decided that placement of a tunneled internal jugular central venous port was indicated given the need for repeat infusions. He presented with his mother to the Children’s Surgery Center of UC Davis Medical Center, with the plan of a general anesthetic with an endotracheal tube.

Due to the anticipated site of the procedure, we formulated a strategy which involved minimal manipulation of the patients’ cervical spine during ETT placement to reduce the risk of facet fracture, mandibular trauma, cervical subluxation, or neurological deficit. The patient was brought to the operating room and mask induced with sevoflurane. Once intravenous access was obtained, we turned our attention to the airway with emergency equipment readily available. While maintaining manual in-line stabilization, a pediatric fiberoptic bronchoscope loaded with a 3.5 mm ETT entered via the oropharynx, passed through the visualized vocal cords, and finally above the carina after which the ETT was slid down and secured to a depth of 12cm at the lips. The surgery went as planned and the patient was extubated in the OR before transferring to the PACU, where he was later discharged home with no issues.

Discussion: Although rare, patients with OI may present for a variety of surgeries with co-morbidities that the anesthesiologist should be prepared for. Previous case reports describe using neuraxial or regional anesthesia as well as intubating LMA’s to avoid difficult airway complications or damage to the airway itself. However, we opted for a fiberoptic approach due to the patients’ size and age, close proximity of the surgery to the patients’ airway given the risk of dislodgement with an LMA, and general experience of the anesthesiology team. This form of management may prove effective if steps are taken beforehand to ensure safety at all stages during anesthetic management.
Arterial Embolism in Mitralclip Procedure

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. se fum (steven) wong 1, Dr. Wolf Benjamin Kratzert 1
1. UCLA

An increasing number of transcatheter based techniques are performed for patients with valvular disease with high predictive risk of mortality. The growing prevalence of this novel device requires for an established anesthetic management and monitoring for this high risk procedure. In particular, air embolism is a rare but catastrophic complication associated with the transseptal puncture. We describe a patient experiencing an ischemic watershed event secondary to coronary air embolism during the MitraClip procedure.

Case Presentation
A 77F with non-obstructive coronary artery disease and severe symptomatic mitral regurgitation from posterior leaflet fail presented for repair.
General anesthesia was induced and percutaneous access was established with transseptal puncture and maneuvering of clip delivery system performed in usual fashion. During clip deployment, significant amounts of air in the left atrium originating from the MitraClip device, inferior wall hypokinesis and RV failure were seen on TEE. Acute ST elevations with bradyarrhythmia and hemodynamic instability ensued. Cerebral oximetry by near-infrared spectroscopy demonstrated significant decrease of right side from baseline. Coronary angiography confirmed occlusion of RCA by air embolus. Selective angiography of cranial vessels demonstrated contrast stasis in right vertebral suggestive of air embolus. Immediate neurologic exam upon emergence of anesthesia demonstrated left greater than right sided weakness. MRI brain showed extensive acute cortical infarct in bilateral MCA/PCA watershed region. The patient received hyperbaric oxygen therapy with gradual improvement in neurologic deficit.

Discussion
Transcatheter based procedures have a steep learning curve and increasing demand of such interventions confronts anesthesia providers with challenge of coordinating comprehensive care to ensure patient safety.
Aspire to Prevent Aspiration: Gastric Sonography in Perioperative Management

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Angela Ji 1, Dr. Carlos Brun 2
1. Stanford University, 2. Veterans Affairs Palo Alto Health Care System

Background
Perioperative aspiration remains a serious anesthetic complication associated with significant morbidity and mortality. Practice guidelines for preoperative fasting aim to reduce this risk, but utility may be limited to healthy patients undergoing elective procedures. The advent of gastric ultrasonography has allowed for rapid point-of-care assessment of aspiration risk, and may be particularly helpful in those patients with intermediate pretest probability of full stomachs.

Case Report
A 69-year-old relatively healthy man presented for elective robotic cholecystectomy for symptomatic cholelithiasis, associated with abdominal pain, nausea, and anorexia for weeks – for which he was admitted pre-procedure for pain control and hydration. Despite full symptom resolution and a 12-hour fast by the morning of surgery, preoperative gastric ultrasound revealed significant amounts of heterogeneous particulate matter, indicative of solid contents and concerning for high aspiration risk. The patient was counseled on his increased risk for aspiration and received pharmacologic therapy including famotidine, metoclopramide, and nonparticulate sodium citrate. He was also offered preoperative nasogastric tube insertion for definitive gastric decompression as further risk mitigation, but he declined. Patient underwent rapid sequence induction and intubation uneventfully, with subsequent orogastric tube (OGT) insertion resulting in 1150 mL output. Post-decompression intraoperative ultrasound revealed persistent heterogeneous gastric contents, for which the OGT was repositioned with additional 250 mL output.

Discussion
The qualitative and quantitative evaluation of gastric contents by bedside ultrasonography can help quickly risk-stratify patients and guide perioperative management to reduce aspiration, especially in cases of clinical equipoise or uncertainty. Specifically, scenarios in which gastric ultrasound may be of benefit include emergent/urgent procedures, unreliable/unclear history, or patient co-morbidities that can delay gastric emptying – oft-cited of which are diabetes, pregnancy, severe hepatic or renal dysfunction, and neuromuscular disorders. Although the patient in this case lacked the aforementioned co-morbidities, he did present with recent gastrointestinal symptoms and ongoing opioid use, both of which can likewise delay gastric emptying. Given the prevalence of opioid-based analgesia both inpatient and outpatient, perhaps it should also be considered an indication for preoperative gastric sonography. Additionally, this case demonstrated the potential utility for gastric ultrasound intraoperatively, in optimizing OGT placement to ensure full gastric decompression. Familiarity with and adoption of gastric sonography in the perioperative setting can enhance the anesthesiologist’s practice in assessing and mitigating aspiration risk.
Association between Acute Post-cesarean Section Pain and Postpartum Infection: A Retrospective Cohort Study

Poster

Dr. John Ngo 1

1. University of Texas Medical Branch

Intro: Cesarean section delivery is associated with a high rate of surgical infection. Incidence of infection varies, but ranges from 3% to 20% (1). Infection is common, led to worse patient outcome (patients who develop infection are twice as likely to die) and is an enormous economic burden (1–10 billion dollars annually) (2). There is increasing awareness of the need to reduce infection given that development of this complication adversely affects length of hospitalization, quality of life, other major postoperative outcomes, and cost. (3) Therefore, we aimed to determine whether average postcesarean pain scores are associated with postpartum infection. Specifically, we tested hypothesis that patients with high postcesarean pain scores have an increased incidence of postpartum infection.

Method: With the approval of the Institutional Review Board, requirement for written informed consent was waived in this retrospective cohort study. We obtained data on singleton intrauterine pregnancy undergoing elective cesarean section under spinal anesthesia, in adults (>18 years old) at the University of Texas Medical Branch at Galveston between 2013 and 2016. Incarcerated patients, chronic pain patients under pain medications were excluded from study. Primarily, we were interested in whether post-partum pain was associated with infection. Post-partum pain was measured using the standard 10-point rating scale at various unspecified intervals during the hospital stay. All analyses were performed using SAS Version 9.4

Result: The dataset consisted of de-identified electronic medical records of 245898 in-patient encounters from 5432 patients admitted for delivery starting March 10, 2013 through March 16, 2016. We observed that post-partum infection status was associated with average postoperative pain score, F (1, 5428) = 6.48, p<0.05; those who had a post-partum infection reported higher pain scores compared to those who did not, 2.40 versus 2.21. Using a Bonferroni corrected p-value significance threshold of p<.0125, we didn’t able to find significant association.

Discussion: This is the first study in the literature to compare the cost-effectiveness of epidural, IV PCA, and TAP infiltrations with LB. Within reasonable WTP values, there is little differentiation in cost-effectiveness between IV PCA and TAP infiltration with LB. Epidural does not become a cost-effective strategy even at much higher WTP values. Further research is required to determine a more representative value for WTP to reduce NRS by 1 point and to assess the impact of cost and effectiveness of the interventions beyond 72 hours.

Atrial septostomy palliation during V-V ECMO with severe pulmonary hypertension and cardiogenic failure.

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. kar wei leung¹, Dr. Neal Gerstein², Dr. Josh Santos², Dr. Timothy Petersen², Dr. Lev Deriy², Dr. John Love³

1. Department of Anesthesiology and Critical Care Medicine, University of New Mexico, Albuquerque, NM, 2. UNM Department of Anesthesiology and Critical Care Medicine, 3. UNM Pediatric Cardiology

Background:
Atrial septostomy creates a shunt between the atria. It was originally developed to alleviate D-transposition of the great arteries in infants. It has since been described in treatment of primary pulmonary hypertension (1). In pulmonary hypertension (PH), elevated pulmonary artery pressures impair blood flow through the pulmonary vasculature resulting in hypoxia and eventual right heart failure and cardiogenic shock. Conceptually, the combination of atrial septostomy and venous-venous extracorporeal membrane oxygenation (V-V ECMO) may provide a reasonable clinical intervention via bypass of this obstruction (2).

Case Description
A 16 year-old male, with history of congenital diaphragmatic hernia treated with Nissen fundoplication was admitted to our intensive care unit with multifocal pneumonia as a complication of enteropleural and enterobronchial fistulas. After several days of antibiotic treatment with doxycycline and piperacillin-tazobactam, the patient developed acute respiratory distress syndrome (ARDS) and circulatory collapse requiring pressor support and V-V ECMO. Echocardiography demonstrated right ventricle dilation with left bowing of the interventricular septum, reduced left ventricular stroke volume, and severe PH. Despite multiple TTE and TEE pulmonary artery pressures were unable to be assessed.

The team diagnosed cardiac failure secondary to development of severe PAH. Patient was treated with epoprostenol and inhaled nitric oxide but continued to experience hypoxia that required escalation of ECMO support. A percutaneous balloon atrial septostomy (12mm x 2cm Opta LP balloon with Genesis 1910 stent) under total intravenous anesthesiawas performed for palliation. On post-procedure day two, the patient continued to deteriorate and care was subsequently withdrawn.

Discussion
Pulmonary hypertension carries significant morbidity and mortality and the evidence of optimal therapies is still evolving. Atrial septostomy with V-V ECMO may be considered after other therapies are exhausted. This technique has maintained normal blood oxygen levels in a sheep model (3). Recent reports show atrial septostomy to be efficacious as a bridge therapy in transplant-eligible patients with PH and life threatening hypoxemia. However, these patients exhibited a natural progression of a chronic disease process (4,5). This is in contrast to our case which had an acute on chronic manifestation of PH secondary to ARDS due to pneumonia. Our patient had a history of World Health Organization (WHO) group 3 PH due to obstructive sleep apnea and kyphoscoliosis prior to admission. Additionally, he had other organ dysfunction such as renal failure requiring dialysis, and underwent several procedures to ameliorate necrotic bowel and enterobronchial fistula which complicated the clinical picture and added significant physiological burden. In this case atrial septostomy with V-V ECMO did not improve hypoxemia or acidemia. Nevertheless, this case adds to the body of literature regarding indications and optimal timing for atrial septostomy with V-V ECMO as a therapy.

(2) Hoopes et al. *Seminars in Thoracic and Cardiovascular Surgery* 24 (3)
Blood Lactate Levels in Adult Cancer and Non-Cancer Patients Undergoing Elective Non-Cardiac Surgery

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Mr. William Kuo¹, Mr. Zhongjie Cai¹, Mr. Michael Ohebsion¹, Mr. Michael Tan¹, Dr. Allison Chambliss¹, Dr. Rodolfo Amaya¹, Dr. Mary Joseph¹

¹ Keck School of Medicine of the University of Southern California

Background: Tissue lactate levels tend to be elevated in cancer patients due to the Warburg effect.¹ Hyperlactatemia has also been shown to be associated with high morbidity and mortality rates in a diverse population of critically ill patients.² Blood lactate levels have also been used to risk stratify patients in order to determine prognosis and administer appropriate treatments.³ However, there is currently little evidence regarding the relationship between cancer and blood lactate levels. To investigate a possible association between cancer and blood lactate levels, our study compared arterial blood lactate levels between cancer and non-cancer patients.

Methods: A retrospective electronic medical record review, approved by our institutional review board, was conducted for 699 adult cancer (n=229) and non-cancer (n=470) patients who underwent elective non-cardiac surgery at LAC+USC Medical Center between July 2015 and July 2017. Collected data included demographics, ASA PS classification, the type of procedure performed, and arterial blood lactate levels. Multivariate logistic regression was performed to investigate a possible association between cancer and elevated blood lactate levels.

Results: Both cancer and non-cancer patients were stratified to normal (≤1.6 mmol/L) and high (>1.6 mmol/L) lactate levels. Prior to adjustment for demographics, our data did not show a statistically significant association between blood lactate levels and cancer status for either the normal or high lactate categories. The odds of having a higher lactate level for cancer patients was 0.995 (95% CI: 0.703-1.408) times that of non-cancer patients (p=0.977). After adjusting for patient sex, age, and ASA level, the adjusted odds of having a higher lactate level for cancer patients was 1.076 (95% CI: 0.754-1.534) times that of non-cancer patients (p=0.688).

Conclusions: Our data did not show statistically significant higher blood lactate levels in cancer patients. Limitations to our study included a limited sample size and the absence of co-morbidity analysis. Future studies may be conducted with a larger sample size and analyze co-morbidities that may influence blood lactate level. A prospective study may also be valuable.

References:
Bone Cement Embolism with TEE Visualization during Hip Hemiarthroplasty

Mr. Nicolas Salvatierra, Dr. Govind Rajan
1. University of California Irvine

Background:
Bone cement implantation syndrome (BCIS) is a rare and poorly understood phenomenon that can cause significant perioperative mobility and mortality that can occur with various orthopedic procedures that utilize methyl methacrylate bone cement. We describe a case of BCIS where bone cement embolization and cardiopulmonary collapse was visualized on TEE.

Case Description:
An 80 year-old female with past medical history of HTN, DMII, CHF with ejection fraction of 35%, pulmonary HTN with RVSP of 75 mmHg, and left femoral neck fracture s/p hemiarthroplasty 1 year prior, was scheduled for revision of left hip hemiarthroplasty for a prosthetic joint infection. A TEE was placed in order to monitor cardiac function due to patient's history. Patient was placed in the right lateral decubitus position for the entirety of the case. After a 300cc blood loss at the beginning of the surgery, dobutamine and vasopressin drips were started. During the bone cementing process, a large amount of debris was noted on the TEE in the RV inflow-outflow tract, and right ventricular strain was also visualized. The patient went into PEA arrest and the case was stopped as ACLS was started. Lateral chest compressions were started and 500ug of epinephrine was given, after which patient had return of spontaneous circulation. The case was then successfully completed, and the patient left the OR with good hemodynamics and an normal ABG. Patient was discharged without further complications on post op day #8.

Discussion:
Bone cement implantation syndrome is a well-documented phenomenon that can occur during various orthopedic procedures that utilize methyl methacrylate bone cement, with hip arthroplasty procedures being of particularly high risk. While clinicians do not fully agree on a standard definition, the clinical features include hypoxia, hypotension, cardiac arrhythmias, pulmonary hypertension, and cardiac arrest. Many models have been proposed, two of which include the embolization model and the monomer mediated model. TEE is not routinely employed during orthopedic procedures requiring high volume cementing. This case is interesting as the intraoperative TEE allowed for continuous cardiac function monitoring and rapid diagnosis of RV strain after cement embolization. Cement emboli are expected to occur fairly commonly in certain orthopedic procedures involving bone cement. A French study, published in 1997, demonstrated that 47 of 48 patients undergoing hip arthroplasty showed echogenic material showering on TEE monitoring. While the consequences of cement emboli can be fatal, the majority of cases end up being subclinical. This French study, however, failed to show any clinical impact of TEE-detected emboli, which confirms our hypothesis of subclinical embolization. More investigational studies involving TEE and orthopedic bone cement procedures will need to be conducted in order to confirm our hypothesis.

References:
**Can peripheral temperature measurement reflect core temperature in patients undergoing hypothermic surgery? A comparison of 3M SpotOn temperature stickers to esophageal temperature.**

**Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster**

*Dr. Francesca Betti*¹, *Dr. Carla Coelho*¹, *Dr. Richard Jaffe*¹, *Dr. John Brock-Utne*¹  
¹Stanford University School of Medicine

**Introduction:** The gold standard for temperature measurement during neurosurgical procedures performed under mild hypothermia is an invasive esophageal temperature probe. The 3M™ SpotOn™ temperature monitoring system is a noninvasive skin sticker designed to measure core temperature through zero-heat-flux technology. The system has been shown to be accurate in normothermia. Our study aims to see if the SpotOn™ system is an accurate way to measure core temperature noninvasively during hypothermic procedures. Moreover, our study aims to evaluate if there is an optimal location for temperature measurement using the SpotOn™ system and if temperature readings can be improved by modifying sensor application.

**Methods:** This was an IRB-approved study. Patients scheduled to undergo neurosurgical procedures under mild hypothermia were consented and enrolled in the study. 24 total patients were enrolled, 3 were excluded from final analysis because they were not cooled or rewarmed properly per our protocol. Patients had an esophageal temperature probe placed in addition to 2-3 SpotOn™ sensors during the surgical procedure. Patients were cooled to a goal temperature of 33-34°C esophageal temperature with a cooling blanket and rewarmed with a warming blanket and Bair Hugger™. Temperature data was recorded every 15 minutes during the procedure.

The three peripheral sites used for SpotOn™ temperature measurement were the forehead, vascular triangle of the neck, and axilla. Locations for each patient were chosen based on accessibility given patient positioning for each procedure. On a subset of vascular triangle sensors, extra foam insulating tape was added to see if extra insulation would improve temperature readings.

**Results:** Forehead temperature readings were within -0.15+/-0.87°C of esophageal temperature and vascular triangle readings were within -0.19 +/- 0.66°C by Bland-Altman analysis. Axillary temperature was less accurate - readings were within -0.38 +/- 0.9°C of esophageal temperature. Adding extra insulating foam to the sensors did not improve the reading. Wilcoxon signed-rank test comparing areas between esophageal and SpotOn™ temperature curves (normalized to procedure duration) confirmed that the vascular triangle and forehead were the most accurate measurement sites. Additionally, it showed that the vascular triangle was the most precise peripheral temperature measurement site.

There was a trend towards temperature correlation being slightly better during cooling than rewarming. This effect seemed to be exaggerated in patients with a BMI>30. This may represent an effect of excess adipose and increased thermal mass causing a delay of re-equilibration of skin and core temperature during the rewarming period. However, our study was not fully powered to analyze this effect given the study only had 5 patients with a BMI>30.

**Conclusions:** 3M™’s SpotOn™ temperature measurement system provides an accurate noninvasive alternative to esophageal temperature measurements in patients undergoing procedures under mild hypothermia when placed on the forehead or vascular triangle of the neck. The axilla is not as accurate as an alternative temperature mea-
surement sites. Moreover, altering the application technique with extra insulation does not improve temperature readings. The system appears to work well in patients with a normal body habitus, but may become inaccurate upon rewarming in patients with higher BMI.
Title: Cardioembolic stroke secondary to aortic valve papillary fibroelastoma
Authors: Penn, Caleb M.D.
Affiliated Institution: Cedars-Sinai Medical Center

Background:
Primary cardiac tumors are extremely rare. As an example, in one series of over 12,000 autopsies, only 7 were identified with an incidence rate of less than 0.1 percent. In symptomatic patients, a mass can virtually always be detected by echocardiography, MRI, or CT. Papillary fibroelastomas are the second most common primary cardiac tumor seen in adults behind myxomas. Usually compared to sea-anemones they usually have frond-like arms emanating from a stalked central core. Papillary fibroelastomas usually range in size from 2mm to 70mm and most frequently arise from the left side of the heart from valvular structures with the aortic valve being the most common. Diagnosis can usually be made on echocardiography. For those patients that are asymptomatic, some practitioners have advised careful observation so long as the mass remains small and non-mobile. That being said, most practitioners recommend surgical removal due to the risk of future cardio-embolic events and associated morbidity.

Case Description:
This is a case of a 45 yo F with a hx of hypothyroidism and endometriosis that described two episodes over a two year period prior to presentation of “bright light” flashing over her eyes with each episode self-resolving within minutes. However, she had a similar episode in October of 2017 that in addition to the bright flashing light was also associated with a headache that did not self-resolve. Upon further work up, the patient was found to have sustained multi-focal occipital infarcts seen on head CT secondary to what was later determined to be a papillary fibroelastoma arising from the left and non-coronary aortic valve leaflets as seen on echocardiogram. Given that the bubble study on the patient’s echocardiogram was negative, it was reasonable to rule out a patent foramen ovale and rule in the 3mm x 5mm mass arising from the left and non-coronary aortic valve leaflets as the likely source of the patient’s occipital infarcts also consistent with her constellation of symptoms self-described in her history. Although the patient did not undergo carotid ultrasound to assess for carotid stenosis secondary to hyperlipidemia, the patient did have a recent lipid panel revealing grossly normal cholesterol values which reduces the likelihood that that cause her strokes were related to any pathology relating to hyperlipidemia.

Discussion:
This case incorporated very rare and unique pathology that was associated with a typical presentation making it a great learning case. Given the patient’s symptomatic and the findings that were seen on echocardiography it was a relatively straightforward diagnosis that was managed in accordance with current practice recommendations for similar cases. Fortunately, the case resulted in a positive outcome for the patient following surgical resection of the mass by way of cardiopulmonary bypass.
Malignant hyperthermia (MH) is rare; occurring in about 1 in 5,000 to 50,000 instances where patients are exposed to triggering agents. The hallmarks of clinical presentation include tachycardia, hypercarbia, acidosis, hyperkalemia, muscle rigidity, hyperthermia and rhabdomyolysis, but it is important to note that the presentation can be highly variable. Fulminant MH episodes can be life threatening and early recognition and treatment is paramount. We describe a case of a fulminant MH episode that presented in PACU in the setting of septic shock.
Case Report: Emergent Anesthetic Management of Incarcerated Umbilical Hernia in a Patient with Diffuse Aneurysmal Disease

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Curtis Walther 1, Dr. Matthew Malkin 1
1. Loma Linda Anesthesiology

Curtis Walther, MD and Mathew R. Malkin, MD
Department of Anesthesiology, Loma Linda University Medical Center

Compared to aneurysmal disease that occurs in isolated areas (e.g., cerebral, aortic, peripheral, etc.), diffuse aneurysmal disease is a rare finding. Literature dealing with this disease state and its prevalence is equally scarce. In patients with complicated comorbidities such as uncontrolled hypertension and coronary/peripheral artery disease, challenges arise in terms of the anesthetic approach and management.

This case details the successful management of a 46 year old man with a history of poorly managed cardiopulmonary compromise and recently diagnosed diffuse aneurysmal disease who presented for emergent surgical management of an incarcerated umbilical hernia. CT imaging revealed diffuse aneurysmal disease involving the aorta, coronaries, and all major arteries. Vascular surgery was consulted regarding the findings and they assessed him to not be in need of acute vascular surgical intervention and stated there were no contraindications for general surgery to operate on the hernia. Echocardiography could further identify structural defects related to his aortic aneurysmal disease but was not obtained due to surgical urgency. Spirometry was considered given his history of asthma, COPD, tobacco abuse, and poor functional capacity however this too was deferred due to case urgency. Because the patient was a poor historian, review of outside cardiology records could characterize his cardiac history. Records were unavailable at time of surgery. The patient denied any familial aneurysmal conditions such as Ehlers-Danlos Syndrome. He demonstrated no joint hypermobility.

Continuous blood pressure was placed pre-induction and monitored via ClearSight System™ (Edwards Lifesciences, Irvine, CA). This avoided damaging a potentially aneurysmal radial artery. Arms were left untucked should emergent arterial cannulation be necessary. Etomidate was chosen to induce anesthesia given his unknown cardiac function and significant comorbidities. Target Blood Pressure maintenance (MAPs 60-75) was achieved throughout the case without requiring drips. Rapid sequence intubation with succinylcholine and a defasciculating dose of rocuronium minimized aspiration risk. Sevoflurane and opioids were titrated to minimize sympathetic stress response. The patient’s atrial fibrillation with rapid ventricular response was rate-controlled pre-, intra-, and post-operatively using intravenous diltiazem.

Diffuse aneurysmal disease presents unique challenges to the anesthesia care provider. In this patient with cardiopulmonary compromise at baseline, obtaining close hemodynamic monitoring while minimizing arterial damage presented a challenge. The ClearSight System™ effectively accomplished this goal, sparing this patient arterial cannulation. As with focal aneurysmal disease, avoidance of hypertension is essential to prevent rupture of aneurysmal vessels. The ClearSight™ monitoring helped us quickly diagnose and treat acute hypertension. For non-emergent cases, identification and characterization of etiology of arterial wall degeneration can help guide the surgical and anesthetic approach. Interview with the patient’s mother revealed a possible familial history of undiagnosed Ehlers-Danlos Syndrome or similar connective tissue disorder. The prevalence of Vascular EDS (formerly ESD Type IV) is estimated to be in 1 in 100,000 to 1 in 200,000 patients. Vascular surgery consultation may be helpful to risk-stratify and medically optimize these patients. Review of radiographic and echocardiographic imaging for aneurysmal disease is also useful.
Background:
Tracheomalacia (TM) is defined as a weakening of tracheal walls resulting in excessive trachea collapsibility, primarily during expiration. During mechanical positive pressure ventilation, TM can lead to airway obstruction and elevated peak inspiratory pressures (PIP). Our case uniquely describes an acute intraoperative presentation and diagnosis of unanticipated TM along with management of difficult ventilation utilizing high peak end expiratory pressure (PEEP).

Case Description:
77-year-old man presented after a mechanical fall with acute burst fracture of T3 vertebral body and T2-T3 interspinous ligament tears. He underwent posterior instrumented fusion and kyphoplasty in prone position under general anesthesia. Medical history included obesity (BMI 33), obstructive sleep apnea (OSA), Hypertension, Gastroesophageal reflux disease (GERD), and active cigar smoking. Patient did not use home inhalers. Preoperative examination, labs, and chest x-ray were unremarkable. After induction, patient was placed on volume control ventilation with tidal volume (TV) of 500cc and PEEP of 5mmHg. PIP was 36-37mmHg and TV 480-500cc. When repositioned prone, the patient's PIP increased to 37-41mmHg and TV decreased to 420-460cc. After one hour in prone, PIP increased to 46-50mmHg. TV fluctuated between 480-490cc to as low as 90-170cc. Switching to pressure control did not improve ventilation. Endotracheal tube (ETT) was not visibly kinked and intraoperative fluoroscopy confirmed ETT tip was above the carina. ETT suctioning, beta agonist treatment, and circuit replacement did not improve respiratory dynamics. Fiberoptic bronchoscopy (FOB) revealed tracheal collapse during mechanical expiration of the posterior wall (from mid trachea to carina and into bronchus), causing near complete tracheal and bilateral bronchi obstruction. To improve ventilation mechanics, PEEP was titrated to 20mmHg without hemodynamic compromise. This maneuver significantly improved ventilation to baseline values, reducing PIP to 37-40mmHg and increasing TV to 500-510cc without fluctuations. Supine FOB showed the same obstruction during coughing. Patient was extubated uneventfully.

Discussion:
Reported presentations of TM are wheezing, stridor, or respiratory distress which were absent in our patient. Reports of unanticipated TM during anesthesia in prone position exist in pediatric patients with congenital connective tissue abnormalities. These cases presented with increase in PIP and reduced TV after being placed in prone position and were diagnosed with TM using FOB, similar to our case. Additionally, our case presented with fluctuating TV, which may be considered a sign of TM. Though our patient was asymptomatic and had no radiographic evidence of TM, his comorbidities reflected some of the known risk factors for TM in adults, which include COPD, cigarette smoking, GERD, chronic cough, and obesity. Reports of successful management of acute TM obstruction in intubated patients have included adjusting the endotracheal tube (ETT) tip past the obstruction to act as a mechanical stent and rotating the ETT side hole to face away from the obstruction. However, our patient's obstruction involved the carina and bronchus making ETT stenting or rotation unlikely to improve ventilation. Instead, gradually increasing PEEP (without adversely affecting hemodynamics) served as a pneumatic stent and successfully reduced elevated
PIP and improved the ability to deliver an appropriate TV during tracheal collapse.
Case Series of Intraoperative Continuous Replacement Renal Therapy through the Venovenous Bypass Circuit during Orthotopic Liver Transplant, a Novel Approach

Introduction
Patients undergoing OLT with preoperative acute renal failure require the use of continuous renal replacement therapy (CRRT) to correct acidosis and electrolyte imbalance. A high-risk subset of these patients requires the use of venovenous bypass (VVB) for maintenance of hemodynamic stability during OLT. For these patients, CRRT performed directly through the VVB circuit as continuous venovenous hemodialysis (CVVH) has not been well explored in the literature. We thus present a case series describing the use of intraoperative dialysis accessed off the venovenous bypass circuit in OLT.

Methods
We retrospectively reviewed preoperative patient characteristics and laboratory variables, intraoperative laboratory variables, and postoperative discharge outcomes of patients who underwent OLT with intraoperative CRRT via the VVB circuit. The following variables were recorded: age, MELD, days on LT waitlist, etiology of liver failure, length of time on preoperative CRRT, and intubation status prior to OLT; preoperative Na, K, PT/INR/PTT; simultaneous renal transplant status, intraoperative transfusion requirements, start/end body temperature, highest K, worst base excess, presence of intraoperative dysrhythmia and post-reperfusion syndrome; postoperative survival at 30 days, mortality at discharge, HD need immediately and 30 days post-transplant, time to discharge, and location of discharge. Stata was used to perform descriptive statistics.

Results
We identified 19 patients at UCLA Medical Center who underwent intraoperative CRRT accessed off the VVB circuit from January 1, 2016 to September 1, 2017. Median MELD score was 40 and 100% were on CRRT preoperatively, with 52.6% (10/19) requiring ≥ 14 days, 31.6% (6/19) between 14 and 30 days, and 15.8% (3/19) >30 days. Intraoperatively, these patients had highest K level 4.9 ± 0.75 mmol/L, worst base excess -10.1 ±3, and 15.8% (3/19) incidence of intraoperative dysrhythmia and 31.6% (6/19) incidence of post-reperfusion syndrome. Postoperatively, 30-day survival was 100% with median 54.5 days to discharge from OLT; 94.7% (18/19) required immediate postoperative CRRT while 68.4% (13/19) continued to require HD 30 days post-OLT.

Conclusion
CRRT performed via an existing VVB circuit in patients undergoing OLT represents a novel extra-renal approach to intraoperative dialysis in these high-risk patients.
Case Description: a 28 year-old female G2P1 at 34+6 weeks gestation with a past history of osteogenesis imperfecta and an RCA dissection with x3 stents placed 6 years earlier presented with chest pain, EKG changes, positive troponins, and new echocardiographic wall motion abnormality consistent with STEMI. Angiography revealed an acute dissection of the LAD and a drug eluting stent was placed by interventional cardiology. Once stable the patient was discharged on dual antiplatelet therapy for 1 month, followed by 7 days without clopidogrel before scheduled induction of labor. Anesthesia during labor was achieved with a carefully titrated lumbar epidural with planned assisted vaginal delivery in order to reduce maternal cardiac stress. Fetal malpresentation was discovered and a routine Cesarean delivery was performed, producing a healthy female infant with APGARs of 9/9. The patient tolerated the procedure well without any cardiac events and had an unremarkable postpartum course.
A 33-year-old pregnant woman with a body mass index of 69 was scheduled for repeat Cesarean delivery. Her medical history included two prior Cesarean sections, chronic untreated hypertension with concern for superimposed preeclampsia, and gestational diabetes mellitus type A1.

Preoperative tests included an electrocardiogram and a transthoracic echocardiogram. Anesthetic preparation prior to surgery included operating platform extensions, a radial arterial catheter, a central venous catheter, and for the administration of continuous spinal anesthesia, an intrathecal catheter, which required multiple attempts to place. These procedures and the surgery were uneventful despite the significant resources required for the management of the morbidly obese patient.

Acknowledgments
The patient gave her written permission for photography.

References

Challenges and Successes in Establishing a Novel Anesthesia Collaboration in Cape Coast, Ghana—A Collaboration at Five Years

Background & Objective: International collaboration among medical professionals has emerged as a proven model in improving training and clinical skills in developing health economies. Additionally, such collaborations grant valuable new perspectives in healthcare delivery for all participants. Improvements in communication infrastructure, as well as development of less costly medical technologies have facilitated such collaborations. However, establishing an international partnership can be fraught with multiple unforeseen challenges, which if not addressed appropriately, can hamper or even terminate collaborations early in their development. This study examines five years worth of first-hand successes and challenges of establishing a new international collaboration between our anesthesiatic team (a board-certified anesthesiologist and anesthesia resident) and the anesthesia division at the Cape Coast Teaching Hospital (CCTH)—the regional hospital in the Western and Central Regions of Ghana with a catchment area of close to 3 million people.

Methods: First hand accounts & case reports

Results: In a country with just one anesthesiologist per 1.2 million people, we have found collaboration to be a lynchpin for delivering safe and appropriate anesthesia. Over the past five years our collaboration has developed on several fronts. 1) Education: Although there is currently not a consulting anesthesiologist at CCTH, a strong group of nurse anesthetists has made education a priority. In addition to onsite training as part of our collaboration, the division has recently secured additional educational opportunities in a burgeoning nurse anesthetist degree program and the University of Cape Coast, as well as receiving funding for continuing education or “top-up” months for recent trainees. 2) Technology: Clinical skills among the nurse anesthetists is highly variable, and difficult intubations have had catastrophic outcomes including emergent tracheostomies and several deaths. In our collaboration we worked with the head of the division in securing videolaryngoscopy equipment and training. Since that time, 100% of the ten nurse anesthetists report improved confidence in managing difficult airways and demonstrate improved laryngoscopy skill. 3) Communication: Such a collaboration would not have been possible with recent technologies such as What’sApp, Facebook Messenger, and Skype. Through ongoing, year-round communication, we have been able to share experiences from across the world.

Conclusion: Establishing a new collaboration with an international partner is mutually beneficial. While the initial launch may be challenging, if approached in a cooperative fashion, such partnerships can significantly improve healthcare delivery in resource-poor settings through ongoing exchange of ideas and consultations, on-site training, and shared partnership in approaching challenging cases and addressing research questions.
Background:

Osteogenesis Imperfecta (OI) is a genetic disorder affecting multiple organs. It predisposes to brittle bones susceptible to fracture, and cardiac and pulmonary abnormalities manifesting themselves in the perioperative period. Discussions of the perioperative management of patients with OI is limited in the literature. The purpose of this study is to contribute to the literature on perioperative management of patients with OI.

Case Description:

We present the case of a 41 year-old patient with OI requiring complex perioperative management during multiple urological surgeries. The patient presented to Urology for complaints of left flank pain found to be due to recurrent nephrolithiasis. Patient reported history of difficulty with intubation and general anesthesia in the past. Exam showed short stature, shortened extremities, and sustained wrist contractures. Airway examination exhibited mouth opening <3 cm, limited flexion of the C spine, normal jaw protrusion, normal dentition, and an inability to assess Mallampati. Anesthetic plan was developed for awake fiberoptic endotracheal intubation to avoid jaw traction or trauma, total intravenous anesthesia with propofol, and awake extubation. Standard monitoring procedure needed to be adjusted due to the patient’s high risk of skeletal fracture. IV was placed preoperatively without a tourniquet, and an arterial line could not be placed due to the concern of pressure to the wrist. Nexfin was used for continuous arterial blood pressure monitoring. The patient did not tolerate a fiberoptic scope passing through the oropharynx initially. Propofol and midazolam were given, and visualization was again attempted with a fiberoptic scope, but the practitioner was still unable to obtain a view of the cords. The practitioner avoided placing significant traction on the patient’s jaw during intubation attempts, to minimize the risk of fracture. 45 minutes after initial induction, a laryngeal mask airway (LMA) #3 was placed successfully. A view of the vocal cords was obtained, and the practitioner was able to pass a fiberoptic bronchoscope through the patient’s vocal cords. A size 5.0 endotracheal tube (ETT) was placed through the LMA. The care team then spent significant time carefully positioning the patient to avoid weight bearing in areas that could lead to fracture. Rocuronium used for nondepolarizing neuromuscular block, but train of four not assessed due to the risk of causing fracture. Sugammadex used to reverse neuromuscular block. His remaining postoperative assessment was uncomplicated, and the patient was discharged home.

Discussion:

Delicate bones seen in patients with OI necessitate careful perioperative positioning and transfer of patients. Furthermore, seemingly routine perioperative monitoring must be accommodating to the patient with OI. Minor trauma associated with mask ventilation, tourniquet use, and arterial line placement can all potentially cause fracture. Airway management is difficult, and cautious techniques that minimize manipulation of the head and neck are required to avoid odontoaxial dislocation. Bag-mask ventilation also risks fracture of facial bones. The pathophysiologic manifestations of OI inherently make the practice of anesthesiaology more difficult. All OI patients must have careful assessments of cardiac, pulmonary, and hematologic risk factors in the perioperative period to reduce intraoperative complications.
Characteristics of non-operating room pediatric case cancellations at UC Davis Medical Center in 2016-2017

Dr. Michael Yim¹, Mr. Risheek Pingili¹, Dr. Niroop Ravula¹

¹. University of California Davis

Introduction: Case cancellations result in a waste of resources, inconvenience to providers and families, and financial strain. Though often preventable, case cancellations can be as high as 24% to 40% (1,2) on the day of surgery. A significant amount of these canceled cases are attributed to factors such as incomplete medical/surgical evaluation, recent patient illness, lack of insurance authorization/financial (3), scheduling error, or patient or family declining surgery (4).

Study Aim: To investigate the amount and type of canceled pediatric non-operating room cases at University of California, Davis Children’s Hospital during a one-year period and reasons for cancellations. Secondly, to examine factors including patient age, type of anesthesia, type of non-operating room procedure or imaging, and the need for an interpreter.

Methods: We retrospectively analyzed all non-operating room pediatric cases, including those scheduled, completed, and canceled in our institution from May 2016 to May 2017. We defined pediatric patients to be under 18 years of age. We collected data from our electronic medical record including age, type of anesthesia, department distribution of cases, need for an interpreter, and reason for cancellation. Data was analyzed using R statistical software.

Results: Our patient population consisted of 93 cancelled cases out of 1544 scheduled cases, for a cancellation rate of 6.02%. The mean age for all cases was 5.55 years old, for completed cases was 5.56 years old and for cancelled cases was 5.39 years old. Among all cases, 1061 (64.8%) were done under general anesthesia, 225 (13.7%) were done under monitored anesthe sia care, and 352 (21.5%) were not specified. Among the 93 cancelled cases, 68 (73.1%) were due to “patient”, 22 (23.6%) were due to “clinician”, and 3 (3.2%) were due to “clinic”. Among both completed and cancelled cases, hospital MRI was the most common case type (42.8% v. 36.56%) followed by hospital interventional radiology among completed cases (21.3%) and chemotherapy/radiation among cancelled cases (26.88%). Among all cases, 146 (8.9%) required an interpreter; 142 (9.2%) among completed cases and 4 (4.3%) among cancelled cases. 97 of the 146 cases (66.4%) requiring interpreters were in the Spanish language.

Discussion: The cancellation rate of 6.02% among non-operating room pediatric cases in our institution was similar to rates described elsewhere (5). Age and need for an interpreter did not appear to be associated with case cancellation, and MRI and general anesthesia cases were the most commonly scheduled, completed, and cancelled cases. The majority of cases cancelled were due to patient factors (73%) at a rate similar to that previously described (3), which can include reasons such as NPO violations, recent upper respiratory infection or illness, or patient no show.

Conclusion: Non-operating room pediatric case cancellations at our institution constitute a small minority of overall scheduled cases and are mostly attributable to patient factors.

5. ANZ J Surg. 2009 Sep;79(9):636-40
Combined Mediastinoscopy, Median Sternotomy and Left Thoracotomy For Carinal Left Pneumonectomy (Sleeve Pneumonectomy) In A Patient With Prior Left Lower Lobe Segmental Resection And Radiation For Metastatic Colon Cancer.

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Jocelyn Wong ¹, Dr. Vivekanand Kulkarni ¹
1. Stanford University School of Medicine

Introduction:
Carinal left pneumonectomy is a rare procedure that presents surgical and anesthetic challenges. We present a case of a 50-year-old male, with a history of metastatic colon cancer to the left lower lobe (LLL), status post prior LLL superior segmental resection, with recurrent nodules to the airway mucosa that extended from LLL bronchus to carina. Surgical exposure necessitated mediastinoscopy, median sternotomy, and left thoracotomy with cross-field ventilation.

Case Presentation:
A 50-year-old male, ASA 3, with history of metastatic colon cancer to his left lung, status post prior LLL superior segmental resection, was found to have recurrence of nodules in the LLL bronchus up to carina. The patient was scheduled for a carinal resection with left sleeve pneumonectomy.
Preoperatively, a T4-T5 epidural was placed in the sitting position. The patient was induced with fentanyl, propofol, and rocuronium. Intubation proceeded with an 8.0 endotracheal tube and C-mac, D blade videolaryngoscope for decreased thyromental distance. The patient was maintained on 1.0 MAC of sevoflurane and 5 mL/hr of 0.125% bupivacaine via epidural. An arterial line was placed for hemodynamic monitoring and frequent blood gases. A fluid restrictive strategy was utilized throughout the 11-hour procedure to reduce post-operative pulmonary edema. Consequential sympathectomy was managed with a phenylephrine infusion. Muscle relaxation was maintained using 20 mg of rocuronium every 30 mins.
The trachea was released from the sternum under medinastinoscopy. Prior to median sternotomy, an EZ-blocker was placed under fiberoptic guidance for right lung isolation. During carinal resection and right mainstem bronchus re-anastomosis to the proximal trachea, cross-field manual ventilation was performed in coordination with surgery. A Grillo stitch maintained the patient's neck in flexion to prevent extension and tension on the shortened trachea after anastomosis.
Oral endotracheal tube ventilation was utilized during left sleeve pneumonectomy. Due to prior lung resection, the LLL was adherent to the parietal pleura. Surgical exposure caused compression of the aortic arch and descending aorta, a known issue in left sleeve pneumonectomy procedures (1). Thus, a left thoracotomy was performed and resection proceeded without difficulty.
The patient was fully reversed with neostigmine and glycopyrrolate. Frequent muscle relaxation prompted the addition of sugammadex to prevent re-paralysis post-operatively. The patient was held in neck flexion and extubated without issue. The thoracic epidural provided excellent post-operative pain control. Acute kidney injury was noted and resolved in the post-operative period.
Discussion:
While left sleeve pneumonectomy and carinal resection is a rare procedure, our case is unique due to the combined
median sternotomy and left thoracotomy required for resection. The case exhibited excellent communication between surgical and anesthesia teams, particularly during cross-field ventilation and during LLL resection. Through close teamwork between the surgical and anesthesia team, the patient underwent a rare, complex surgery and recovered remarkably well.

References:
Comparison of Postoperative Opioid Use and Pain Scores in Primary versus Secondary Cesarean Sections in Opioid Naïve Patients: A Retrospective Cohort Study

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Amanda Chao¹, Dr. Ioana Pasca¹, Dr. Michelle Woodfin¹, Mr. Matthew Alschuler¹, Mr. Justin Pugh¹, Dr. Jay Lee¹, Ms. Sara Alsouqi¹, Mr. Mostafa Naghshbandi¹, Ms. Briahhna Austin¹, Ms. Jennifer Shyong¹, Mr. Mark Ringer¹, Dr. Davinder Ramsingh¹

1. Loma Linda Anesthesiology

Background: 1.3 million Cesarean sections (C-section) are performed in the United States each year. Acute, severe pain after C-section is a predictor for poor outcomes including chronic pain, postpartum depression, and difficulty with breastfeeding and infant care. Identifying risk factors for severe, acute postoperative pain is an ongoing effort. No study has investigated whether undergoing a secondary C-section is a risk factor.

The patient population undergoing secondary C-section is also unique from other surgical populations undergoing repeat procedures. Concerns regarding passing medications through breastmilk to their newborn may play a part in patients’ decisions to accept an opioid analgesic.

We sought to evaluate the acute postoperative opioid requirements and pain scores in patients undergoing secondary C-section who remained opioid naïve after their primary C-section. Identifying whether a secondary C-section is a risk factor for increased acute postoperative pain or increased opioid requirements would be beneficial in optimizing perioperative analgesia for these patients.

Aim: To determine if opioid naïve ASA II obstetric patients, who received the same regional anesthetic care and nonopioid analgesic regimen, have different acute postoperative opioid requirements and/or pain scores on secondary compared to primary C-section.

Methods: This was a retrospective cohort study of obstetric patients who had either their primary or secondary C-Sections between 2015 and 2017 at Loma Linda University Health. Patients were screened for those that received a spinal anesthetic with the same dose of intrathecal opioids and had the same postoperative pain management protocols. Patients were excluded who had a history of opioid use or illicit drug use or other major abdominal surgery. The primary outcome was the amount of opioid administered in morphine equivalents divided into postoperative periods of 0-24 hours, 24-48 hours, and 48-72 hours. The secondary outcome was pain scores divided into those same respective periods.

Results: 1617 C-section patients were screened with a total of 594 cases compared as having either primary (217) or secondary (377) C-section procedures meeting all inclusion and exclusion criteria. Significant differences were found in patient baseline demographics via the Mann-Whitney test in that those undergoing secondary C-section were of greater age and required shorter hospital length of stay (HLOS) (p<0.05). The primary outcome comparison showed statistically significant reduced opioid requirements in patients undergoing secondary C-section compared to the primary group for the 24-48 and 48-72 hour periods (p=0.0005). The secondary outcome of pain scores did not demonstrate a statistically significant difference (p>0.05).

Conclusion: Obstetric patients are a unique patient population. Opioid naïve obstetric patients who undergo a
secondary C-section are better able to tolerate pain with lower opioid requirements in the acute postoperative period and require shorter HLOS. Providers should be aware of these differences in order to better educate patients, set realistic expectations of patients’ hospital stay, and provide adequate pain management without overprescribing opioids.
Complex regional pain syndrome following Southern Pacific rattlesnake envenomation

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. L. McLean House II**, **Dr. Matthew Lewin**, **Dr. Ramana Naidu**

1. UCSF, 2. California Academy of Sciences, 3. Mount Tam Orthopedics & Spine Center

Chronic regional pain syndrome (CRPS) is characterized by persistent pain disproportionate to an initial injury with sensory disturbances. We present a case of CRPS type 2 in a 12 year old boy after a southern Pacific rattlesnake (*Crotalus oreganus helleri*) bite near the lateral malleolus. Initial management with Crotalidae polyvalent immune Fab (ovine), opioids for acute pain, and supportive care. Coagulation studies were within normal limits. Five months after the envenomation, the patient reported to a pain medicine specialist with lower extremity edema up to the knee, erythema, hyperalgesia, hot and cold dysesthesia, and sudomotor changes. After a month of conservative care with physical therapy, desensitization, weight bearing, acupuncture, and transcutaneous electrical nerve stimulation, his symptoms resolved. A literature review of CRPS cases following snake or viper bites revealed four case reports in Asia and Europe. Successful management strategies proposed in the literature included snake antivenom, gabapentinoids, sympathetic ganglion blockade, physical therapy, and psychological support. Isolation of compounds in viper venoms causing tissue and/or nerve injury may provide insight into the pathogenesis of CRPS.
Correlation of Percent Change in Serum Free Hemoglobin Values to Percent Change in Transcranial Doppler Velocity in Aneurysmal Subarachnoid Hemorrhage Patients

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Gary Shih ¹, Dr. Christianna Steely ², Dr. Justin Daniels ¹, Dr. Davinder Ramsingh ²

1. Loma Linda Anesthesiolgy and Critical Care, 2. Loma Linda Anesthesiology

Background: Delayed cerebral ischemia (DCI) is one of the most important causes of mortality and poor neurologic outcome for patients who survive an intracranial bleeding event. Pathogenesis of DCI has historically been thought to be secondary to large cerebral vessel vasospasm but other mechanisms including microcirculatory dysfunction, impaired autoregulation, and spreading depolarization have also been suggested. Transcranial doppler (TCD) is the standard modality used clinically to evaluate for large cerebral vessel vasospasm events in patients at risk for DCI. In animal models, associations have been demonstrated between free hemoglobin levels within the brain parenchyma to both severity of the intracranial bleed as well as DCI events. Indeed a suggested mechanism for DCI events include the extracellular hemoglobin and its interaction with the vasodilator nitric oxide. The relationship between brain parenchyma free hemoglobin levels and serum free hemoglobin levels is poorly understood in humans. This study evaluated whether serum free Hgb is a useful marker to evaluate for DCI in patients who acutely suffered an intracranial bleeding event. Specifically, this study examined for this association by assessing for correlation between the percent change in serum free Hgb levels and the percent change in TCD velocities.

Methods: Patients diagnosed with aneurysmal subarachnoid hemorrhage were evaluated for the study. Cell free Hgb levels were drawn in patients diagnosed with aneurysmal subarachnoid hemorrhage on post-hemorrhage day 0. TCD were also performed on day 0. After the aneurysm was secured, cell free hemoglobin levels were obtained on the same day as the repeat TCD’s. Comparison of the percent change in serum free Hgb from day 0 to the percent change in TCD velocity from day 0 were performed.

Results: A total of 36 TCDs to serum Hgb comparisons were performed on 7 patients. For each patient the average peak percent increase in serum Hgb from day 0 was 60% (+ 21) and the matched average change in TCD velocity was 22% (+30%). No significant correlation was observed between percent in serum Hgb values to TCD velocity (r = -0.39).

Conclusion: Preliminary results demonstrate a rise in serum free Hgb in this patients population. However, no significant correlation was observed between serum Hgb values and TCD velocity. This could be due to the small number of patients presently enrolled in the study.
CPVT, a rare but deadly condition that could present to your operating room

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. Betelehem Asnake**¹, **Dr. Aubrey Yao**², **Dr. Neal Fleming**¹

1. University of California, Davis Department of Anesthesiology and Pain Medicine, 2. University of California Davis Department of Anesthesiology and Pain Medicine

Catecholaminergic polymorphic ventricular tachycardia (CPVT) is a rare hereditary disease characterized by adrenaline driven potentially lethal tachyarrhythmias in individuals with normal heart structures. The disease usually presents with syncopal episodes after physical effort or acute emotional stress that triggers a surge of catecholamines. Most patients have a normal ECG and echocardiogram has no characteristic abnormality. Diagnosis can be made based on ECG during exercise which shows isolated monomorphic ventricular premature beats which increase in number as physical efforts continues. Induction and progressive deterioration of ventricular arrhythmias during stress testing or isoproterenol infusion are diagnosis hallmarks of CPVT. The perioperative management of patients with this condition can be challenging due to the rarity of the disease and the hemodynamic instability associated with tachyarrhythmias. There are limited studies that discuss anesthetic management of patients with this rare disorder. In this case report, a 17 year old female with known CPVT is admitted to the ICU after suffering witnessed cardiac arrest. She is intubated and remained stable on multiple pressors. Given her deteriorating heart function and ejection fraction of 12% upon admission, the placement of an impella under general anesthesia was deemed necessary. The anesthetic considerations discussed in this report will include preoperative management, airway placement, monitoring options, choices of anesthetics including drugs to avoid in this condition and the pathophysiology of the disease.
Critical Bone Cement Implantation Syndrome, A Rare Phenomenon Which May Increase in Frequency

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. Evan Sobel**¹, **Dr. Delara Brandal**², **Dr. Sunny Jha**³

*¹. UCLA, ². UCLA Department of Anesthesiology and Perioperative Medicine, ³. University of Southern California*

**Background**

Bone cement implantation syndrome (BCIS) is a relatively common occurrence associated with cement hemiarthroplasty of the hip (1, 2, 3). Significant BCIS with cardiovascular collapse is a rare phenomenon (overall total hip arthroplasty mortality is 0.11%). With a growing elderly population seeking joint replacement and an increasing number of orthopedic fractures, BCIS is likely to become a more frequently experienced complication. We report a case of BCIS that resulted in cardiac arrest in order to augment the literature.

**Case Description**

A 45 kg, 98 year-old female with a right periprosthetic hip fracture secondary to a fall presented for ORIF and femoral stem revision. The patient's history included dementia, hypertension, GERD, colon cancer status-post resection, osteoporosis and chronic prednisone use. An arterial line was placed in the operating room and anesthesia was induced with fentanyl, propofol and rocuronium. She was intubated and mechanical ventilation was initiated. Anesthesia was maintained with a propofol infusion and a fascia iliaca catheter was placed for pain control. A phenylephrine infusion was titrated to a MAP of 70-80 mmHg. Approximately eighty minutes following incision, the surgeons began bone cementation. Minutes into cementation, the patient's MAP and end-tidal CO2 began to rapidly fall followed by PEA. Since the patient was in a left lateral position, she was immediately placed supine and chest compressions commenced. She received two doses of intravenous epinephrine and ROSC was achieved. She also received 100 mg of intravenous hydrocortisone empirically due to the high suspicion for cement embolus. Following ROSC, the surgeons rapidly completed the operation. A central line was placed, neuromuscular blockade was reversed and sedation was discontinued. A MAP of 80 mmHg was achieved via high dose phenylephrine infusion. Over the first several days in the ICU, she required significant hemodynamic support with numerous vasoactive substances. Postoperative CT imaging showed a small filling defect within a subsegmental pulmonary artery and echocardiogram was grossly normal. Brain MRI on postoperative day three showed minute subacute embolic infarcts. The patient was extubated on postoperative day seven. After numerous medical complications, she was eventually discharged to a skilled nursing facility on POD 26 with some decline in her cognition.

**Discussion**

BCIS consists of a constellation of symptoms including confusion, hypoxia, hypotension, pulmonary hypertension and in severe cases, cardiovascular collapse (1, 2, 4, 6). The pathophysiology of the syndrome has not yet been fully elucidated but includes embolization of fat, bone marrow tissue and cement leading to complement activation, inflammatory response and anaphylaxis (1, 2, 4, 6). Risk factors associated with the syndrome include high ASA physical status, COPD, use of diuretics and warfarin, arthroplasty in setting of fracture or metastatic disease, previously undisturbed intramedullary canal, osteoporosis, advanced age and use of a long stem components (1, 2, 3, 5). Current treatment goals focus on supporting oxygenation and hemodynamics though there is evidence for use of steroids to target the inflammatory response (7,8). With a growing elderly population, this syndrome is likely to be encountered more frequently and should always remain on an anesthesiologist's radar.
Cryoamputation as Perioperative Optimization in Patient with Acute Limb Ischemia and Septic Shock

Dr. Erin McNamara ¹, Dr. Siddharth Singh ²

¹. Keck School of Medicine of USC, Department of Anesthesiology. ². University of Southern California

Background: We are presenting the case of a patient with multiple comorbidities including cardiovascular disease and diabetes who presented in septic shock complicated by PEA arrest related to acute limb ischemia and gangrene. The patient's instability necessitated surgical amputation but also placed him at high risk for perioperative complications and mortality. He underwent cryoamputation to physiologically isolate the septic limb, allowing him to be optimized prior to definitive surgical management three days later. Physiologic cryoamputation may be utilized in hemodynamically unstable patients with acute limb ischemia as a therapeutic delay in surgical management to allow for stabilization and hemodynamic optimization.

Case Description:
51 male ASA 4E with history of hypertension, coronary artery disease, AAA repair, bilateral iliac stents, diabetes, and renal insufficiency was transferred from outside hospital with concern for lower extremity gangrene with absent left lower extremity pulses. Upon admission, patient had a lactate of 9 and CK of 7500. Pt went into cardiac arrest and was coded for 50min prior to ROSC, after which he remained severely septic requiring high levels of pressors to maintain blood pressure, including levophed at 30mcg/min, epinephrine at 10mcg/min and dobutamine at 2.5mcg/kg/min. Patient was started on dialysis for acute renal failure. Patient’s RCRI for major cardiac events was calculated to be 11%. Risk of perioperative mortality using the NSQIP universal surgical risk calculator was 47%. He underwent left lower extremity cryoamputation resulting in improved hemodynamics and was weaned off all pressors. Lactate and creatinine kinase levels improved. He was taken to the OR 2 days later for surgical amputation under general anesthesia. In the OR, patient received 2mg versed, 50mg ketamine and fentanyl gtt (50-100mcg/min) for analgesia. Sevoflurane (1%) was used for maintenance anesthesia. Patient received 400cc crystalloid and 1U RBCs. Patient's hemodynamic parameters remained stable throughout the case and the immediate postoperative period.

Discussion: Complications of acute limb ischemia include rhabdomyolysis, acute kidney injury, metabolic acidosis, coagulopathy, cardiac dysrhythmias, and sepsis, which may result in profound hemodynamic instability. Such patients often have multiple comorbidities, including cardiac and vascular disease, which further complicate their anesthetic management and increase perioperative morbidity and mortality. Cryoamputation is an infrequently-used procedure which physiologically isolates the source of sepsis or systemic inflammation as a temporizing measure to allow for perioperative optimization of unstable patients.
Current Anesthesia and Post-procedure Management Techniques for Transfemoral Aortic Valve Replacement (TAVR) in the United Sates: A Survey of TAVR Centers

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Simona Lupu ¹, Dr. Alec Runyon ², Dr. Dustin Wailes ², Dr. Colin Garner ³, Mr. Justin Pugh ³, Mr. Matthew Alschuler ³, Dr. Davinder Ramsingh ³

1. Loma Linda University Medical Center, 2. Loma Linda Anes, 3. Loma Linda Anesthesiology

Background: Transcatheter aortic valve replacement (TAVR) is a rapidly developing procedure for patients with aortic stenosis. Initially designed for only those of high risk who were thought to be unable to undergo conventional surgery, recent evidence has expanded its utility for patients of intermediate risk. As the TAVR procedure gains efficacy in the United States both the total number of procedures as well as sites is rapidly increasing. Along with this rapid change in case volume too is the anesthetic and post-procedure management of these cases across the world. General Anesthesia (GA), Monitored Anesthesia Care (MAC), and Local Anesthesia (LA) have all been demonstrated. This study seeks to evaluate the current state of anesthesia management and monitoring as well as post-procedure management across all TAVR centers in the United States. Data reported is a continuous of preliminary data presented last year.

Methods: The study is an ongoing nonrandomized survey of all TAVR centers in the United States. TAVR centers were discovered via online searches and use of www.newheartvalve.com. After IRB approval, each center was contacted to identify the contact that could answer questions regarding anesthesia and post-procedure management and the survey was distributed electronically via Qualtrics (Provo, Utah) survey system. Each center was asked the same questions regarding anesthesia and post-procedure management.

Results: Data results (78 of 304 programs to date) show that GA is practiced on average 41%, MAC is practiced on average 59%, and no center currently has described the use of LA. Medication regimens for MAC seem to vary across centers. Transthoracic echocardiography is used frequently for MAC cases. Current data suggests that patients are sent to the ICU after the procedure and most patients remain in the hospital for less than 72 hours. More centers use peripheral venous access then central or pulmonary arterial catheter and radial artery catheters are most often used without cardiac output monitoring for both MAC and GA techniques. Further details are listed in Table 1,

Conclusions: Data suggests that GA appears to be the predominant practice in the United States, however the use of MAC has risen from what has previously been reported in the United Sates. There also appears to be a large degree of variation regarding other management choices for patients undergoing TAVR. Future research should evaluate the potential utility of standardization strategies.

Table 1: Survey Results on Anesthesia and Post-procedure Management Techniques for Transfemoral Aortic Valve Replacement (TAVR) in the United States
Current Practice Strategies in the Acute Care Setting and the Utilization of Point of Care Ultrasound: A Survey Study Across all Acute Care Specialties

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Alex Taborek ¹, Dr. Davinder Ramsingh ², Dr. Alec Runyon ², Dr. Ihab Dorotta ², Dr. Brian Chung ², Mr. Justin Pugh ³, Mr. Matthew Alschuler ², Mr. Kishore Athreya ¹, Dr. Jason Gatling ²

¹. Loma Linda University Medical Center, 2. Loma Linda Anesthesiology, 3. Loma Linda Anesthesia

Background: Point-of-care (POC) ultrasonography (US) is the concept of ultrasound brought to the patient’s bedside and performed “real-time” by the provider. The utility of POC US to facilitate the management of the acutely ill patient has been demonstrated for multiple pathologies and across multiple hospital environments. However, the level of training across all acute care specialties, including: Anesthesiology, Emergency Medicine, Family Medicine, Internal Medicine, Pediatrics, and General Surgery is thought to be quite different. This is despite the fact that each of these specialties may encounter the same acute management situations. To discover some clarity on this topic we designed a survey that was distributed to all program directors of the various specialties listed above in the United States. The survey was designed to evaluate the common examination techniques utilized for common acute care situations as well as evaluate the training and utilization of POC US. The results of this submission is an update to preliminary data presented in 2016.

Methods: After IRB approval, a list of all program directors (PD) for the specialties listed above was created from the accreditation council for graduate medical education website (http://www.acgme.org). The survey was distributed electronically via Qualtrics (Provo, Utah) survey system. The survey consisted of 11 questions evaluating the primary bedside assessment tool used for various common acute care situations, as well as to evaluate which topics in POC US the PDs felt comfortable practicing, and which topics they felt were useful for their specialty. In addition, the topics of barriers to POC US use, certification, and documentation were also surveyed utilizing a Likert scale.

Results. Data collection shows over 25% completion of surveys for anesthesiology each specialty. Results show a large degree of variability between the primary assessment tools amongst specialties for the four common acute care situations (Table 1). In addition, the level of comfort, education, and usefulness for ones particular specialty, was also variable across various POC US topics and amongst specialties (Table 1). Interestingly most specialties demonstrated a large difference between POC US topics PD reported to have received education vs. topics that they identified to be useful for their specialty (Table 2). Majority of PD reported a lack of educational opportunities as the barrier to learn POC US (48 %) and the vast majority of PD reported that a POC US exam should be documented (95%). Finally, the majority of PD (42%) reported that departmental certification would be sufficient to perform POC US examinations.

Conclusions: Currently, there is a large variability in the way POC US is utilized in the acute care setting. Further research should evaluate methods to educate and standardize POC US training across all acute care specialties.
Phantom limb pain (PLP) is a pain experienced in a missing limb, occurs in 50% to 80% of amputees, and can be severe and disabling. Many therapies have been trialed for PLP over the years; however, efficacy is equivocal and there remains no optimal treatment. Deep brain stimulation (DBS) is a form of neuromodulation used most often to treat movement and neuropsychiatric disorders, and has been described for several etiologies of refractory chronic pain. However, this indication does not have Federal Drug Administration approval and remains “off label” in the United States. Consequently, only a small number of DBS for PLP have been reported.

We present a case of a 61-year-old female with severe chronic leg pain resulting in an above-the-knee amputation, with subsequent phantom limb pain refractory to all pain-control modalities, who recently underwent DBS electrode placement. The patient had a right-leg desmoid tumor removed over 20 years ago, which eventually resulted in knee instability requiring right total knee arthroplasty (TKA). TKA was complicated by compartment syndrome and infection requiring multiple operations for fasciotomy and debridement. She developed severe refractory chronic pain ultimately treated with above-the-knee amputation, with subsequent severe PLP also refractory to pharmacologic therapy (NSAIDs, APAP, gabapentinoids, SNRI, opioids, sodium channel blockers, dextromethorphan, medical marijuana), acupuncture, hyperbaric oxygen, psychotherapy, mirror box therapy, meditation, physical therapy, prosthetic adjustments, TENS unit, spinal cord stimulation, sympathetic nerve blocks, and sciatic nerve blocks. After significant deliberation and counseling, she enrolled in a trial and underwent deep brain stimulation electrode placement in the bilateral anterior cingulate and orbitofrontal cortex with the Activa Primary Cell + Sensing device. She will undergo six months of monitoring and sensing/data collection to identify pain biomarkers before deploying stimulation treatment that will hopefully control brain rhythms associated with chronic PLP.
Delayed Emergence following a Bilateral Thyroidectomy

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Adam J Milam ¹, Dr. Andrew Kuo ¹, Dr. Patrick Lam ², Dr. Roya Yumul ¹

1. Cedars Sinai Medical Center, 2. Department of Anesthesiology, Cedars-Sinai Medical Center, Los Angeles, CA

**Background:** Delayed emergence is defined as an “abnormally slow pace of regaining consciousness characterized by somnolence and a state of unresponsiveness from which a patient cannot be aroused.” With the current anesthetics available, most researchers define delayed emergence as longer than 45 minutes after the end of general anesthesia. The causes of delayed emergence are broad and can be divided into 4 categories: patient factors (e.g. age, comorbidities), drug factors/pharmacological causes (e.g. residual drug effect), duration/type of anesthetic used, and metabolic causes (e.g. electrolyte disturbances).

**Case description:** The patient is a 57yo female, 5’5”, 82kg, BMI-30.4 undergoing bilateral thyroidectomy and central neck dissection for a newly diagnosed left papillary thyroid carcinoma (5.1x1.8x1.6cm) with left neck metastases. The patient was euthyroid and denied any symptoms of hypo- or hyperthyroidism. The only medical history the patient reported was vasovagal attacks; medications included folic acid and vitamin B complex. The patient underwent a colonoscopy and hysterectomy in the past without complications from anesthesia. Preoperative evaluation was unremarkable. The patient did report significant motion sickness and a scopolamine patch was placed in preop. Two-milligrams of versed was given in preop. She was induced with 300mg of propofol, 0.6mg of dilaudid, and 100mg of succinylcholine. Intubation was uneventful; a 7.0mm NIM ETT was used. The patient was maintained with ½MAC of sevoflurane and a continuous infusion of propofol.

Anesthesia started at 11:41am, incision was 1-hour later. The surgery was uneventful with minimal EBL. The patient was hyperthermic and the heated forced air was discontinued during the case. The continuous propofol infusion was discontinued 45-minutes prior to the end of surgery followed by discontinuation of the sevoflurane 30-minutes prior to the end of the surgery. About 10-minutes after the incision was closed the BIS was 50, the ET sevoflurane concentration was 0.1%, and 6-hours had elapsed since versed was given. The patient was maintaining a respiratory rate of 14 and intermittently responsive to stimulation. The scopolamine patch was removed due to concern for anti-cholinergic syndrome; a neurological exam was conducted and glucose, electrolytes, and hematocrit were sent. There were no focal neurological deficits and laboratory values were unremarkable. The patient was following commands and extubated about 2-hours after the incision was closed. The patient was transferred to the PACU area where she remained drowsy, awakening to verbal stimuli, and intermittently following commands.

**Discussion:** Delayed awakening has a broad differential and is often multifactorial; a stepwise approach is necessary to identify the cause of the delay in emergence. The steps we took to identify the cause are described above; we checked the equipment, assessed possible drug interactions, performed a neurological exam, and sent blood work. Additional steps could have included reversal of dilaudid with naloxone, administration of physostigmine for concern of anti-cholinergic syndrome, and imaging. The delay in emergence in this case could be from the long duration of the propofol infusion. Another possibility is increased delivery of scopolamine from the patch as studies have found increased uptake from transdermal patches during hyperthermia due to increased skin perfusion.
Introduction: Malignant hyperthermia is a rare, well-known, and potentially fatal hypermetabolic disorder with characteristic signs and symptoms associated with inhaled volatile anesthetics and succinylcholine. While there are typical clinical features, the time of onset can vary from immediately following administration of a triggering agent to many hours later. We present a patient with delayed onset and interesting signs of malignant hyperthermia 12 hours into a total parotidectomy with free flap procedure.

Case Description: A 64-year-old man, with multiple prior uneventful volatile anesthetic events presented for resection of a left parotid mass that was causing unilateral facial weakness. Initial biopsy results were concerning for primary malignancy and the patient was scheduled for a total parotidectomy and mastoidectomy with free flap. Induction at 0745 was uneventful with midazolam, propofol, sufentanil, and succinylcholine. A 7.0mm oral ETT was placed and anesthesia was maintained with isoflurane, a sufentanil infusion, rocuronium and ventilation through a circle system. The case proceeded uneventfully until 1300 when a mild respiratory acidosis (ETCO2: 47mmHg) and gradually increasing temperature from 36°C to 38°C was noted. Increasing the minute ventilation corrected the acidosis and the temperature decreased. At approximately 1900, ETCO2 readings were disrupted due to accumulation of large amounts of fluid in the anesthetic circuit that occluded the capnogram sampling port and caused the anesthetic gas module (AGM) to malfunction. Once the anesthetic tubing and AGM were replaced, the ETCO2 was noted to be 67mmHg. Over the ensuing 30 minutes, the patient's ETCO2 climbed precipitously to 88mmHg with worsening acidosis, hyperkalemia (6.8mmol/l), hyperthermia (40.5°C) and an inappropriately low HR (90-100bpm, sinus rhythm) given the clinical situation. With this combination of features, malignant hyperthermia was diagnosed and treated with dantrolene 3mg/kg, conversion to TIVA, change of anesthetic machine, application of gas filters, and initiation of active cooling. Supportive measures included treatment with calcium chloride and insulin with dextrose infusion to correct the hyperkalemia. ETCO2 and temperature subsequently normalized over the next 30-45 minutes with improvement in acidosis. Large volume IV fluid resuscitation and mannitol were used to prevent acute kidney injury. The patient was subsequently transferred to the ICU, where additional doses of dantrolene were given along with continuation of intravascular fluids. Total dantrolene dose amounted to 5mg/kg over the treatment period. Urine myoglobin peaked at 767mcg/L on postoperative day one and creatine kinase peaked at 11607units/L on postoperative day two. Renal function, however, was preserved. The patient was discharged eight days later.

Discussion: This case demonstrates the insidious onset of malignant hyperthermia many hours after administration of both succinylcholine and volatile anesthetics. Once the hypermetabolic state was triggered, the potentially catastrophic sequence of clinical adverse indicators evolved rapidly and required urgent active and supportive measures to alter the trajectory of the disorder. It also demonstrates the dramatic efficacy of dantrolene to treat this condition. Once the acute causes of mortality (hyperkalemia, hyperthermia, arrhythmia) were corrected, prevention of
complications such as acute kidney injury was essential to prevent delayed mortality and morbidity.
Developing a Serious Game for Teamwork Skills Training and Assessment: Year 1 of a 2-year Department of Defense Grant

Dr. Sophia Poorsattar¹, Dr. Cameron Rice¹, Dr. Randolph Steadman¹
¹. UCLA

INTRODUCTION
Lapses in teamwork and communication are responsible for the majority of medical errors. Team training is critical in addressing these barriers, particularly in crisis conditions, when it is important for a leader to emerge who can direct, coordinate, and designate roles for team members, ensure accurate and timely communication, and resolve any conflict quickly so as to reduce or eliminate errors. This Department of Defense project addresses current gaps in team training as well as the state-of-the-art of training individuals to optimize their team performance. Gaps in available training include limited evaluation criteria/metrics, unknown retention of teamwork skills, and lack of convenient, screen-based simulation systems for training. The proposed project intends to develop tools to evaluate, assess, and sustain teamwork skills for licensed professionals.

OUR PROPOSAL
Our proposal augments existing team training programs by the development of an innovative, easily accessible, interactive, engaging screen-based simulation that allows practice in the application of validated teamwork skills. We plan to evaluate learning and performance differences between two modes of screen-based simulated team training, Evaluation Mode and Game-Play Mode, which utilize the same player interface but differ in how the user experiences the game, as an observer assessing non-player performance or as a game-player interacting with non-player characters.

We will evaluate training effectiveness differences between the modes, hypothesizing that our simulated training systems will each effectively teach and evaluate training skills, while the less complex, more cost effective system (Evaluation Mode), will offer non-inferior performance gains.

The overall design is a mixed randomized repeated measures design, with participants randomly assigned to one of two training modes. Participants’ skill acquisition will be measured using an automated assessment engine via a carefully constructed ontology, or node-based Bayesian network.

In the short term, goals include competency outcomes for knowledge (teamwork concepts and strategies, shared mental model), attitudes (mutual trust, team orientation), and performance decisions.

In the long-term, goals include knowledge transfer to practice and cultural transformation in healthcare systems that will ultimately result in reduction of preventable medical errors; however, this project will not assess transferability.

GAME PROGRESS TO DATE
Scenario Development
Each scenario focuses on teaching teamwork skills in a unique setting of: ICU, trauma bay, OR. For each scenario, learning objectives, number and type of non-player characters, scenario evolution, and dialogue are established.

Teamwork Skills Integration
All scenarios include the following teamwork skills within varying contexts, including: leadership, communication, mutual support, psychological safety, situation monitoring. Psychological safety, an important component of each skill, will be emphasized and assessed. An inventory of observable actions will be mapped to each skill.
User Interface Development

Development of an intuitive game-based environment for practice of team training that is simple and intuitive, yet comprehensive, will facilitate participant engagement.
**Diagnosis and surgical repair of double aortic arch in 30-year-old male presenting with pneumonia**

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

---

**Dr. Danielle Laufer**, **Dr. Lundy Campbell**<sup>1</sup>

1. UCSF

**Background**: Vascular rings are congenital anomalies of the aortic arch that result in compression of the tracheo-bronchial tree and/or esophagus. The most common type of vascular ring is a double aortic arch, which appears when the right fourth embryonic arch does not regress, leading to both a left and a right aorta. Symptoms usually appear in the first 5 months of life. The most common symptoms include dyspnea on exertion, respiratory infections from aspirations, dysphagia and vomiting. Diagnosis is first made by esophagram and CXR. Transesophageal echo plays a role in identifying other cardiac abnormalities, and CT and MRI are important for careful surgical planning.

**Case Description**: 30-year-old male with recent pneumonia, dysphagia, and positional dyspnea presented for repair of a double aortic arch. The patient was in his normal state of health until 9 months prior when he had a hospital admission for pneumonia. On that admission, a CXR was performed that noted a vascular anomaly of his aortic arch. A follow-up CT chest confirmed double aortic arch with tracheoesophageal compression. The patient was referred to our center for surgical repair. On interview, he endorsed difficulty swallowing solids, increased saliva production, and postural shortness of breath.

Thoracic epidural was placed for intra/post-operative pain control. After general anesthesia was induced, RSI was performed, and the trachea was intubated with a left-sided DLT. Right radial arterial line, left femoral arterial line, and right IJ CVC was placed. The patient was placed in the right lateral decubitus position and the left lung was deflated. Via left-sided thoracotomy incision, the left-sided aortic arch was identified, and the duct connecting to the descending thoracic aorta was temporarily occluded. Given no changes in peripheral pulses or desaturations, the duct was ligated, releasing the vascular ring. The surgeons had difficulty controlling blood loss at the proximal end of the ligated duct resulting in a 2-liter EBL. The patient was extubated in the OR and taken to the ICU for recovery.

**Discussion**: We presented a case of a 30-year-old male presenting with dysphagia, positional dyspnea, and respiratory infections found to have a vascular ring. CT confirmed R dominant double aortic arch with tracheoesophageal compression. He underwent surgical repair via L thoracotomy where the vascular ring was ligated without incident. Double aortic arch (DAA) is the most common type of vascular ring (70%) although vascular rings account for only <1% of all congenital heart disease. Diagnosis as an adult is exceedingly rare and usually presents as dyspnea on exertion, frequently mistaken for other respiratory diseases such as COPD or asthma. The diameter of the aorta increases by 1mm every decade due to aging, and may be one reason for later symptom development.

Surgical correction is very effective and indicated in symptomatic patients. Surgery can be done through a L or R thoracotomy or midline sternotomy incision. CPB or rarely hypothermic circulatory arrest may be indicated. Swallowing symptoms generally resolve immediately after surgical correction where as respiratory symptoms may take longer to resolve due to residual tracheobronchial malacia.
Difficult awake fiberoptic intubation of a patient with Klippel-Feil syndrome and morbid obesity presenting to OR for revision of spinal fusion

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Ashley Fejleh 1, Dr. Christy Slingwine 1, Dr. Roya Yumul 1
1. Cedars Sinai Medical Center

Klippel-Feil syndrome (KFS) is a well-known congenital cause of difficult airway that is characterized by abnormal cervical vertebral fusion resulting in a short neck, limitation of neck movements, and a low posterior hairline. Additionally, potential cervical spine instability puts these patients at an increased risk of neurologic damage with manipulation of airway and positioning required for surgery. These anatomic features of KFS patients pose a significant challenge, especially in the presence of comorbid illness for safe and effective airway management. We report a case of a 65 year old female with KFS who presented for revision of occiput-C4 posterior spinal fusion and left hardware removal under general anesthesia. She was managed using awake fiberoptic technique for endotracheal intubation.

Patient is a 65 year old female with history of Klippel-Feil malformation, OSA, COPD, morbid obesity, who presented to the OR for occiput-C4 hardware revision and posterior fusion. She previously had a C1-C4 fusion 7 months ago and underwent an uneventful awake fiberoptic intubation (FOI) given the airway exam at that time. On presentation she had gained 50 pounds since the last surgery and could only tolerate sitting upright. Her airway exam revealed a Mallampati IV, limited neck ROM, 2.5 fingerbreadth mouth opening and large neck circumference. Given the above, it was decided to perform an awake FOI.

In the preoperative holding area, patient was given adequate topical anesthesia with viscous and inhaled lidocaine. A laryngoscopy blade coated with 1% lidocaine ointment was then advanced slowly along the surface of the tongue to the back of the oropharynx. Only after the patient was fully able to tolerate advancement of the laryngoscope blade was she taken back to the OR.

On arrival to the OR, the patient was placed in upright position, saturating 92% on 10L supplemental O2 via nasal cannula. A fiberoptic bronchoscope with a preloaded 7.0 ETT was used to enter the oropharynx and advanced through the glottic opening into the trachea and positioned above the carina. The patient was then induced with versed, fentanyl, propofol and cisatricurum. She was flipped prone and remained hemodynamically stable throughout the case requiring no vasopressors or blood products. At the end of the case she was successfully extubated awake, following commands and neurologically intact in the OR. She was discharged to the floor the next day and discharged home on POD#3.

This case demonstrates successful airway management of a KFS patient with prior cervical spine fusion as well as underlying obstructive lung disease, OSA and morbid obesity. Performing a thorough history and airway examination allows clinical identification of comorbidities that may further contribute to an anticipated complicated airway. Other airway management techniques such as direct laryngoscopy or use of video mac with cervical spine stabilization may be considered for KFS patients presenting for general surgery, however our patient was at high risk for difficult mask ventilation and difficult intubation given her congenital anomaly and comorbidities making awake FOI in the upright position the method of choice.
Disseminated Intravascular Coagulation in a Parturient with Retained Stillbirth

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Charles Gruver, Dr. Mojgan Moallempour

1. Keck School of Medicine of the University of Southern California

Background:
Disseminated Intravascular Coagulation (DIC) is a life-threatening condition that may arise during pregnancy. It is a dysregulation of the coagulation system that produces cyclical microvascular thromboses and fibrinolysis, which may lead to organ failure and death. Leading causes include retained stillbirth and placental abruption. Prompt recognition and treatment of the underlying condition are critical for improved morbidity and mortality.

Case Description:
An 18-year-old African-American woman, G1P0 at 37 weeks gestational age, presented to LAC+USC Medical Center for decreased fetal movement and new onset uterine contractions. A bedside ultrasound confirmed fetal demise, but there was no evidence of placental abruption. The patient was admitted for delivery of the deceased fetus. Initial labs were notable for a white count of 16.1, hemoglobin of 10.3, platelets of 112, INR of 2.45, and creatinine of 2.23. Initial vital signs included a heart rate of 55, blood pressure of 145/93, and oxygen saturation of 100% on room air. Two units of fresh frozen plasma (FFP), two units of packed red blood cells (PRBCs), and twenty units of cryoprecipitate were transfused to the patient. Her labs were then re-drawn. The results were as follows: white count of 18.1, hemoglobin of 7.2, platelets of 64, INR of 1.79, creatinine of 2.51, fibrinogen less than 60, and d-dimer greater than 9999. Aside from a heart rate in the 90s, she was normotensive and saturating well on room air, but severely oliguric. A second bedside ultrasound revealed a likely placental abruption. She was examined further and found to be fully dilated with frequent contractions, thus was emergently transported to the operating room. Blood products were transfused according to the massive transfusion protocol. The dead fetus was delivered vaginally and massive hemorrhage ensued. Although the patient remained normotensive, her heart rate reached the high 180s. Hemostasis by the surgical team was ultimately achieved. The patient then became dyspneic, accompanied by desaturations despite increased oxygen delivery by simple face mask. Therefore, the decision was made to emergently intubate her. Copious pink froth pooled in the glottis. Nevertheless, an endotracheal tube was passed, with stabilization of the patient's vital signs. She was then transferred to the ICU and extubated on post-operative day five, with resolution of her coagulopathy.

Discussion:
There should be a high index of suspicion for DIC based on fetal demise alone. Laboratory values are useful for diagnosis, but normal values in the parturient are different than the non-parturient. This patient presented with deranged laboratory values and evidence of end-organ dysfunction (oliguria), which both worsened despite treatment. This patient required an ICU level of care from the outset, something her initial vital signs and mentation would not suggest. The intraoperative pulmonary edema was likely ARDS, probably secondary to DIC or SIRS, or possibly volume overload or TRALI, or some combination thereof. This case resulted in the development of a new protocol for parturients suspected of having DIC and the acquisition of an intraosseous device for the Labor and Deliver floor to obtain rapid intravascular access in high risk patients.
DRUG-INDUCED HYPERTHERMIA IN A PEDIATRIC PATIENT

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. inhwan chang
1. Cedars Sinai Medical Center

OBJECTIVE

- To report a pediatric patient with oxybutynin-induced hyperthermia.

CASE SUMMARY

- A pediatric patient with past medical history of posterior urethral valve and chronic kidney disease, underwent general anesthesia with intrathecal clonidine administration for laparoscopic nephrectomy and intravesical ureteric re-implantation. After three hours into the operation, the patient's temperature had risen to a max temperature of 39.2 degrees Celsius. External cooling measures were initiated, and the patient was immediately packed in ice. Infectious etiology could not be identified.

DISCUSSION

- Oxybutynin is a tertiary amine compound with anhidrotic effects as a result of its inhibition of cholinergic action on sweat glands. This has the potential to disturb the body's temperature regulation. Treatment consists of external cooling measures and cardiopulmonary support.

CONCLUSIONS

- In cases of hyperthermia, such causes as thyrotoxicosis, infection, and substance use should be ruled out first. Due to the potential permanent neurologic sequelae from prolonged hyperthermia, it is important to consider the possibility of drug-induced hyperthermia in all patients.
Epidural Management in a Patient with an Acute Myocardial Infarction Secondary to Coronary Artery Septic Emboli

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Andrea Poon 1, Dr. John Le 1, Dr. Siamak Rahman 1
1. UCLA Anesthesiology and Perioperative Medicine

Introduction:
It is important to assess a patient’s anticoagulation regimen when determining appropriate time for neuroaxial catheter removal given concerns for increased risk of spinal hematoma formation. A few cases document epidural catheter removal in patients on dual antiplatelet therapy with an acute STEMI (2). One case describes a patient with an acute myocardial infarction during gastrectomy under general anesthesia combined with a thoracic epidural (4). This is a unique case of a patient with an epidural placed for acute postoperative pain control that was complicated by development of an acute myocardial infarction.

Case Description:
The patient is a 32 year-old male with a PMHx of HTN and multiple gunshot wounds to the back and pelvis. He had multiple abdominal surgeries involving an exploratory laparotomy, colostomy takedown and partial abdominal wall closure on 2/26/16. An epidural was placed for postoperative pain control. On 3/2/16, the patient was taken back for a ventral hernia repair. Postoperatively, the patient experienced significant chest pain. Troponins were elevated with EKG showing ST elevations in II, III, aVF, V3-6, ST depressions in aVL, V1-2. The patient was taken for an emergent left heart catheterization. He had a thrombus in his left main and mid-RCA. The patient was loaded with heparin and ticagrelor before they noticed the epidural catheter. The team suctioned the ticagrelor via an orogastric tube. As the patient was not a candidate for dual antiplatelet therapy and needed to be off of heparin for 4 hours, percutaneous intervention was not attempted. An aspiration catheter was used for extraction with some residual thrombus present, and conservative management with therapeutic heparin was started.

The decision was made to continue the heparin drip, hold the heparin drip for repeat coronary angiogram, and remove the epidural catheter six hours later or once partial thromboplastin time was normalized. The epidural was uneventfully removed on 3/04/16. Repeat angiography showed improvement, but non-obstructive thrombi were still noted. Patient was discharged to home on aspirin, clopidogrel and warfarin. Upon readmission for abdominal wound bleeding and elevated INR, TEE showed a 10mm x 2mm mobile mass on ventricular side of left coronary leaflet suggestive of vegetation and moderate to severe aortic valve regurgitation. The patient likely experienced an acute myocardial infarction secondary to cardiac septic emboli. Patient underwent resection of mass of the left ventricle of aortic valve and aortic valve replacement on 7/22/2016.

Discussion:
It is crucial to assess appropriate timing of neuroaxial catheter removal given concerns for spinal hematoma. The question arises of how to remove an epidural without cessation of antiplatelet therapy in the management of STEMI patients. Another case reports using platelet aggregometry to assist decision of neuroaxial catheter removal early on (2). Current ASRA guidelines only provide draft recommendations for the newer oral anticoagulants, such as ticagrelor (3). There are only a few cases illustrating acute ST-elevation myocardial infarction secondary to septic emboli. We present a case of a patient who received an epidural complicated by an acute MI secondary to coronary artery septic emboli.
Several truncal nerve blocks have been described as adjuvant therapy in the postoperative setting for a variety of thoracic, abdominal and pelvic surgeries. Erector spinae plane (ESP) block is a newer regional anesthesia technique providing satisfactory pain relief for the aforementioned surgeries. Here we present a case of an ESP block used to control postoperative pain in a urological surgery in a pediatric patient.

Case presentation:
A previously healthy 8-year-old, 38.3kg male presented with inguinal hernia and symptomatic hydrocele; both right-sided. Unilateral herniorrhaphy and orchiopexy were performed with incisions made along the right inguinal ligament and right scrotum. After induction, the patient was placed in the left lateral decubitus position. A level L1 ESP block was performed. Using ultrasound, the 12th rib was traced back to the transverse process (TP) of T12. While maintaining the parasagittal view, the probe was directed caudally to identify the TP of L1. A 22g echogenic needle made contact with the TP of L1, then was withdrawn slightly off the osseum for injection of 12 mL of ropivacaine 0.2%, and classical cranial-caudal solution spread in the desired space was visualized.

Of note, the surgery began shortly after the block and warranted the use of 25mcg of fentanyl. In PACU, 15mcg of fentanyl was given for “agitation” per nursing. The patient had no pain at discharge and did not require pain medication until 12 hours after his surgery ended, treated with ibuprofen. He required no narcotics at home.

Discussion:
Herniorrhaphy and orchiopexy in the pediatric population is typically controlled with a combination of intravenous and oral medications with or without regional techniques. Several regional truncal techniques can manage pain in these types of surgeries. While systemic opioids are effective, their adverse effects generally worsen patient satisfaction when compared to nerve blocks. Single shot caudal injections have been utilized for abdominal surgeries, but have shorter duration of analgesia than regional blocks. Neuraxial analgesia carries the risk of dural puncture, meningitis, urinary retention, and seizures. Paravertebral blocks (PVBs) have shown advantages over caudal analgesia including lower emesis incidence, longer pain relief duration and less effect on hemodynamics. However, PVBs typically require multiple site injections and carry a risk of pleural puncture and pneumothorax.

Ultrasound guided transversus abdominis plane (TAP) blocks have also been shown effective in orchiopexy patients. However, quadratus lumborum (QL) blocks have a longer duration of action than TAP blocks in managing lower abdominal surgeries. While QL blocks have better dermatomal spread than TAP blocks, their spread is variable when compared to ESP blocks. We believe ESP blocks are a more effective regional anesthesia technique to provide pain relief. Given the use of ultrasound and superficial location of the erector spinae plane, a larger spread of local anesthetic is able to migrate covering nerve roots supplying incisions made at the level of an inguinal hernia and scrotum.
Erector spinae plane block for postoperative pain control in an 18-month-old pyeloplasty patient

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Seong Wook Seo 1, Dr. James Hruschka 1, Dr. Timothy Petersen 1, Dr. Codruta Soneru 1

1. University of New Mexico Hospital

Introduction
Regional techniques for lateral thoracic incisional pain include neuraxial, paravertebral (PVB), and transversus abdominis plane (TAP) blocks. Erector spinae plane block (ESP) is a new regional anesthesia technique. ESP provided satisfactory postoperative pain relief for a pediatric pyeloplasty at our institution.

Case presentation
The patient was an 18-month 10.6 kg female with left ureteropelvic junction obstruction. Pyeloplasty was planned with incision inferior to T12 on the mid-axillary line. After anesthesia induction, the patient was placed in the right lateral decubitus position.

ESP was performed at T12 for postoperative analgesia. Using ultrasound, we identified the left 12th rib by the absence of another inferior rib. Keeping a parasagittal view, we followed the rib to the transverse vertebral process. We contacted the vertebra with a 22G Touhy needle, withdrew it to be superficial to the erectors spinae, then injected 10 cc of 0.25% bupivacaine with 1mg dexamethasone and 1: 200,000 epinephrine. The patient did not require any pain medication until 9 hours after surgery, when she developed bladder spasm which resolved by oxybutynin. The patient was discharged the next day without complications.

Discussion
Postoperative pain from pyeloplasty can be managed with intravenous/oral medication with or without regional anesthesia. Medications typically include scheduled NSAIDS and Tylenol, with opioids for breakthrough pain. Regional anesthesia generally reduces opioid exposure, and there are several options.

Caudal analgesia is available, but single shot caudal wears off in 4-8 hours, and many surgeons prefer not to have a caudal catheter for pyeloplasty. Neuraxial blockade complications include dural puncture, urinary retention, meningitis, seizure, leg weakness interfering with early ambulation, etc. Literature has shown that peripheral blocks overall have advantages over caudal, including reduced emesis, longer pain relief, and less hypotension. PVB complications include hypotension, vascular puncture, pleural puncture, and pneumothorax. TAP block provides longer pain relief than single shot caudal, but is performed near the incision site, so it may not cover the part of the incision posterior to the block. It may also disrupt the surgical field with large volumes of anesthetic solution. ESP appears to have less risk of deep organ penetrating injury than caudals, epidurals, and paravertebral blocks because it is more superficial, and the transverse spinous process shields vital structures from the needle. ESP is performed posterior to the TAP site, and therefore should provide better posterior coverage than TAP.

ESP appears to provide non-inferior pain relief to TAP, PVB, or neuraxial blockade, with reduced risk of complications given its relatively safe anatomical injection site. Many case reports have shown it to be easy to perform under ultrasound guidance and provide satisfactory pain relief.
Erector spinae plane block for treatment of pain associated with multiple unilateral rib fractures

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Andrew Bussey, Dr. Kenneth Furukawa
1. UC Davis Department of Anesthesiology & Pain Medicine

The erector spinae plane (ESP) block has been described as a novel technique for treating thoracic and abdominal pain in both the chronic and perioperative setting. We present a case in which the ESP block provided pain control for multiple unilateral rib fractures in a trauma patient after a motor vehicle collision.
Esophageal perforation, a case report

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Kaitlin Flannery 1, Dr. Anil Panigrahi 1
1. Stanford University School of Medicine

Background:
Esophageal perforation is rare but has high morbidity and mortality. Early diagnosis and intervention is key for good outcomes. The most common cause of esophageal perforation is iatrogenic (e.g., complication from an upper gastrointestinal endoscopy), especially in patients with malignancy, achalasia, stricture, hiatal hernia and scleroderma. The majority of patients with esophageal perforation will require surgical repair. Literature regarding anesthetic management of esophageal perforation is limited. Anesthetic management of esophageal perforation requires smooth induction and intubation to limit rise in intra-abdominal pressure and expulsion of gastric contents into the chest, lung isolation for surgical exposure and active resuscitation.

Case Report:
A 72-year-old female, Jehovah’s Witness with history of left neck squamous cell cancer treated with chemoradiation, complicated by esophageal stricture presented for repeat elective esophageal dilation. The patient’s airway exam revealed Mallampati three, short thyromental distance and limited cervical range of motion. Direct laryngoscopy produced a grade 2b Cormack-Lehane view and a 6.0 wire-reinforced endotracheal tube (ETT) was placed. Serial dilation of the esophageal stricture was performed. Endoscopy following dilation revealed a 2cm perforation in the thoracic esophagus. This location was too distal for endoscopic repair and thoracic surgery was consulted. The anesthesia team obtained large bore peripheral intravenous access and an arterial line and foley catheter were placed for monitoring. Decision was made to perform primary repair through right thoracotomy.

For surgical access, left one lung ventilation was requested. Exchange of the ETT was necessary, as the wire-reinforced 6.0 ETT is not compatible with bronchial blockers. Given the need for exchange, placement of a 37 French left double-lumen tube (DLT) over exchange catheter under Glidescope visualization was planned. The glottic opening was visualized but with advancement, the DLT abutted the arytenoids and would not enter the glottic opening. The second attempt using direct laryngoscopy resulted in the same and a third attempt with a 35 French left DLT was also unsuccessful. Although easy initially, mask ventilation became progressively more difficult requiring high pressure to achieve adequate ventilation. Ultimately, an 8.0 single-lumen ETT was placed and EZ-Blocker was used for lung isolation. The patient’s vitals remained stable throughout. Given the vigorous bag-mask ventilation required between intubation attempts, the surgical team requested a chest x-ray (CXR). The CXR revealed a large left-sided pneumothorax without mediastinal shift. A left chest tube was placed and the optimal surgical plan was considered. Thoracotomy on either side presented challenges. Right thoracotomy could produce significant hypoxia due to atelectasis in the left lung. However, left thoracotomy would require mobilization of the aorta for access to the esophagus and risk significant blood loss in a Jehovah’s Witness. Right thoracotomy was performed with successful esophageal repair and adequate oxygenation throughout. The patient was brought to the ICU intubated. She was successfully extubated the next morning and discharged from the hospital on post-operative day ten.

Discussion:

1. Esophageal perforation: Discussion of presenting symptoms, diagnosis, treatment and anesthetic considerations.
2. One lung ventilation: Review the options available for one lung ventilation and the algorithm for managing hypoxia with one-lung ventilation.
Evaluation of Pre-operative Non-Invasive Hemodynamic Monitoring for Patients Undergoing Moderate to High Risk Surgery

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Carl Ying 1, Dr. Gary Stier 1, Dr. Daniel Dobroskay 1, Dr. Isuru Wijesinghe 1, Dr. Heather Goodly 1, Mr. Justin Pugh 1, Mr. Matthew Alschuler 1, Dr. Davinder Ramsingh 1

1. Loma Linda Anesthesiology

Background: Numerous studies have proven that the physical and vital signs correlate poorly to identifying patients’ cardiac function. Currently, consultant diagnostic studies are frequently obtained to provide this information, despite not always being available in urgent settings. Recently, new technology (ClearSight/Nexfin) has been developed and validated to provide cardiac index non-invasively, along with other hemodynamic (HD) parameters (stroke volume index, dp/dt, and systemic vascular resistance index). This multi-phase study seeks to assess if use of this technology can facilitate preoperative assessment with an ultimate target of helping risk-stratify patients undergoing emergent/urgent procedures.

Methods: The current phase of the study is designed to evaluate the utility of the HD device in identifying patients with cardiovascular dysfunction. Patients seen in the preoperative clinic who were scheduled to undergo major surgery (defined as surgical time greater than two hours and having the potential of > 20% shifts in blood volume) were consented. The patient had the HD device placed for 2 minutes for data capture and were then surveyed. The perioperative provider then performed the clinic visit and reviewed the patients medical record. The provider was then asked to quantify the patient's cardiac dysfunction status as normal, mild, moderate, or severe. Results from the HD monitor were compared between the patients who were scored as normal/mild vs. moderate/severe. Additionally, comparisons of HD parameters and cardiac dysfunction status were examined for associations to alteration in patients mean arterial blood pressure (MAP) after induction of general anesthesia. The change in MAP was used as surrogate for intraoperative hemodynamic instability. Comparisons of these multiple variables between groups were performed with one-way ANOVA. A p-value of < 0.05 was significant.

Results: Currently, 189 patients have been enrolled for the first phase of this project. Current results suggest no subject discomfort while wearing the device. A total of 26 patients were identified by the preoperative provider as having moderate or severe cardiac dysfunction. Comparisons of HD data showed that the normal/mild group had statistically significant higher HD values for CI, SVI, dp/dt, and statistically significant lower values for SVRI when compared to the moderate to severe cardiac dysfunction group, p <0.05. Identification of associations for which patients would have a greater alteration in MAP after induction showed no relationship to cardiac dysfunction status. However, comparison of patients who had a CI > 2.5 vs. those who had CI < 2.5 demonstrated a significant difference in alteration to MAP, p=0.03. Further analysis of the group identified as not have cardiac dysfunction demonstrated that 32% had CI values below 2.5.

Conclusions: Preliminary data from this ongoing study demonstrated an association between HD data derived from a non-invasive device to a patient's degree of cardiac dysfunction. Additionally, the degree of cardiac dysfunction was not associated to alteration in MAP intraoperatively but the HD markers were. The lack of association of cardiac dysfunction status may be secondary to our findings of a large percentage of patients identified as having normal cardiac function with reduced HD parameters.
Evaluation of Spread for the Quadratus Lumborum Blocks 1,2, and Transmuscular by Computed-Tomography Study

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Dan Moy 1, Dr. Jean-Louis Horn 1, Dr. Philippe Gautier 2
1. Stanford University School of Medicine, 2. Clinique St Anne

Background and Objectives: The quadratus lumborum block (QLB) is an effective regional anesthetic technique for abdominal surgeries. One suggested mechanism of analgesia is local anesthetic (LA) spread to the paravertebral (PV) space via the thoracolumbar fascia which is the investing fascia of the quadratus lumborum muscle (QLM). Cadaver studies have inconsistently demonstrated evidence supporting this theory. We aim to describe the unique spread of the three QLB approaches using computed-tomography (CT) imaging.

Methods: After IRB approval, 27 surgical patients were randomly assigned to receive a QLB by any of three techniques, anterolateral to the QLM (QL1), posterior to the QLM (QL2) or transmuscular (QL-TM), unilateral or bilateral as clinically indicated. Injectate consisted of 19 ml of ropivacaine 0.5% and 1 ml of contrast dye. Blocks were performed post-operatively prior to emergence from anesthesia. Patients then underwent abdominal CT scan after approximately 30 minutes in the PACU. Images were evaluated for spread to the thoracic and lumbar PV space, transabdominus plane (TAP) and into the psoas major muscle.

Results: Forty-eight injections were performed on 27 patients. Six patients had unilateral injection and 21 had bilateral injections. Of the 48 injections, there were 18 QL1, 14 QL2, 16 QL-TM. Four injections showed contrast in the thoracic PV space (percent [95% CI]): 1/18 QL1 (5.6 [0-27]), 1/14 QL2 (7.1 [0-34]), 2/16 QL-TM (12.5 [2-38]); p=0.75). Lumbar PV spread was seen in 7/18 QL1 (38.9 [17-64]), 4/14 QL2 (28.6 [8-58]) and 12/16 QL-TM (75.0 [48-93]); p=0.025. Spread to TAP was seen in 12/18 QL1 (66.7 [41-87]), 11/14 QL2 (78.6 [49-95]) and 2/16 QL-TM (12.5 [2-38]); p<0.001. Contrast within the psoas major was seen in 1/18 QL1 (5.6 [0-27]) 0/14 QL2 (0 [0-23]) and 9/16 QL-TM (56.3 [30-80]). The QL-TM injections with spread into the psoas major muscle, 9/16 (56.3 [30-80]) all demonstrated spread to the lumbar PV space (p=0.019).

Conclusions: Spread of contrast was rare to the thoracic but common to the lumbar PV space. Spread to the lumbar PV space for the QL-TM was significantly correlated with spread into the psoas major muscle. Spread to the TAP was more common for QL1 and QL2.
Fluid Overload and Respiratory Decompensation in a Morbidly Obese Patient with Abdominal Compartment Syndrome and Prolonged Mechanical Ventilation

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Charles Gruver 1, Dr. Duraiyah Thangathurai 1, Dr. Peter Roffey 1
1. Keck School of Medicine of the University of Southern California

Background:
Abdominal compartment syndrome (ACS) occurs when intraabdominal pressure is greater than 20 mmHg and the pressure results in organ dysfunction. ACS may cause pulmonary compromise, renal impairment, reduced mesenteric perfusion, increased intracranial pressure, cardiovascular dysfunction, and possibly death. Surgical decompression is often warranted. Noncardiogenic pulmonary edema may occur secondary to a variety of conditions, including severe volume overload, lung reperfusion and/or re-expansion, and ARDS.

Case Description
A 35-year-old Caucasian woman, morbidly obese at 230kg and ventilator dependent, was transferred from an outside facility to the ICU of Keck Hospital of USC for higher level of care. She was suspected of having a large abdominal mass that was causing abdominal compartment syndrome and limiting diaphragmatic excursion. However, her body habitus precluded a CT scan from being performed. Portable x-ray and ultrasound machines also produced poor images with limited utility. Shortly after admission, the patient began to decompensate with increased peak airway pressures, non-sustained episodes of ventricular tachycardia, and increased abdominal pressures measured via Foley catheter. Therefore, the patient was emergently taken to the operating theatre for abdominal decompression. A large intraperitoneal cystic mass was encountered and approximately 60 liters of cystic fluid was drained. The patient was then returned to the ICU, and a tracheostomy was performed the following day in the operating room.

The patient appeared to have pulmonary edema and/or pleural effusions per the portable chest x-ray and remained a challenge to wean from the ventilator. Therefore, an aggressive diuretic plan was instituted that included bumetanide and a furosemide drip. Over the course of twelve days, approximately 30 liters was diuresed from the patient with concomitant improvement in respiratory dynamics. The patient was now approximately 130kg and was able to be transitioned to tracheostomy mask with minimal blow by oxygen for the majority of the day. Soon thereafter, patient was transitioned to tracheostomy collar and transferred to the medical/surgical floor.

Discussion: The severe morbid obesity and prolonged intubation of this patient upon presentation to the hospital resulted in significant diagnostic and treatment challenges. The longstanding enormous cystic mass, aside from having severe respiratory consequences, likely resulted in increased hydrostatic pressure on the patient's vasculature, causing an insidious and chronic third space volume overload phenomenon. Successful weaning from the ventilator would not have been possible without aggressive diuresis. Because it was unclear what this patient's normal obese weight should have been, the diuresis was guided by clinical improvement in respiration and improvement in the patient's daily chest x-rays.
Gastric ultrasound revealing presence of ingested rocks in the stomach

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Caleb Stalls¹, Dr. Timothy Petersen², Dr. Ricardo Falcon², Dr. Codruta Soneru²

¹. univer, 2. University of New Mexico Hospital

We present a 14 year old, 69 kg patient with a past medical history of ADHD, major depression, autism spectrum disorder, and suicidal ideation who presented to the emergency room with abdominal pain after swallowing two rocks at 8 AM the previous day.

On presentation to the emergency department, abdominal x-ray revealed “at least 2 large densities projecting over the distal stomach.” Initial management was conservative, in hopes that the rocks would pass into the intestine. During the next 24 hours the patient received two more x-rays. The rocks remained in the stomach, thus the patient was brought to operating room at 6 pm the next day.

The anesthesiologist performed a gastric ultrasound preoperatively, to assess the gastric contents. Gastric ultrasound demonstrated that the rocks remained in the stomach.

After uneventful rapid sequence induction and intubation, endoscopy was performed. Two rocks of approximate diameter 3 cm and 2.5 cm were removed. After uneventful recovery, the patient was discharged back to the hospital ward.

Gastric ultrasound is emerging as a rapid, convenient, contributory noninvasive technique for evaluation of gastric contents in pre-surgical patients. Gastric contents shape anesthesia plans during induction, maintenance, and emergence. Adequate fasting time by current guidelines may not ensure empty status before the surgery in the presence of factors that may delay stomach emptying. These include acute pain, distress and anxiety, opioid intake, and gastric pathology such as gastroparesis. Several studies suggest that the gastric antrum is more amenable to ultrasound examination due to its reliable location.

Patients sometimes present for radiologically demonstrated esophageal or gastric foreign body removal. By the time the endoscopy is performed, an esophageal foreign body (commonly a coin) might have passed into the stomach, or from there into the intestine. Gastroenterologists generally decline to retrieve smaller foreign bodies from the stomach, since they usually pass, unless they have remained in the stomach for more than 3-4 weeks. Similarly, once in the intestine, foreign objects are usually allowed to complete passage normally. Pre-procedure gastric ultrasound by an experienced sonographer for visualization of foreign bodies might prevent unnecessary procedures. In our case, during ultrasound evaluation of the stomach for gastric contents, we were able to visualize the rocks in the stomach. This finding confirmed both the failure to pass into the intestine since the last x-ray, and thus the necessity to proceed with the endoscopic retrieval.
Grade IV anaphylaxis resistant to epinephrine in a healthy child presenting for elective scalp lesion removal under general anesthesia

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Michael Yim 1, Dr. John Liu 2
1. University of California Davis, 2. Shriners Hospital For Children

Introduction: Anaphylaxis is a life-threatening IgE mediated reaction that requires prompt diagnosis and treatment and is characterized by severity classification from I (cutaneous-mucous signs such as erythema/urticaria with or without angioedema) to IV (cardiac arrest) (1). Though rare, medications that can cause anaphylaxis include neuromuscular blocking agents and antibiotics (2).

Case: We describe a case of Grade IV anaphylaxis in a healthy 11 year old female that presented for surgical resection of a superficial scalp lesion under general anesthesia. The patient received midazolam and fentanyl premedication, followed by propofol and remifentanil for induction and was uneventfully intubated. Dexamethasone and cefazolin were administered and within minutes the patient became tachycardic and progressively hypotensive to 50/20. During this sharp decline in cardiac performance intravenous fluids and phenylephrine boluses were given without improvement. Differential diagnosis considerations included anaphylaxis, hypovolemia, pneumothorax, pulmonary/air embolism, and other causes of tamponade physiology. Epinephrine (100mcg followed by 300mcg) was given without effect and an OR code was called to recruit additional resources. Pulse oximetry and ETCO2 became untraceable and chest compressions were initiated. Anesthetic gases were turned off, 600mcg of epinephrine was given and return of spontaneous circulation was achieved within 1 minute. An epinephrine infusion was started, and arterial and central venous access were obtained. With the epinephrine infusion at maximum dose, episodes of severe hypotension persisted requiring additional code dose epinephrine boluses every 2-3 minutes for 30 minutes before hemodynamics stabilized. During this period hydrocortisone, diphenhydramine, ranitidine, and ketamine were administered for presumed anaphylaxis. Serum tryptase was elevated to 15.3 at 1 hour (normal <13) and 20.6 at 4 hours. There were no mucocutaneous signs or rash visible. The patient did not exhibit any signs of bronchospasm and ventilation was adequate throughout the case. After vital signs stabilized a leak test was positive with the tracheal cuff deflated. The patient was extubated and transported to the pediatric intensive care unit and had full neurologic recovery in the postoperative period.

Discussion: To our knowledge, this is the first reported pediatric case of grade IV anaphylaxis under general anesthesia initially resistant to multiple code-doses of epinephrine. This report shows that early diagnosis and aggressive treatment with repeated administrations of epinephrine in suspected anaphylaxis can be life-saving. Although most cases of anaphylaxis respond to 1mcg/kg boluses of epinephrine and low dose epinephrine infusion, grade IV anaphylaxis presents with sudden cardiovascular collapse requiring astounding amounts of epinephrine. In community settings, these cases do not respond to EpiPen administration and are sometimes mistaken for EpiPen failure instead of inadequate epinephrine dosing.

Conclusion: Anaphylaxis is a life-threatening condition that requires ongoing assessments and interventions to achieve the best possible outcome.
1. Anesthesiology 2009; 111:1141-50
2. Anesthesiology 2005; 102:897-903
HALF DOSE ALTEPLASE FOR THE TREATMENT OF ACUTE RESPIRATORY FAILURE SECONDARY TO RECURRENT SUBMASSIVE PULMONARY EMBOLISM WITH UNDERLYING HEMORRHAGIC PANCREATITIS: A CASE REPORT

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Alexandra Ruan, Dr. Talha Mehmood, Dr. Tsuyoshi Mitarai
1. Stanford University

Reduced dose thrombolysis as a treatment for moderate pulmonary embolism (PE) has been demonstrated to be safe and effective in reduction of pulmonary artery pressures. However, what subgroup of patients with submassive PE benefit from such approach is not clear.

We present a case of a successful and safe use of half dose alteplase (tPA) in a 48y old African American male with acute hemorrhagic pancreatitis complicated by acute respiratory failure from recurrent submassive PE despite therapeutic unfractionated heparin (UFH). Initial CT scan on ED presentation showed evidence of necrotizing pancreatitis and right lower lobe segmental PE. Ultrasound of the lower extremity showed thrombus in bilateral femoral and popliteal veins. He was started on intravenous UFH and achieved therapeutic target by heparin activity level, but on the tenth day of admission, the patient experienced sudden onset shortness of breath and hypoxia without hypotensive. Echocardiography indicated moderate RV dilation and elevated right ventricular systolic pressure of 69 mmHg. He was subsequently intubated due to severe work of breathing despite BiPAP and started on inhaled epoprostenol at 0.05ng/kg/min. CT angiogram of the chest demonstrated presence of saddle pulmonary embolism with extension into the main right and left pulmonary arteries as well as multiple bilateral segmental branches, and concern for hemorrhagic necrotizing pancreatitis. Doppler ultrasound re-demonstrated bilateral LE clot. Given large clot burden after 10 days of therapeutic UFH, alternate treatment plans were considered. Because of PE leading to respiratory failure, IVC filter was not expected to impact his respiratory failure. Catheter directed therapy was also considered, but after extensive discussion with patient regarding risk and benefits of various options, the patient elected for half dose tPA. His body weight was 119 kilograms and he received 50mg of tPA over two hours. Prior to tPA, he was on pressure support with 55% FiO2, and PEEP of 8. After tPA, he was successfully weaned off epoprostenol within four hours and extubated to 2L nasal cannula 15 hours later. Heparin drip was restarted after infusion and he had no complications associated with tPA.

Pulmonary embolism is a rare complication of acute pancreatitis, and recurrent PE on therapeutic anticoagulation is also rare. Nonetheless, recurrent PE on therapeutic anticoagulation has a case fatality rate of up to 8.8%, and escalation of treatment needs to be considered. The PEITHO trial showed that the benefit of thrombolysis for submassive PE was countered by bleeding risk. The long term follow up study also did not demonstrate any superiority of thrombolysis over anticoagulation alone. However, this case illustrates the potential role of reduced dose thrombolysis in submassive PE resulting in acute respiratory failure with or without risk of hemorrhage. Prospective and randomized control trials are needed to verify this finding.
Hemodynamic instability following peritoneal Insufflation and Liver Parenchymal Injury with the Veress Needle

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Govind Rajan 1, Ms. Aline Silva 1, Dr. Simon Kim 1

1. University of California Irvine

Background:

The creation of a CO2 pneumoperitoneum induces particular pathophysiological changes, some of which can evolve into intraoperative complications. Potential complications from peritoneal CO2 insufflation are wide ranging and can include inadvertent insufflation and injury to surrounding tissues, vasculature, and various organ systems. Some examples of complications cited in the literature include gas embolism, pneumomediastinum, pneumopericardium, pneumothorax and cardiac arrest 1.

Case Description:

In our poster, we will discuss a case report of a 60 year old female with intrahepatic cholangiocarcinoma who undergoes a diagnostic laparoscopy and right hepatic lobectomy during which she experiences hemodynamic instability following peritoneal insufflation and liver parenchymal injury by the Veress needle and subsequent CO2 gas embolus.

Discussion:

We explore the components of adequate monitoring during insufflation as well as appropriate management of gas embolism, a rare but potentially fatal complication. Lastly, we discuss the importance of both the surgical and the anesthesia teams having a high index of suspicion for gas embolism in the setting of CO2 insufflation followed by sudden hemodynamic deterioration and decreased ETCO2, as well the various preventive and therapeutic measures.

References:

High-dose ketamine anesthesia to overcome difficult neuromonitoring in a myelopathic patient

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Amy Chen, Dr. Andrew Schober
1. University of California San Francisco

Background
Neuromonitoring techniques are utilized during complex spine surgery to monitor functional integrity of the spinal cord and nerve roots. Intraoperative evoked potentials, specifically somatosensory evoked potentials (SSEPs) and motor evoked potentials (MEPs), allow for real-time assessment of spinal tracts at risk. Evoked potentials are described in terms of amplitude, voltage, and latency. A 50% decrease in amplitude or 10% increase in latency from baseline is considered clinically significant and can alert the team to potential spinal cord compromise in an anesthetized patient. Monitoring of SSEPs and MEPs can be particularly challenging in myelopathic patients due to low baseline signal amplitude. However, monitoring of at risk spinal cord remains critical in order to avoid further injury.

A variety of modifiable factors can affect signal strength of evoked potentials, including hypotension, hypoxia, hypothermia, and anesthetic choice. While many hypnotic agents depress evoked potentials, opiates have an negligible effect and ketamine can actually boost signals by increasing cortical excitability. Balancing appropriate depth of anesthesia with preservation of adequate neuromonitoring signals can create unique challenges, but can often be overcome by modification of the maintenance anesthetic.

Case Description
We present a case of a 77-year-old woman with chronic low back pain and neurogenic claudication status post L4-S1 anterior spinal fusion (ALIF) and T11-pelvis posterior spinal fusion (PSF) who presented with paresthesias of her legs following a mechanical fall. MRI revealed a T10 compression fracture with proximal junctional kyphosis leading to severe canal stenosis and abnormal cord signal at T9-T11. As a result, she presented for urgent T4-pelvis PSF. After standard induction with propofol, fentanyl, and rocuronium, initial maintenance was with low-dose sevoflurane as well as propofol, fentanyl, ketamine, and lidocaine infusions. However, after turning prone, no MEP responses were detectable below the level of the lesion despite lightening the depth of anesthesia and cessation of sevoflurane.

A prone wake-up test was performed to ensure intact motor function. Maintenance was then changed to high-dose ketamine (20 mcg/kg/min) and remifentanil (0.2 mcg/kg/min) infusions with low-dose propofol and intermittent midazolam boluses to ensure amnesia. With this change, MEP responses in foot flexors increased bilaterally to sufficient amplitude to allow for consistent monitoring. The remainder of the procedure was completed without significant change in SSEPs or MEPs. She remained intubated post-operatively due to facial swelling and a failed cuff leak test. She was extubated on post-operative day 2 and had no recall of intraoperative events, including the wake-up test. The remainder of her hospital stay was uneventful and she demonstrated significant improvement in leg strength at six-week follow-up.

Discussion
Effective monitoring of neurologic function in the anesthetized myelopathic patient can be challenging. Standard anesthetic techniques may be incompatible with obtaining adequate evoked potential responses. A thorough un-
standing of how specific agents affect evoked potentials can allow for optimal signals. In this case, use of high-dose ketamine with remifentanil provided adequate anesthesia and enabled effective monitoring of spinal cord integrity. If uncertainty remains, an intraoperative wake-up test in the prone position is generally well tolerated.
Home Premedication With Diphenhydramine To Avoid Mast Cell Degranulation In An Infant With Urticaria Pigmentosa

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Felipe D. Perez 1, Dr. Anita Honkanen 1
1. Stanford University Hospital and Clinics Department of Anesthesiology, Perioperative, and Pain Medicine

Introduction: Urticaria Pigmentosa (UP) is a type of cutaneous mastocytosis. The rare disorder is characterized by mast cell accumulation in the skin forming maculopapular lesions. Mast cells are involved in the inflammatory process and release histamine, heparin, leukotrienes, prostaglandins, proteases, and cytokines. The degranulation process can be triggered by emotional stress, medications, friction of maculopapular lesions, temperature extremes, and surgery. In severe situations the mediators released can result in symptoms of anaphylaxis such as hypotension, vasodilation, pruritus, nausea, and flushing, which can result in death. Case Report: 5-month old girl, weighing 7.1 kg, with history of UP and tethered cord presented for L5 laminectomy and release of tethered cord by neurosurgery. Management: There were many potential triggers for mast cell degranulation. The patient was scheduled as the first case of the day to minimize the anxiety related to prolonged NPO time. The day prior to surgery the parents were called and informed on how to minimize triggers. A recommendation was made to give diphenhydramine, H1 blocker, 12.5 mg PO if patient was agitated prior to leaving home to minimize stress. On arrival in our Preoperative area, she remained calmed and was transported to the OR where an inhalational induction was performed. An intravenous catheter was placed in the hand with careful attention to avoid maculopapular lesions with minimal skin friction and avoidance of alcohol preps. The histamine release potential of all medications used during the anesthetic were checked. Fentanyl, Acetaminophen, and Remifentanil were used for analgesia. An H2 blocker, Famotidine, was given after intubation. Propofol and Sevoflurane were used for anesthetic maintenance. Cefazolin was given prior to incision for surgical site infection prevention. Dexmedetomidine was used to diminish post-operative stress. Efforts were made to decrease the friction during positioning of the patient prone on bolsters at her chest and hips. Outcome: The surgical time was approximately one hour. During this time there was no evidence of major histamine release, such as profound hypotensive or flushing episodes. The patient was extubated deep and taken to the Post Anesthesia Care Unit where she had an uneventful recovery. She left the children's hospital two days after surgery with adequate pain control and without complications. Discussion: UP is a rare disorder. Understanding and minimizing triggers prior to, during, and after surgery is of most importance. We describe how we successfully managed an infant with UP, by starting diphenhydramine at home as a premedication, eliminating medications with a histamine release profile, and paying close attention to potential environmental triggers.
Humanities in Medicine – A Tool for Resident Wellness

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Daniel Hansen 1, Ms. Katherine Kough 2, Dr. Renee Caswell 1

1. Mayo Clinic, 2. Mayo Clinic

Introduction
Physician wellness and tools to promote resiliency during residency and into practice are increasingly recognized as essential components to training successful physicians in the 21st century. Burnout and job dissatisfaction are legitimate concerns for medical practitioners and specific recognition and training on resiliency has often been sporadic and non-mainstream. Recognizing the value of exposure to tools capable of promoting wellness and resiliency to residents, we developed a pilot program of exposure to various facets of the humanities for our anesthesiology residents with the ambition that the program would help promote resiliency and improve overall job satisfaction.

Case Report
Over a period of two months we scheduled four one-hour sessions following our afternoon didactics to focus on a specific humanities-based educational exercises. The four sessions were interactive, hands-on experiences with professional guidance by invited specialists in each theme. The themes consisted of visual art (painting), music (instruments and singing), literature (guided reading/writing), and theatre (improvisation).

Discussion
Prior to initiating the program, we conducted a survey of residents’ thoughts on the value of a humanities curriculum/program to support wellbeing and resiliency, as well as its impact on clinical practice. Following completion of the program, we conducted a post-program survey. Results of the surveys were notable for 1) high pre-program valuation of the humanities as a tool for wellness as a medical professional, 2) high levels of deferred ‘interests and hobbies’ due to medical training, and 3) 100% agreement (of completed surveys) that “humanities based programming should be an ongoing addition to the [residency] curriculum.”
Hyperacute Catheter-Associated Pulmonary Embolus in the Immediate Postoperative Period Following Spinal Surgery

Dr. Ergit Paparisto, Dr. Daniel Donoho, Mr. Michael Kim, Dr. Kevin Blaine
1. Keck School of Medicine of the University of Southern California

Introduction

Central venous catheters (CVCs) are frequently placed in critically ill and surgical patients for volume resuscitation, intravenous nutrition, and medications. CVCs can predispose patients to serious complications including line infection, anatomic injury to adjacent structures, and thromboembolic events. We present the case of a patient who developed multiple PEs in the immediate post-operative period originating from a large, line-associated, upper extremity DVT. The case is notable for the timing of the DVT and PEs, at just over 24 hrs after the surgery, and the management tensions between therapeutic anticoagulation and risk for post-operative epidural hematoma.

Case Description

The patient is a 70 year-old male scheduled for a planned T9-L5 posterior spinal fusion with pseudoarthrosis and revision of prior instrumentation. He had a history of debilitating lower back pain that was refractory to medical management and underwent six prior thoracolumbar spine surgeries. Induction was uneventful and an 8.5-French Cordis introducer catheter was inserted into the right internal jugular vein on the first attempt without complication. Anesthesia was maintained by infusions of sufentanil, lidocaine, ketamine, and propofol. Following the completion of the 12 hr procedure, the patient remained intubated post-operatively for transfer to the ICU. The estimated blood loss was 1.5L. He received 2 units of RBCs and 750 ml of cell saver. The first dose of prophylactic heparin (5000 units) was initiated 24 hours after ICU admission. Within a few hours of the first heparin dose, however, he developed tachycardia to 100-115 beats per minute, and a rapid oxygenation desaturation to 85% was noted on pulse oximeter. He was placed on a nasal cannula at 4 L/min of oxygen, with improvement. A CT angiogram of the chest revealed multiple acute PEs involving segmental and subsegmental branches of all lobes. A transthoracic echocardiogram found no evidence of right heart strain. Follow-up lower extremities Duplex ultrasound revealed no evidence of lower extremity DVTs, however a large right upper extremity DVT was noted around the Cordis introducer catheter. The central line was promptly removed. Gradual titration of enoxaparin to therapeutic levels by POD6 was initiated with resolution of symptoms.

Discussion

We present the case of a patient who developed multilobar PEs from a line-associated DVT within hours of spine surgery. He required anticoagulation, which needed to be balanced against the risk of epidural hematoma. Our case presents an unexpected complication of a perioperative central line. Anesthesiologists should attempt to minimize the use and catheter size of CVCs when able, and to consider using large-bore peripheral IVs instead of introducer catheters. There are no evidence-based guidelines for when to start therapeutic anticoagulation in the postoperative spine patient, although expert opinion recommends 7 days. Unstable PEs may require more urgent treatment. The choice of anticoagulant medication may depend on bleeding risk and local management capabilities. Enoxaparin was chosen for this case but heparin may be more appropriate in other settings. Without clear treatment plans, we recommend using all avenues to prevent thromboembolic events in hemostatically tentative patients.
Hyperperfusion Syndrome Causing Encephalopathy in Orthotopic Heart Transplant Patient: A Case Report

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Alex Taborek¹, Dr. Huayong Hu²

¹. Loma Linda Anesthesiology, 2. Loma Linda Anesthesiology and Critical Care

Background
Altered mental status and neurologic complications in orthotopic transplant patients remain a major cause of morbidity and mortality despite successful transplantation. In one series, 48% of cardiac transplant patients developed some type of neurological complication in the post-operative period, with the incidence of encephalopathy reported between 9% and 16% in two studies, and cerebrovascular complications ranging between 5-11% [1, 2]. Cerebral hyperperfusion syndrome (CHS) is a rare cause of neurologic impairment and encephalopathy in cardiac transplant patients with a reported incidence of less than 1% [1].

Case Description
A 46-year-old male with a history of chronic systolic heart failure and cardiomyopathy (NYHA 4) EF 10-15%, status post left ventricular assist device (LVAD) was admitted for repeat sternotomy, and orthotopic cardiac transplant. His operative course was complicated by an infected driveline site and prolonged bleeding requiring 257 minutes of bypass time and transfusion of 17 units of blood products.
He was brought to the cardiothoracic ICU intubated on norepinephrine, milrinone, dopamine, propofol, and insulin infusions. His immediate post-operative course was uneventful; he was extubated and was moving all extremities, following commands, and communicating with short responses. Throughout the day pressors and inotropes were weaned, the patient remained euglycemic, with vital signs and electrolytes within normal limits.
However, overnight the patient became increasingly confused, stopped following commands, developed a fever to 101.9°F, and became catatonic. This prompted a workup for altered mental status and infection including neurology and infectious disease consultations, head CT, bacterial cultures and viral serologies of the blood, CSF, and urine; all of which returned negative other than an elevated LP opening pressure of 28 cm H2O and elevated protein in CSF. Empiric antibiotics were started and the patient received one dose of Cytogam after it was noted that the donor heart was CMV+.
On the morning of post-operative day three the patient remained altered with minimal movement, no verbalizations, and no recognition of family. The patient's SBP was persistently in the 150-160s and the possibility of CHS was proposed. A diltiazem infusion was titrated to maintain an SBP between 100-130 mmHg and within 12 hours of tight blood pressure control, the patient's mental status was significantly improved. Over the next 72 hours the patient's encephalopathy completely resolved despite some waxing and waning and he was discharged on post-op day 11 with no neurological deficits.

Discussion
CHS has been reported after both heart transplant and LVAD placement, but is more widely reported in the Vascular Surgery literature following carotid endarterectomy. The pathogenesis of CHS is multifactorial, resulting from impairment of cerebral blood flow autoregulation and endothelial dysfunction, ultimately resulting in breakdown of the blood brain barrier [3]. CHS is a potentially life threatening complication requiring, timely diagnosis and treatment, to prevent progression to intracranial hypertension, which may carry a mortality of up to 50%. Rapid
renormalization of cerebral blood flow following transplantation, with a mean flow velocity increase of 53.3% in the middle cerebral artery as measured by transcranial Doppler in one study, may cause CHS in rare cardiac transplant patients[4].
Hypertensive Emergency in a Pediatric Moyamoya EC-IC Bypass

Dr. Jeffrey Skanchy 1, Dr. Birgit Maass 1, Dr. Cedar Fowler 1
1. Stanford University

Moyamoya disease is a unique chronic progressive cerebrovascular disease characterized by bilateral stenosis or occlusion of the arteries around the base of the brain. There is no curative treatment for moyamoya disease, but secondary prevention for symptomatic patients is largely centered on surgical revascularization techniques such as EC-IC vascular bypass. For these surgeries, patient comorbidities and pathological processes can thwart efforts to maintain tight blood pressure control, maintain optimal cerebral perfusion pressure, and provide optimal anesthetic care.

The author reports a case of a 4-year-old who presented for his second stage right sided EC-IC indirect bypass complicated by an intraoperative hypertensive emergency. The patient had a history of familial type 1 neurofibromatosis & hypertension. His first stage left sided EC-IC bypass was complicated on postop day 2 with an ischemic stroke; symptoms improved with blood pressure augmentation, midodrine was initiated, and the second EC-IC bypass was delayed one week. On the day of second stage surgery, induction of general anesthesia was uneventful; however, 30 minutes after induction (but before incision) the patient developed a hypertensive emergency with systolic blood pressure >220 mm Hg and an associated reflexive bradycardia. Hypertension did not respond to increased anesthetic depth. Additional support was received from available anesthesiologists. The patient’s hypertension was initially refractory to nitroglycerine and clevidipine boluses but responded to nitroprusside. Differential diagnosis for this concerning event included possible intracranial hemorrhage, cerebrovascular ischemia, altered cerebral autoregulation from moyamoya and recent EC-IC surgery, pheochromocytoma with associated familial NF-1, recent midodrine usage, and other more common etiologies. Pupillary exam was reassuring, but due to the severity of the anomalous hypertension, we elected to perform a stat MRI brain to rule out hemorrhage or infarct before proceeding with surgery. Serum metanephrines were sent to screen for pheochromocytoma. After MRI results were reassuring, surgery proceeded with a few additional isolated episodes of unprovoked hypertension. After surgery was successfully completed and patient was extubated, neurological exam revealed no deficits and clevidipine was continued to maintain MAPs 90-120. Patient’s postop course was uneventful and patient was discharged 3 days later. MRI performed on postoperative day 6 revealed anticipated postsurgical alterations from EC-IC bypass and no evidence of acute infarct.

This case illustrates the difficulty moyamoya patients can present in managing tight blood pressure control. Patients with intracranial anomalies such as moyamoya and recent cerebral ischemic strokes often require the tightest blood pressure control, but this can be difficult if there is altered cerebral autoregulation and other pathological processes. During these situations it can be paramount to call for appropriate additional assistance, have medications readily available to regulate blood pressure, and also rule out other life-threatening etiologies before safely proceeding with surgery.
Hypoxia in the Recovery Unit from Unilateral Diaphragmatic Paralysis

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Vivian Pham 1, Dr. Martin Rutkowski 1, Dr. Michael P. Bokoch 1, Dr. Matthew Dudley 1
1. UCSF

The diaphragm is a skeletal muscle innervated by the phrenic nerve via C3-5 nerve roots. Injury to C3-5 nerves can result in diaphragmatic paralysis with unilateral diaphragmatic paralysis (UPD) being more common than bilateral paralysis. UPD can be caused by phrenic nerve injury during thoracic surgery, viral infections such as herpes zoster, blunt neck trauma, and cervical neck tumors. Patients with UPD are usually asymptomatic at rest but may experience exertional dyspnea. In UPD, the forced vital capacity can be decreased by 20-30% of the predicted value and the maximal inspiratory pressure can be decreased by 40%. Chest x-rays are sensitive for an elevated hemi-diaphragm, but UPD is formally diagnosed by a fluoroscopic sniff test in which the diaphragm is paradoxically elevated upon sniffing.

We present a 19-year-old man with severe brachial plexus injury following a penetrating neck wound from a remote motorcycle accident. His past medical history includes class II obesity. The patient had limited range of motion of his left upper extremity and was only able to slightly flex his wrist and grasp with his left hand. He underwent an Oberlin nerve transfer which involves transferring fascicles of his ulnar nerve to his musculocutaneous nerve to regain motor function of his biceps. In the preoperative unit, his vitals were within normal limits, but he had a paradoxical breathing pattern where his chest was depressed while his abdomen billowed during inspiration, a breathing pattern seen in patients with airway obstruction or diaphragmatic paralysis. He received general anesthesia with an endotracheal tube and paralyzed on induction with succinylcholine. Intraoperatively, his oxygen saturation was above 98%, but in recovery, his oxygen saturation was in the low 90’s on room air. He was not in distress and denied shortness of breath or a history of sleep apnea. A chest X-ray was obtained which showed an elevated left hemi-diaphragm and atelectasis of his left lung field. He was subsequently admitted overnight for closer monitoring and encouraged to use his incentive spirometer. He was discharged the following day with normal oxygen saturation on room air.

Hypoxia is not uncommon in the recovery unit. The differential diagnosis for postoperative respiratory failure is broad but include residual muscular blockade, atelectasis, and diaphragm palsy. To ensure complete muscle blockade reversal, the patient should have tetanus with no fade on a manual twitch monitor or >90% train-of-four on the neuromuscular transmission (NMT) monitor prior to extubation. Recruitment breaths or maintenance of PEEP intraoperatively can minimize atelectasis. In the recovery unit, the patient can start using an incentive spirometer. Our patient’s oxygen saturation remained low despite using an incentive spirometer, but it was his paradoxical breathing that eluded to another cause of hypoxia. He stated that this has been his baseline breathing since his accident. The prognosis of UPD is favorable in patients without underlying pulmonary disease and usually does not require treatment. Although recovery from UPD is variable, those who do not recover diaphragm function can lead a normal life with dyspnea in situations requiring increased ventilatory effort.
Hypoxic Respiratory Failure and Abdominal Compartment Syndrome in a Morbidly Obese Patient with Ovarian Mucinous Cystadenoma

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Kevin Vu, Dr. Duraiyah Thangathurai, Dr. Anoosh Javaherian

1. Keck School of Medicine of the University of Southern California

This is a case report involving a 34F HTN DM baseline morbidly obese patient who presented from an outside hospital with worsening abdominal compartment syndrome and acute-on-chronic hypoxemic respiratory failure secondary to an enlarged ovarian mucinous cystadenoma. While mucinous cystadenomas are largely known to be benign tumors, they have the potential to grow to a size large enough to compromise cardiopulmonary and renal function. In this particularly severe case, this can result in abdominal compartment syndrome and can lead to hypoxemic respiratory failure, worsening kidney function, and eventual hemodynamic collapse. Although the initial treatment plan was for medical management with diuretics with surgical management later after the patient was more hemodynamically stable, the development of abdominal compartment syndrome led to the patient being taken emergently to the operating room for surgical decompression. In the operating room, incision of the abdominal cyst resulted in 60 liters of fluid being drained and aspirated. To maintain effective circulatory volume and renal perfusion during this emergent procedure, we employed an aggressive resuscitation strategy with blood products, albumin, and crystalloids. Infusions of mannitol and albumin were started to maintain oncotic and osmotic pressures to prevent third spacing of fluids. Nitroglycerin to increase microcirculatory flow and improve microvascular end-organ perfusion. Furosemide drip was continued from the ICU to maintain adequate urine output and prevent fluid overload. Low-dose vasopressors were administered to maintain arterial perfusion pressures to end-organs. As a result of these interventions, the patient was transferred to the ICU intubated but hemodynamically stable and producing adequate urine output. After further diuresis in the ICU (an additional 20L removed), the patient was successfully weaned off of the ventilator, sent to the floor, and discharged home.

The definitive treatment of abdominal compartment syndrome is prompt surgical decompression to relieve the increased pressure in the abdomen. This procedure however can be challenging for the anesthesiologist due to pre-operative compromised end-organ function, large fluid shifts, and potential blood loss. Maintenance of adequate renal function is vital as these patients can present with severe total body fluid derangements secondary to fluid overload and third spacing of fluids. Careful attention is needed to maintain effective circulating volume in order to provide adequate end-organ perfusion.
Iatrogenic Rupture of Superior Vena Cava During Routine Cannulation of the Right Internal Jugular Vein as a Result of “Juvenile” Xanthogranuloma in an Adult

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Andrew Hennigan

1. University of A

Background:
Juvenile xanthogranuloma (JXG) is a rare histiocytic disorder primarily found in children affecting the skin and much more rarely visceral organs. A case report series described 7 instances of intracardiac JXG only one of which was an adult.

Case Description:
Our patient was 53 yo woman with past medical history of “tumor of heart” status post resection over a decade ago in Mexico with pacemaker, obesity, and mitral regurgitation who presented for elective mitral valve replacement and biopsy of the right atrium. Following uneventful induction of general anesthesia and immediately after placement of Cordis introducer, patient experienced PEA arrest. Femoral-femoral bypass was emergently established and sternotomy performed. Upon entering thoracic cavity the central venous catheter was found to have ruptured SVC with ensuing hemorrhagic shock. The SVC was repaired and patient resuscitated. The surgery was then aborted as both atria were entirely encased in tumor and mitral valve could not be replaced. The patient’s subsequent ICU was complicated by an open chest, AKI requiring CRRT, status epilepticus, and bowel ischemia.

Discussion:
Central venous catheter insertion is a routinely performed procedure in anesthesiology and critical care medicine. Vascular injury complications related to cannulation are well described and vascular injury including rupture is an uncommon, but known complication. This case describes a catastrophic rupture of the SVC related to patient’s known, rare cardiac tumor.
Impact of the Introduction of Sugammadex on Provider Practice

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Ms. Melissa Brown 1, Mr. Seth Fischer 1, Dr. Betelhem Asnake 2, Dr. Neal Fleming 2

1. University of California, Davis, 2. University of California, Davis Department of Anesthesiology and Pain Medicine

**Introduction:** Until recently, Neostigmine was essentially the only choice for reversal of neuromuscular blockade. This drug has many known side effects and limitations, most notably: pulmonary complications from incomplete reversals of the neuromuscular blockade. Approximately four months after US FDA approval (March 11th, 2016) the anesthesia carts at the UC Davis Medical Center (UCDMC) were stocked with Sugammadex. Overnight, anesthesiologists were able to choose between two neuromuscular blockade reversal agents. The aim of this study was to analyze how practices changed with respect to choosing a neuromuscular blocking agent (NMBA) or reversal agent after the sudden introduction of Sugammadex.

**Methods:** This retrospective study used data from all anesthetic events at UCDMC. Non-surgical events including nerve blocks, labor epidurals, lumbar punctures, blood patches, and vaginal deliveries were excluded from analysis. In addition to the total number of cases, additional measured variables included of the number of patients who received Rocuronium, Vecuronium, Cisatracurium, Succinylcholine, Neostigmine and Sugammadex. The average number of cases per month and the average number of patients receiving each of the studied drugs were compared before and after the introduction of Sugammadex using a grouped t-test analysis (Prism ver. 7.01). A value of p<0.05 was considered to be significant.

**Results:** We looked at data for all patients for one year before and after the introduction of Sugammadex (April 1, 2015 - March 31, 2017). Data from a total of 57,812 patients were extracted. Year 1 is April 1, 2015 – March 31, 2016 and Year 2 is April 1, 2016 – March 31, 2017. To avoid the influence of the transition period on practice patterns, representative six-month samples of data, ranging from September to February of Years 1 and 2, were analyzed. The average monthly case numbers were 2324±134 and 2334±131 (p>0.05) before and after the introduction of Sugammadex, respectively. The corresponding average uses of NMBA's were: Rocuronium 1012±83 and 1144±63 (p<0.05), Vecuronium 25±6 and 5±4 (p<0.05), Cisatracurium 135±14 and 62±11 (p<0.05) and Succinylcholine 198±12 and 126±7.4 (p<0.05). In Year 1, 66±11% of patients receiving NMBA’s were reversed with Neostigmine. In year 2 in the main operating rooms, of those receiving reversal drugs, 90±3.2% received Sugammadex and 10±3.2% received Neostigmine.

**Conclusion:** The landscape of neuromuscular blockade reversal agents is rapidly shifting, and the goal of this study was to analyze how provider practices are changing in this setting. From this study we can conclude that after the introduction of Sugammadex at UCDMC there was a significant decrease in the use of Neostigmine, Cisatracurium, Vecuronium and Succinylcholine, coupled with an increase in the use of Rocuronium. Sugammadex is now the chosen reversal agent in almost 80% of cases where reversal agents are used, perhaps attributable to the strong evidence accumulated that it offers many advantages over Neostigmine.
Improving patient outcome through the use of cerebral oximetry during high risk liver transplant surgery

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Eunice Lee 1, Dr. Bryan Chow 1, Dr. Carly Wachi 1, Dr. Duraiyah Thangathurai 1, Dr. Arash Motamed 1
1. Keck School of Medicine of the University of Southern California

Background:
Neurological complications following invasive surgical procedures remain a cause of significant morbidity and mortality. Cerebral hypoperfusion or ischemia may lead to residual neurological damage and postoperative cognitive dysfunction (POCD) (1).

Cerebral oximetry is a continuous, noninvasive monitor that utilizes near-infrared spectroscopy (NIRS) to measure cerebral regional oxygen balance within the frontal cortex (2). Specifically, it measures the hemoglobin oxygen saturation within the microvessels (diameter < 100 um) (3). An association between a cerebral oxygen desaturation and POCD has been observed after cardiac and abdominal surgeries.

We present a liver transplant case that demonstrates how increasing microcirculation and oxygen delivery optimizes cerebral perfusion as shown by an increase cerebral oximetry, thereby mitigating or avoiding POCD.

Case description:
A 67-year-old female with NASH cirrhosis (MELD score 35), chronic kidney disease, and type II diabetes mellitus presented for liver transplantation. She originally presented with worsening hepatic encephalopathy and hyperbilirubinemia (baseline 9 to >28 mg/dL). Through the use of cerebral oximetry, baseline values were obtained prior to induction and trended during the three stages of liver transplantation: preanhepatic, anhepatic, and neohepatic phase. Both nitroglycerin and blood transfusion were initiated to improve microcirculation, endothelial dysfunction, and oxygen carrying capacity, respectively, demonstrated by a dramatic increase in cerebral oximetry (> 200% increase from baseline values) (4). Patient recovered rapidly with clear sensorium by POD #1. Neither surgeons nor family members appreciated any sign of postoperative cognitive dysfunction after liver transplant surgery.

Discussion
Cerebral regional tissue oxygen saturation (rSO2) by near-infrared spectroscopy is the most recent development for bedside monitoring of brain oxygenation. It reflects the regional oxygen balance and thus changes in regional blood flow and/or metabolism and is used to detect tissue hypoxia that may precede or occur independent of changes in global hemodynamics (3).

In this case, we evaluated rSO2 in the setting of liver transplant surgery. Prior to induction, patient’s baseline values were abnormally low (L 18, R 22). This was noted in one study where high bilirubin levels in patients undergoing liver transplantation artificially lowered the rSO2 values, although there was no impact on the overall trend and changes in rSO2 when comparing with patients with high versus normal bilirubin levels (5). Nevertheless, we demonstrated that nitroglycerin infusion to improve microcirculation and pRBC transfusion increased the rSO2 by over 200% from baseline values as seen in the preanhepatic phase (L 65, R 73). During anhepatic phase, we observed a drop in preload, cardiac output, and ultimately cerebral perfusion during IVC clamping and recovery when unclamped. Lastly in the neohepatic phase, we noticed a mild decrease in rSO2 during reperfusion (L 60, R 66), but still remained significantly above baseline values. Postoperatively, patient’s mental status recovered rapidly with no evidence of POCD.

Although the majority of clinical use of NIRS has been in the area of cardiac surgery, this technology may be applied to other high-risk surgeries. NIRS can provide a more rapid identification of cerebral hypoxemia than pulse
oximetry and can be used to ensure maximum cerebral oxygenation.
Reinke's edema is characterized by the “sac-like” appearance of the fluid-filled vocal cords which may cause for concern for the anesthesiologist when securing the airway. The swelling of the vocal folds rarely cause any airway compromise. The major symptom of Reinke's edema is a hoarseness similar to laryngitis. The major cause associated with Reinke's edema is smoking. We report an interesting case report of an incidental finding of edematous vocal cords for a patient going under elective spine surgery. Further, we will discuss the incidence, pathophysiology of Reinke's edema and anesthetic considerations during the perioperative period.
Intercostal Nerve Cryoablation and Post-thoracotomy Pain with Left Ventricular Assist Device Placement - A Case Series

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. John Carey 1, Dr. Samata Paidy 1, Dr. Zain Khalpey 1
1. university of arizona

Background:
Left ventricular assist device (LVAD) placement has become an increasingly frequent therapy for patients suffering from end-stage heart failure. The surgical incision for placement of a LVAD is a combination of an upper hemi-sternotomy and a left mini-thoracotomy. Thoracotomy is associated with significant acute and chronic pain with the incidence of post-thoracotomy pain syndrome as high as 50%[1]. The intensity of acute post-operative pain is a statistically significant predictor of developing post-thoracotomy pain syndrome (PTPS)[1]. Inadequate control of PTP is associated with increased post-operative morbidity and increased rates of pulmonary complications[2]. Current methods that exist to control PTP include thoracic epidural analgesia (TEA), intercostal nerve (ICN) cryoablation, ICN blocks with local anesthetics and parenteral agents such as acetaminophen, NSAIDs, opiates, ketamine, etc. TEA is regarded as the gold standard method for controlling PTP[2]. Randomized controlled trials (RCT) comparing ICN cryoablation vs. parenteral opiates alone found a statistically significant improvement in post-operative pain, reduced use of opiate analgesia and improvement in respiratory function tests in the cryoanalgesia group[4,5]. RCTs comparing TEA vs. cryoanalgesia and those comparing TEA plus cryoanalgesia vs. cryoanalgesia alone found similar acute pain relief and an increased incidence of neuropathic type pain in the cryoanalgesia group[2,7,8,9]. LVAD patients must be immediately anti-coagulated after surgery usually with an unfractionated heparin infusion as a bridge to warfarin therapy to prevent thrombotic complications[10]. Following ASRA guidelines this prevents the routine use of TEA in LVAD patients and alternative methods for PTP control must be utilized[11]. In this case series we surveyed four patients requiring LVAD therapy for end-stage heart failure that received intra-operative intercostal nerve cryoablation for management of post-thoracotomy pain.

Case description:
Four cases received a left ventricular assist device and cryoablation using the Atricure cryoICE probe. Each patient was contacted via phone six to twelve months from their procedure date and information about the quantity (using the numeric pain rating scale) and quality of their pain was recorded along with the incidence of allodynia (Figure 1). All four patients included in our case series had minimal pain by 3 months post-op which continued to decrease in subsequent months. One of four patients complained of minimal dysesthesia (tingling) around incision site after 12 months that did not affect activities of daily living.

Discussion:
The efficacy of cryoanalgesia as a treatment for acute and chronic PTP remains controversial, as some studies have shown an increase in long term neuropathic pain compared to TEA. All four patients in our case series had minimal pain after 3 months and were satisfied with their pain control. LVAD patients represent a unique population who require immediate post-operative anticoagulation to prevent thrombotic complications preventing the routine use of TEA[10]. Cryoanalgesia may prove to be a safe and effective method of controlling acute PTP in LVAD patients and potentially decrease the development of PTPS. RCTs comparing cryoanalgesia to parenteral agents or cryoanalgesia to other modalities such as liposomal bupivacaine ICN blocks will help determine the best method of pain control for LVAD patients.
Intranasal Dexmedetomidine for Postictal Agitation in Electroconvulsive Therapy

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Kathryn Iwata¹, Dr. Lindsey Huddleston¹, Dr. Linda Liu¹, Dr. Charlene Blake¹

¹ University of California San Francisco

Background
Postictal agitation (PIA) occurs in up to 10% of electroconvulsive therapy (ECT) cases and is characterized by disorientation, restlessness, and combative behavior. Current interventions include physical restraints or intravenous medications like midazolam, propofol, or dexmedetomidine. Dexmedetomidine is a selective alpha agonist with sedative, analgesic, and anxiolytic properties and does not cause respiratory depression. We sought to investigate if intranasal dexmedetomidine could be used in lieu of intravenous interventions to treat PIA for faster transfer to the post-anesthesia care unit (PACU) without need for further sedation weaning from nursing.

Case Description
Mr. R is a 45 year-old man with a history of morbid obesity (147 kg, BMI 42) and severe bipolar disorder requiring frequent ECT sessions. The patient's first ECT was complicated by severe PIA where he became combative with staff, pulled out his IV, and required IM ketamine. Successive ECT sessions required use of propofol, ketamine, fentanyl, midazolam and haloperidol in various combinations. However, given the patient was difficult to ventilate via mask, a laryngeal mask airway (LMA) usually had to be placed to prevent airway obstruction and oxygen desaturation, which delayed transfer time to the PACU. Intravenous dexmedetomidine was attempted as well, but required further weaning by the recovery room nurses.

For the patient's seventh ECT, we used 2 mcg/kg intranasal dexmedetomidine (1 mcg/kg per nostril) post seizure. The patient's airway was successfully managed with only an oral airway until he emerged from anesthesia, without a need for a LMA. He was transported to the PACU calm without further need for sedation weaning by the nurses. Comparing intranasal dexmedetomidine vs. propofol/ketamine infusions, (1) the patient emerged from anesthesia post-seizure in 29 minutes vs. 35 minutes; and (2) the patient was discharged from the PACU post-seizure in 45 minutes vs. 1.25 hours. Per discussion with the patient, he felt the same after the intranasal dexmedetomidine compared to his earlier ECTs.

Discussion
Managing PIA is not always simple, and intranasal dexmedetomidine can be considered as a treatment option. It is especially useful in cases of difficult mask ventilation because it does not depress respiratory drive. Its ease of administration without need for further weaning in the PACU make intranasal dexmedetomidine a viable alternative to other traditional intravenous infusions.

Resources
Intraoperative pneumothorax - A Rare Complication During Percutaneous Nephrolithotomy: A Case Report

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Lia Hoffner¹, Dr. Tony Yen¹

¹Department of Anesthesiology and Critical Care Medicine, University of New Mexico, Albuquerque, NM

Introduction

Percutaneous nephrolithotomy [PCNL] is the procedure of choice for the removal of large staghorn calculi. Complications related to this surgical procedure have important anesthetic implications. We present a rare case of an intraoperative pneumothorax during percutaneous nephrolithotomy.

Case

A 50 year old female presented with a large left staghorn calculus for elective percutaneous nephrolithotomy. She had a history of OSA with CPAP, and coronary artery disease status post 2 drug eluting stents to her LAD with a normal ejection fraction. She was taking Plavix chronically, but it was held 7 days preoperatively while continuing ASA. Preoperative examination, including laboratory data and ECG, were unremarkable. After arrival to OR, routine non-invasive monitoring was established. Baseline blood pressure and heart rate were 102/74 and 83, respectively. Her SpO₂ was 95% on room air. After midazolam sedation, GA was induced with fentanyl, propofol, and rocuronium. A bougie was used to facilitate endotracheal intubation with direct laryngoscopy. The endotracheal tube was secured 21 cm at the teeth. She was then placed in the prone position and bilateral breath sounds were confirmed by auscultation. Approximately 1.5 hours into surgery, the patient’s oxygen saturation began to slowly dwindle to the low 90s. FiO₂ was titrated up at this time with minimal increase in SpO₂, and slowly rising peak and plateau pressures. After SpO₂ reached 88%, FiO₂ was increased to 100% with subsequent manual ventilation. Although ventilation was without difficulty, SpO₂ did not improve. Auscultation revealed decreased breath sounds on the left. Considering possible mainstem intubation, the ETT was withdrawn 2cm, with no appreciable difference in SpO₂ or airway pressures. Under fluoroscopic guidance, a left lung film suggested incomplete lung expansion. General Surgery was consulted and identified a left pneumothorax. A large bore chest tube was placed, and both SpO₂ and airway pressures improved. She was extubated uneventfully after surgery. Immediate postoperative X-ray revealed improvement of lung inflation with left pleural fluid collection. Subsequently, patient's hematocrit dropped to 20 the following morning, requiring two units of PRBC infusion. Persistent output was noted from chest tube ranging from 40-130ccs every 24 hours. Chest X-ray on POD 4 revealed resolution of pneumothorax with residual pleural fluid collection. She was discharged home the same day.

Discussion

Percutaneous renal puncture provides minimally invasive access to the collecting system for removal of large calculi, but is associated with an increased risk of pleural injury. This can manifest as hydrothorax, pneumothorax, or hydropneumothorax. The overall rate of pleural injury ranges between 0.3 and 1% during percutaneous access puncture for PCNL (1). The anesthesiologist must be vigilant for elevated airway pressure and/or decreased SpO₂, and should auscultate the lungs frequently. If violation of the pleura is suspected, intraoperative chest fluoroscopy can verify pneumothorax and allow appropriate intervention while the patient remains under anesthesia.

Intraoperative pulmonary embolism diagnosed by TEE in a morbidly obese patient undergoing orthopedic surgery following motor vehicle crash

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Patrick Lam¹, Dr. Maximillian Blanter¹, Dr. Adam Milam¹, Prof. Omar Durra¹
¹. Department of Anesthesiology, Cedars-Sinai Medical Center, Los Angeles, CA

Background: Surgery and major trauma increase the risk of pulmonary embolism (PE), with higher risk in those immobile, obese, and smoking. In the OR, the diagnosis of PE can be challenging. The most common findings are tachycardia, hypotension, hypoxemia, and abrupt reduction of EtCO2, but PE is considered a diagnosis of exclusion, and current guidelines for intraoperative diagnosis are not well-defined.

Case description: KW is a 28 yo female with pmh morbid obesity (BMI 50), BIBA s/p auto vs. pedestrian (auto ~25-35 mph). Initial HR 116. Patient found to have left midshaft clavicle, fibular neck, and ankle fractures, and was scheduled for ORIF left clavicle and left ankle, under regional anesthesia (interscalene/superficial cervical plexus and popliteal blocks), and general anesthesia. Induction (with midazolam, fentanyl, propofol, succinylcholine, esmolol, and sevoflurane) and intubation were uneventful.

Prior to prepping and during manipulation of her knees, patient noted to have sudden-onset hypoxia and hypotension, VS: HR 145 from 105, BP 86/46 from 149/131, O2 sat 71% from 100% on ventilator FiO2 96%, EtCO2 12 from 39. Patient was manually ventilated, found to have clear, bilateral breath sounds, good Vt, and reasonable compliance. Help was called. Albuterol was given, and fiberoptic bronchoscope showed clear airways with ETT above carina. Pneumothorax was ruled out with CXR. VS did not improve, and an intraoperative TEE was performed. 200 mcg epinephrine was given. Arterial and central lines were placed. VS improved: HR 121, ABP 141/85, O2 sat 100% on ventilator FiO2 96%, EtCO2 27.

TEE showed dilated RV, severe RV dysfunction that spared the RV apex (McConnell’s sign), large PFO with right-to-left shunting, and large PE with subtotal occlusion in right PA. PE Response Team, CT surgery, IR, and CSICU consulted. Both ORIFs were aborted. Patient was transferred to CSICU intubated, with plan to perform catheter-directed tPA injection and thrombectomy in IR suite.

Discussion: The incidence of PE is 0.7% to 30% after orthopedic surgery, and 2.3% to 6.2% after trauma. Patient had several risk factors including obesity, smoking, limited mobility/venous stasis, trauma, acute inflammation, activation of clotting cascade, and lower extremity mobilization in the OR. Her sudden hypoxia and hypotension refractory to medical management, exclusion of pneumothorax, and risk factors for PE necessitated the use of rescue TEE which showed a large PE in the right PA and RV dilation, the most common finding on TEE in patients with PE. An incidental, previously undiagnosed PFO was also seen which likely helped our patient maintain her left heart volume and partly offset her sudden-onset hemodynamic insult.

Studies have shown intraoperative TEE to be beneficial for establishing diagnoses i.e. thrombotic embolic events, and directing treatments i.e. MI and/or RV and LV failure. Furthermore, researchers found the diagnosis of PE with TEE to be fast and accurate, comparing favorably to spiral CT. Nonetheless, more studies need to be completed to prove the utility of rescue TEE in the OR, and ultimately establish formal algorithms for the management of perioperative PE.
In Investigating the Cardiotoxicity of Liposomal Bupivacaine (Exparel) in Rats: The Role of Intralipid Rescue

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

*Dr. Marsha Kristel Bernardo*¹, *Mr. Shayan Moazeni*¹, *Ms. Nancy Cao*¹, *Ms. Mylene Vaillancourt*¹, *Dr. Siamak Rahman*¹, *Dr. Soban Umar*¹

¹. UCLA Anesthesiology & Perioperative Medicine

**Background:** Exparel is a formulation of bupivacaine encapsulated in multi-vesicular liposomes, developed for post-surgical anesthesia. The liposomes have been shown to increase the drug's stability and extend its duration of action. Exparel may prevent accumulation of bupivacaine in blood and/or tissue; thus, decreasing risk of central nervous or cardiovascular toxicities. However, administration of Exparel has its risks. The maximum dosage of Exparel for adults is ~266 mg, but the maximum mg/kg dosing limit is unknown. No formal studies have been conducted to test if use of Intralipid (ILP, 20%) can reverse Exparel toxicity. Our aim is to determine the toxic dose of Exparel in mg/kg and investigate whether ILP can reverse its cardiotoxic effects in rats.

**Methods:** Female rats (~250-300 gm, n=7) were used for the study. Asystole was attempted with different IV doses of Exparel (25 mg/kg, 15 mg/kg, 7.5 mg/kg over 10 seconds). For the second part of the study, asystole was induced with Exparel (15 mg/kg over 10 sec, IV), and resuscitation with ILP (5 ml/kg bolus and 0.5 ml/kg/min maintenance) was started immediately along with chest compressions. Heart rates (HR, beats per min) and ejection fractions (EF, %) were measured using transthoracic echocardiography (VisualSonics Vevo 2100) at 1, 5, and 10 min after ILP bolus.

**Results:** We found that a dose of 25 mg/kg of Exparel caused cardiac arrest immediately. Next we decreased the dose of Exparel to 15 mg/kg, that also caused immediate cardiovascular collapse. Exparel 7.5 mg/kg did not induce cardiac arrest; instead, it caused wide complex tachycardia that self resolved in 5 min. ILP rescue of Exparel cardiotoxicity was found to be unpredictable (n=5). EF, HR and EKG improved after cardiac arrest the most at 1 min after ILP bolus. At 1 min, EF was 42.815% and HR was 169.325 bpm. ILP rescue of Exparel cardiotoxicity was not sustained contrary to ILP’s rescue of bupivacaine cardiotoxicity in rats. EF and HR continued to deteriorate when measured at 5 and 10 min, with 4 out of 5 rats with EF=0 at 5 and 10 min.

**Conclusion:** We found a dose of Exparel that reliably induced cardiotoxicity in rats. Based on our results, ILP is unreliable in rescuing Exparel induced cardiotoxicity at the typical dosage regimen used for rats with bupivacaine cardiotoxicity. More experiments are needed to determine mechanisms of Exparel cardiotoxicity and ILP’s effective dosage that can reliably reverse Exparel cardiotoxicity.
Background: The Lariat device eliminates the need for anticoagulation in the treatment of atrial fibrillation by using a pre-tied suture to ligate the left atrial appendage (LAA). A guidewire is placed in the LAA using a percutaneous transeptal approach. A subxiphoid, epicardial approach is then used to guide the suture to the base of the LAA. When the two are approximated the suture is deployed to ligate the LAA.

The Lariat is approved in the United States for soft tissue approximation or ligation, though not specifically for LAA closure. Risks of the Lariat procedure range from small punctures to life-threatening cardiac lacerations. In 2015 the FDA issued a safety report on deaths and serious adverse events associated with the Lariat, approximately 75% of which required emergency cardiac surgery. Here we describe a case of Lariat deployment causing LAA laceration, requiring emergent sternotomy and cardiopulmonary bypass.

Case description: Our patient is a 73-year-old male with paroxysmal atrial fibrillation and bladder cancer. Due to frequent urologic procedures, the patient was suffering from cerebral and systemic emboli brought on by interruptions in his anticoagulation schedule. He was scheduled for a Lariat procedure as an alternative to anticoagulation. At our institution these procedures are performed away from the operating room in the electrophysiology lab. A general endotracheal anesthetic with arterial line monitoring and large bore IV access is usually performed. TEE monitoring is performed throughout the procedure and cardiothoracic surgery backup is available. The case was initially uneventful, but shortly after the Lariat was deployed the patient became acutely hypotensive. TEE revealed a rapidly enlarging pericardial effusion. The epicardial access catheter was converted to a pericardial drain, and with autotransfusion of the drained blood hemodynamic stability was restored. To stop the bleeding, the heparinization for the procedure was reversed with protamine. The pericardial drain stopped draining, however the patient became hypotensive again indicating continued bleeding despite reversal of anticoagulation. Cardiothoracic surgery was called and a pericardial window was performed with relief of the tamponade, however brisk bleeding continued and a sternotomy with CPB was required. When the heart was inverted, a roughly 2cm tear in the LAA was identified. The hole was repaired and the patient was successfully weaned off CPB. He was successfully extubated on POD 1 and discharged on POD 6.

Discussion: While the Lariat and other LAA closure devices provide an opportunity for discontinuation of anticoagulation in patients with atrial fibrillation, these procedures are not without risk. Given the potential remote locations of these procedures, proper preparation and knowledge of available resources is paramount. Some of the challenges that we faced included: the patient being too unstable to transport to the OR, getting the CPB machine to our location, and having limited physical space in the EP lab for the necessary equipment and personnel. The key actions that made this case successful were prompt recognition of the problem via TEE, having adequate vascular access and blood bank resources, and having CT surgery available and able to act on short notice.
A 36-year-old male with morbid obesity, insulin dependent diabetes, and reported history of chronic pulmonary hypertension, clotting disorder of unknown etiology, and multiple prior DVT and PE with poor compliance with coumadin, presented to an outside hospital (OSH) with progressive chest tightness and dyspnea. A computer tomography (CT) scan at OHS showed thromboembolic material in bilateral main pulmonary arteries consistent with chronic thromboembolic pulmonary hypertension (CTEPH) with noted right atrium thrombus. Patient was started on lovenox but was subsequently transitioned to heparin drip. A transthoracic echocardiography (TTE) obtained at OHS showed dilated right ventricular (RV) and a mobile mass, presumably thrombus, in the left atrium (LA) and extending across the mitral valve into the left ventricle (LV). The patient was transferred to UCSD for urgent atrial thrombectomy and pulmonary thromboendarterectomy (PTE).

On the day of surgery, a pre-induction radial arterial catheter was placed. After induction and intubation, a right internal jugular catheter was placed under ultrasound and TEE guidance to prevent thrombus dislodgement (pulmonary artery catheter was not placed), as well as a femoral arterial catheter was placed. On TEE, a midesophageal right ventricular inflow-outflow view demonstrated a large thrombus from the right atrium transitioning through a patent foramen ovale to the left atrium as shown in Figure 1. A three-dimensional zoom view of the interatrial septum from the LA aspect demonstrates a large mobile mass transiting across the PFO and extending through the mitral valve towards the LV is demonstrated in Figure 2. The patient was cooled to 20 degrees Celsius on CPB in anticipation of deep hypothermic circulatory arrest (DHCA). A surgical thrombectomy was performed via incisions through the right atrium, the interatrial septum and the left atrium. This allowed for a complete examination of the atria and removal of all thrombotic material. Bilateral PTE was additionally performed under DHCA without complication and patient was subsequently rewarmed.

Prior to separation from CPB, a midesophageal five-chamber view from TEE demonstrated an echodense mass immediately superior to the anterior mitral valve leaflet as showed in Figure 3.

What is the diagnosis and how should it be managed?
Background
Severe hypotension after induction of anesthesia can be due to several causes and correct diagnosis is imperative to appropriate treatment. However correct diagnosis on symptoms alone can be challenging. We describe a case of post induction hypotension requiring trans-esophageal echo to diagnose a patient with left atrial obstruction secondary to a large esophageal mass resulting in severely reduced preload and hypotension.

Case:
A seventy-seven year old male with a past medical history of achalasia requiring serial botox injections and poorly controlled gastroesophageal reflux presented for a biopsy of a deep abdominal mass. Prior anesthetic records showed no allergies but the patient required high levels of vasopressive support during surgery. A general anesthetic with an endotracheal tube was planned due to high aspiration risk. After induction with propofol and rocuronium, the patient became profoundly hypotensive with little response to fluid resuscitation or phenylephrine/ephedrine boluses. Anaphylaxis was ruled out due to absence of symptoms. An intra-operative trans-esophageal echo was performed, which showed a mass within the esophagus obstructing flow into the left atria resulting in a collapsed left atria and severely under filled left ventricle. When color flow doppler was applied significant turbulent flow was observed in the left atria indicating compression of the pulmonary veins. The trans gastric short axis view showed an under filled ventricle with mildly reduced systolic function with no wall motion abnormalities, valvular pathology, or cardiac tamponade. An orogastric tube was placed, and after decompression hemodynamics improved. The patient was extubated in the operating room, and had an uneventful recovery in the post operatively.

Discussion
Often post induction hypotension is due to the effects of induction agents on cardiac output and systemic vascular resistance, which should be attenuated after phenylephrine boluses and fluids. When hypotension is refractory to these interventions further diagnosis for appropriate management is needed. Anaphylaxis should be ruled out as this also is a common cause of hypotension post induction. Differentiating between cardiogenic vs anaphylaxis causes of hemodynamic compromise can be difficult. Echo can be useful in differentiating the diagnosis as demonstrated in this case.

Left atrial compression from surrounding structures was first characterized in 1994 by D’Cruz et al in which a numerical grade was assigned to indicate severity of obstruction. The first case of esophageal achalasia compressing the left atria was first published in 2012 in which transthoracic echo (TTE) was utilized for the eventual diagnosis. In this case TTE was attempted first though poor cardiac windows limited the ability to assess the heart. TEE was then used to make the diagnosis. Intraoperative management focuses on maintaining preload and reducing the mass effect by decompression. While management can be practical and quick, diagnosis remains the keystone to solving this perioperative dilemma. Point of care ultrasound is paramount for clinicians to make the correct diagnosis.
Azygos and hemiazygos continuation of the inferior vena cava (IVC) is a relatively rare developmental anomaly. However, understanding the embryology and anatomical implications of the interrupted IVC is particularly important for liver transplant surgeons and anesthesiologists, as it may impact surgical technique and intraoperative management during liver transplant. Only one other case of successful liver transplantation in an adult patient with an interrupted IVC and azygos continuation has been reported. We describe the perioperative considerations taken and care provided for a patient with an aberrant IVC and Model for End-stage Liver Disease score 40 secondary to severe acute alcoholic hepatitis who received a liver transplant.
Local Anesthetic Systemic Toxicity at the Conclusion of an Axillary Brachial Plexus Nerve Block

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Valeria Carcamo-cavazos, Dr. John Markley
1. University of California San Francisco

Background
Local anesthetics (LAs) are widely used by anesthesiologists and are considered safe. However, overdose of LAs can cause significant morbidity and mortality. Local anesthetic systemic toxicity (LAST) has various presentations that include mild symptoms such as metallic taste and tinnitus, to severe effects leading to seizures, cardiac disturbances and cardiopulmonary collapse. The incidence of major LAST events is low, ranging from 0.03-0.87/1000 (3); however, given the serious consequences of a major LAST event, knowledge of how to prevent, detect and treat LAST are paramount during administration of local anesthetics.

Case Description
A 60 year-old man presented to the emergency department after sustaining a laceration to the left hand. Given the severity of his injury, urgent left hand debridement was scheduled. The anesthetic plan was an axillary and intercostobrachial nerve block, and monitored anesthesia care (MAC).

The patient underwent the axillary/intercostobrachial nerve block in the preoperative area. Standard ASA monitors were placed prior to block initiation. At the beginning of the procedure, the patient was uncomfortable, so he was premedicated with 1 mg of IV midazolam and 50 mcg of IV fentanyl. At the conclusion of the block, the patient became tachycardic to 130s, the EKG showed ST segment changes and widening of the QRS complex, and he had a generalized tonic-clonic seizure. LAST was immediately suspected. Help was called for, 3 mg IV midazolam were administered and a 100 mL bolus of 20% intralipid was immediately given. Seizure activity quickly resolved, and his heart rate decreased to 100s. The patient was hemodynamically stable and oxygenating appropriately throughout. Given the patient was stable, the surgery proceeded with the nerve block under MAC.

The procedure was uncomplicated and the block worked as expected. The patient recovered uneventfully in the PACU and had no pain for 8 hours following the procedure. The patient was discharged home postoperative day 1 without apparent sequelae from LAST.

Discussion
This case demonstrates that being prepared to treat LAST is crucial to avoid progression to cardiovascular collapse. Prevention is the most important step to decrease morbidity from LAST, including using the least amount of LA necessary, using direct visualization of LA injection under ultrasound guidance, and ensuring negative aspiration intermittently during injection of LA. Close monitoring with standard ASA monitors and patient feedback will allow early detection of LAST, which leads to quick abortion of the LA injection and prompt treatment. Finally, the anesthesiologist must ensure emergency medications are readily available when performing a block, as timeliness of treatment is paramount to prevent progression to cardiovascular compromise. During administration of local anesthetics, anesthesiologists should plan for prevention, early detection and timely treatment of LAST.

References
27, 2018.
Loss of Airway During an Awake Craniotomy in an Obese Patient

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Bessie Abrahahm 1, Dr. Pramod Panikkath 1

1. University of New Mexico Hospital

Background:
Doing craniotomy while the patient is awake is beneficial for resection of tumors involving the functionally important regions of the brain. The intraoperative mapping of the brain in an awake patient allows for maximum resection of the tumor without injuring the eloquent areas. The purpose is to improve the quality of life of the patient after brain surgery. The analgesia for awake craniotomy is provided by a scalp block. The patient will be adequately sedated to ensure comfort, at the same time, they should be awake and able to participate in the neurological assessments. This technique is not without risks to the patient and challenges to the Anesthesiologist. Here I am presenting a case where there was an accidental airway emergency in an obese patient during the awake craniotomy. I also make a few suggestions about how we can be better prepared to tackle this issue.

Case Report:
A 43 year old obese man, with recurrent metastatic tumors to the brain from testicular cancer, was scheduled for an awake craniotomy and tumor resection. He did not have any other significant past medical history or previous anesthesia related problems. He was thoroughly assessed by the neurosurgeon, anesthesiologist, and the neuropsychologist, and the procedure was explained in detail. On the day of surgery, vascular accesses were established, including an intra-arterial line, and routine ASA monitors were connected. A sleep-awake-sleep technique was planned. The patient was adequately sedated, and he received a bilateral scalp block. During the awake mapping, the patient developed seizures, which required treatment with propofol. He subsequently obstructed his airway and desaturated, which was corrected by an LMA placement from the front of the patient.

Discussion:
The most important consideration for this type of surgery is ideal patient selection. Awake craniotomy involves a multidisciplinary team work that includes the Neurosurgeon, Anesthesiologist, Neuropsychologist, Neurophysiologist, Neuro-monitoring person and nurses. There are several challenges to the anesthesiologist. The most significant concern is the risk of loss of the airway in a patient, who has been moved away from the field of the anesthesiologist, making any airway manipulation difficult. The anesthesiologist should be familiar with various airway management techniques in sub-optimal conditions. The success of this procedure depends on thorough communication among all the people in the operating room.
Background: The incidence of perioperative anaphylaxis is reported to be 1:5,000 to 1:20,000. Anaphylaxis during anesthesia can present as hemodynamic instability, airway obstruction, and skin manifestations. Allergic reactions may be difficult to recognize in patients undergoing general anesthesia and surgery. After an anaphylactic event, allergologic assessment is recommended to identify the offending agent and to prevent recurrences. Careful consideration must also be given to future anesthetic management of a patient with history of anaphylaxis.

Case Description: A 50-year old female with lumbar pseudarthrosis was scheduled for an oblique lateral interbody fusion of L2/L3. Past medical history was significant for chronic back pain with prior lumbar fusion of T10-ilium. The patient had tolerated general anesthesia for previous surgeries without reported issue. The patient was induced and intubated without difficulty, and the procedure was started. About two hours into surgery, the patient developed an acute drop in her end tidal CO2 to 20s, with O2 saturations from 100 to 80s and SBP from 150 to 50s. The patient was resuscitated with epinephrine, calcium chloride, and vasopressin with subsequent improvement in pressure and oxygenation. No significant bleeding, bronchospasm, or rash was evident; initial concern was the patient developed an acute intraoperative pulmonary embolism. TEE was performed in the OR, which demonstrated adequate LV and RV contraction, no RV dilatation, but low filling volumes in the LV. No new medications were administered, however liquefied gelfoam powder was injected into the surgical field shortly before the event. Tryptase was obtained two hours after the patient became unstable, which was elevated to 28 ng/ml. The procedure was aborted, and the patient was transferred to the ICU intubated for further care. The patient was stabilized in the ICU, extubated on POD1, and subsequently transferred to the floor.

On review of the case, the patient's history and elevated tryptase were suspicious for anaphylaxis, although a triggering agent was not clearly identified. Following a risk/benefit discussion, the decision was made to complete surgery one week later, despite uncertainty of the etiology of the intraoperative event. Allergy medicine was consulted and recommended avoidance of cefazolin, rocuronium, lidocaine, all latex products, and gelfoam powder. Skin-prick testing was considered but could not be accurately performed until 4-6 weeks after reaction. The patient was pre-medicated, and only drugs that the patient tolerated following the initial operative event were used. The patient tolerated the subsequent procedure well without complications, and was discharged with referral to allergy medicine for further testing.

Discussion: When anesthesia is planned after a suspected episode of anaphylaxis, consult to allergy medicine should be obtained and drugs with a lower incidence of hypersensitivity should be utilized. Skin-prick testing should be performed at least 4-6 weeks following a systemic allergic reaction since test reactivity may be falsely negative in the interim. A thorough discussion of the risks and benefits of proceeding with surgery should be performed with intraoperative preparation to manage an anaphylactic reaction.
**Management of a Patient with Unexpected Placenta Percreta**

**Dr. Lawrence Younan**, **Dr. Taizoon Dhoon**, **Dr. Ho Choi**

1. UC Irvine

**Introduction:**

Placenta accreta is a potentially life-threatening obstetric condition describing when part of the placenta invades and is inseparable from the uterine wall. The reported incidence of placenta accreta is as high as 1 in 533 pregnancies and has increased due to high cesarean delivery rates (1). Placenta percreta describes invasion through myometrium and serosa, occasionally into adjacent organs like the bladder (1). Tranexamic acid (TXA), an antifibrinolytic, exerts its effect by blocking lysine binding sites on plasminogen molecules, enhancing effectiveness of the patient's own hemostatic mechanisms. Fibrinolysis is inhibited and excessive or recurrent bleeding is reduced (3).

**Case:**

We present a 37 year-old female with history of two previous cesarean sections in Ghana at 33 4/7 weeks who underwent scheduled cesarean hysterectomy with diagnosis of placenta accreta. The patient had prior episodes of vaginal bleeding, however on the morning of surgery, she was hemodynamically stable with a starting hematocrit of 31.5 and no coagulopathy. Anticipating hemodynamic fluctuations, blood loss, and frequent lab draws, an arterial line and two large bore peripheral IV's were placed, followed by a combined spinal-epidural with anticipated conversion to general anesthesia. Urology started with a cystoscopy and ureteral stent placement to evaluate placental bladder invasion, however no invasion was seen in the bladder mucosa. However, when the obstetricians began the cesarean, the bladder was adherent to the lower uterine segment. The baby was delivered successfully followed by initiation of Pitocin for uterine tone. The patient began complaining of pain and anxiety and the decision was made convert general anesthesia with endotracheal intubation at this time. Urology was called back to aid in dissection and bladder reconstruction. Significant bleeding was encountered with an estimated blood loss of 15L during the case. TXA was administered after the fourth PRBC. The patient required a total of 21 units of PRBC, 14 Units of FFP, 2 units of Cryoprecipitate, and 3 units of platelets intraoperatively. At the end of the case, the patient was hemodynamically stable without pressors, had no significant base deficit, but the decision was to keep the patient intubated and transfer to ICU. She was extubated the following day and pain control was maintained with her in-situ epidural. She made a full recovery and was discharged with a healthy baby on post-operative day eight.

**Discussion:**

Hemorrhage is potentially life threatening in the maternal population. Uteroplacental blood flow is estimated between 450-750 mL/minute at term. For comparison, approximately 5000 mL/minute flows through the entire circulation of a non-pregnant woman (2). The WOMAN Trial is a randomized control trial that concluded TXA reduces death due to bleeding in women with post-partum hemorrhage and when used as a treatment TXA should be given as soon as possible after bleeding onset (3). This case highlights the severity of obstetrical hemorrhage, the complications that can arise from abnormal placental placentation, and the preoperative planning required of the anesthesiology team.
Management of Intra-Operative Massive CO2 Embolism in the Setting of Main Pulmonary Artery Tear

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Jessica Rodriguez 1, Dr. Timothy Maus 1

1. University of California San Diego

Intra-operative CO2 embolism typically manifests in the form of low cardiac output yielding hypotension, low end-tidal CO2 and desaturation. However, this can present in unexpected forms.

The patient is a 69 yo M with well-controlled hypertension, hyperlipidemia, 60 pack-year smoking history with mild COPD and excellent functional status. He initially presented with hemoptysis for 5 months and significant weight loss. He was found to have a 3.6 cm hypermetabolic mass along the left hilar region and scheduled for Robotic Assisted Left Thorascopy with left upper lobectomy. His physical exam included a height of 6’3”, weight of 66 kg, and BMI of 18.24. His cardiovascular and pulmonary exams were unremarkable with a favorable airway.

The patient was induced in general fashion and intubated with a right-sided DLT. After confirmation of the correct location the patient was started on one lung ventilation. The right lung was ventilated with 500ml TV, RR ~12-16, with a SpO2 of 99% on 0.6 FIO2. The patient's hemodynamics and ventilation remained stable during incision and the initial dissection stages of the case.

Approximately 2 hours into the case the patient's EtCO2 became acutely elevated in high extremes (~70s) with each exhalation. The surgeons were at the stage of separating left bronchus from tumor, but did not report any other changes. Despite altering ventilation settings, the EtCO2 continued to be elevated while hemodynamics and oxygenation remained stable. During bronchoscopy to evaluate tube positioning, copious amounts of blood was noted from both lumens of the DLT. It was then decided to convert to an open thoracotomy. It was identified that through dissection of tumor from left bronchus that the left main PA was violated. This led to continuity between left PA and left bronchus with resultant bleeding into the left lung. A large volume of blood filled the non-ventilated left lung such that it overwhelmed the capability of the DLT balloons and bled into the right lung with inability to ventilate. Additionally the thoracic CO2 insufflation from the robotic surgery with an open PA likely led to entrainment of CO2 into the pulmonary vasculature.

Multiple FOBs were performed to evacuate the right bronchus from blood/clots and an arterial line was placed during conversion to open thoracotomy. An ABG was sent which resulted: 6.89/150/121/27. This first ABG was sent 10 minutes after the initial elevated EtCO2 readings. While ventilation of the patient was managed with 100% FiO2, TV 6cc /kg, RR 18 and PEEP of 5, the surgeon performed an emergent clamping of the left main PA and total left pneumonectomy. The patient’s hemodynamics remained stable with intermittent boluses of vasopressin (4 units total). After pneumonectomy the patient’s ventilation improved. An ABG 30 minutes after pneumonectomy showed 7.11/80/269/21. No further bleeding was noted with FOB. The patient was extubated smoothly and recovered well in the PACU.

Discovering the source and appreciating different presentations of massive intra-operative CO2 embolism while concurrently managing the crisis is integral to a patient’s survival. This case can hopefully provide reference for others in the future.
Background:
Pheochromocytoma is a rare neuroendocrine tumor that commonly occurs in the adrenal gland. Perioperative hemodynamic unpredictability is problematical due to the release of endogenous catecholamines by the tumor. A solid understanding of the altered physiology associated with pheochromocytoma is paramount to ensuring patient safety before, during, and after surgical resection of the tumor.

Case Description:
A 24-year-old male with previously resected pheochromocytoma and type 1 diabetes mellitus presented to his doctor after numerous episodes of severe headache, high blood pressure, and diaphoresis. Computed Topography (CT) scan revealed a right parietal mass requiring craniotomy for removal of the tumor. The current constellation of aforementioned symptoms was suspicious for pheochromocytoma; however, the location of the mass made definitive preoperative diagnosis complicated. Due to increased suspicion, the patient was medically optimized prior to surgery with phenoxybenzamine (alpha blockade) and atenolol (beta blockade) for blood pressure control. Systolic blood pressure prior to surgery was greater than 160 mmHg. Intraoperatively, invasive arterial blood pressure monitoring was employed to monitor the anticipated sizeable hemodynamic fluctuations. Blood glucose was controlled with an insulin pump set to half the basal rate and noted to be 168 g/dL prior to the procedure. Induction of general anesthesia was narcotic-based in order to blunt the increased sympathetic response associated with direct laryngoscopy. Maintenance of anesthesia was achieved with propofol and remifentanil to reduce brain CMRO₂. In addition, end-tidal carbon dioxide level of 30 mmHg was achieved via hyperventilation to decrease the overall size of the brain. Nitroprusside, nicardipine, and nitroglycerin were immediately available to manage hypertension during surgical manipulation of the tumor. The tumor was highly vascular; therefore, two large bore intravenous catheters were placed, and type and crossed blood was immediately available in the operating suite. Intraoperative blood loss and blood glucose levels were monitored with intermittent arterial blood gas measurements. Transfusion was deemed appropriate when approximately 3 liters of blood was lost during the procedure. The tumor was found to be epidural. After the tumor was resected, intermittent boluses of phenylephrine augmented blood pressure as need to maintain mean arterial blood pressure greater than 60 mmHg, but large fluctuations were no longer seen. The tumor was sent to pathology and confirmed histologically to be a pheochromocytoma. Long acting narcotics were avoided to ensure quick emergence and prompt neurological evaluation. The patient was transported to the neurosurgical critical care (NCC) unit after the procedure with stable hemodynamic parameters.

Discussion:
This case demonstrates that a pheochromocytoma is not restricted to typical metastatic locations; rather, it can present in extraordinary locations. Standard preoperative hemodynamic optimization with alpha and beta blockade, use of short-acting intraoperative medications to manage hemodynamic instabilities, and preparation for volume resuscitation are crucial components of perioperative planning to defend the safety of the patient.
Mindfulness & Meditation: Improving Resident Burnout

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Dulce Boucher ¹, Dr. Scott Junkins ¹, Dr. Rob Davies ¹

¹ University of Utah Hospitals and Clinics

Introduction: 50% of practicing physicians experience burnout and residency training is the peak time for distress in medical education. Burnout is characterized by emotional exhaustion, depersonalization, and a sense of low accomplishment. It is linked to anxiety, depression, substance abuse, broken relationships, disillusionment, suboptimal patient care and decreased effectiveness. To address burnout, mindfulness education early in a physician’s career could help improve psychological well being by fostering improved self-care practices, awareness and reflection; a healthier approach to dealing with stress.

Methods: In 2017, incoming anesthesiology residents (CA-1) received a lecture on maintaining wellness through residency during their orientation in July. They were also invited to participate in short mindfulness trainings using the Headspace App.

In addition, at least once per week throughout the rest of orientation, 15 minutes of protected time- “mindfulness moments”- were dedicated to practicing meditation.

Anonymous surveys measuring Burnout and Professional Quality of Life were administered prior to the wellness lecture and mindfulness moments. These surveys were repeated 6 months later in January 2018.

Results: There were 12 participating residents, 3 female and 9 male. Average age was 31 years. 50% of residents reported at least 1 symptom of high burnout prior to the intervention. There were small improvements in mean scores before and after the intervention, however results were not statistically significant.

Discussion: Mindfulness cultivates present moment awareness, improves attention, fosters clear thinking and open-heartedness in a nonjudgmental manner, and is linked to positive emotional states, enhanced self awareness, declines in mood disturbances and perceived stress. Various mindfulness programs have been employed successfully in residents highlighting that regardless of the method used, mindfulness training can significantly impact resident well-being. Based on prior internal data collected by the GME wellness office, resident burnout scores worsen in winter, which correlates with the time our follow-up survey was administered. Although there was no improvement seen in MBI or ProQOL scores in January, notably their scores did not worsen, possibly indicating that the residents did benefit from the intervention. With only 12 participants, this study was likely underpowered to detect a difference in mean MBI and ProQOL scores. This study will be ongoing and repeated for the upcoming anesthesia residents.
Cold agglutinins are auto-antibodies that become activated at temperatures below typical physiologic temperatures. They are present in most humans, however they are rarely clinically significant. Patients undergoing cardiac surgery with cardiopulmonary bypass are frequently exposed to cold cardioplegic solutions and are made hypothermic in order to reduce myocardial, cerebral, and other organ system metabolic demands. This may unmask undiagnosed cold hemagglutinin disease and may lead to hemolysis or agglutination of red blood cells, which may cause end-organ damage. We describe the case of a 76 year old female undergoing mitral valve replacement due to rheumatic mitral stenosis and worsening heart failure symptoms. During pre-operative workup, the patient was found to have cold agglutinins present on her type and screen. We maintained her at a relatively warm temperature while on bypass and utilized warm cardioplegia in both an antegrade and retrograde fashion to minimize the risk of triggering her cold auto-antibodies. This case report describes one method of performing open heart surgery with cardiopulmonary bypass, safely, in a patient with cold hemagglutinin disease.
Sugammadex, a modified cyclodextrin, has revolutionized anesthetic practice as a means of rapid and complete reversal from neuromuscular blockade during general anesthesia. Other than very rare complications, the medication is very well tolerated.

A 72-year-old male with IV Contrast and Penicillin allergies presented emergently for open reduction and internal fixation (ORIF) of Failed Pelvic Symphysis and Left Sacroiliac Joint Fracture Dislocation Fixation. He has significant comorbidities of which include, obstructive sleep apnea, heart failure with preserved ejection fraction, atrial fibrillation, chronic renal insufficiency and a stable thoracic aortic aneurysm. General anesthesia was induced with 200mcg of fentanyl and 160mg of Propofol. He was a grade 2 mask, and required 2 attempts to place an endotracheal tube. An arterial line was placed for hemodynamic monitoring and multiple blood draws. Anesthesia was maintained with isoflurane at 1.0 MAC, a sufentanil infusion at 0.6mcg/kg/hr, pressure control ventilation and rocuronium boluses titrated to 1 out of 4 twitches. The patient was stable for most of the 6-hour procedure, requiring very little hemodynamics support. Nearing the end of the procedure, 250mg of Sugammadex was administered resulting in hypoxemia with a nadir spO2 of 55%. The patient was switched to hand ventilation, with noted decrease in compliance, loss of end tidal CO2, high peak airway pressures and a respiratory rate of 4 breaths per minute. Presuming bronchospasm in this patient after examination, he was given 50mcg of Epinephrine resulting in improvement of his clinical picture. He was re-paralyzed with 70mg of rocuronium at the request of the surgical team, and was hemodynamically stable for the rest of the surgery. During this time an intraoperative transesophageal echocardiogram was performed with no evidence of embolism or right heart strain. Nearing the end of the procedure a second time, 150mg of sugammadex was administered with an almost identical sequence of events to previous sugammadex administration, but ultimately culminating with PEA arrest and noted abdominal muscle rigidity by the surgical team. The patient was successfully resuscitated with 2 rounds of chest compressions and 100mcg of epinephrine. A consensus decision was made by anesthesia and surgical teams to leave the patient intubated and he was transferred to the surgical intensive care unit (SICU) where he was extubated successfully after 12 hours.

This case illustrates the potential for severe complication from sugammadex administration. While bronchospasm in those with bronchopulmonary disease has been described in very limited case reports, muscle rigidity has not. Recognition of the clinical picture after medication administration is integral in instituting the correct life saving maneuvers and prevention of significant morbidity and mortality.
Neuropathy Following Axillary Block for Arteriovenous Fistula Creation: What Was the Cause?

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Carla De la Cruz ¹, Dr. Lauren Steffel ², Dr. Michelle Han ²

¹. University of Washington, Department of Anesthesiology, 2. VA Puget Sound Health Care System

BACKGROUND:
The axillary peripheral nerve block targets terminal branches of the brachial plexus and provides effective anesthesia in procedures involving the mid and distal upper extremity (Davis et al. 1991). However, the rate of neurological complications after axillary block ranges from 0.2-19% (Horlocker et al. 1999). We present a case of postoperative neuropathy following radiocephalic arteriovenous fistula creation, which was initially attributed to axillary block but, in fact, was secondary to the surgical procedure.

CASE DESCRIPTION:
A 67-year-old left-handed man, American Society of Anesthesiology (ASA) physical class IV, with comorbidities of severe interstitial lung disease, obesity, hypertension, coronary artery disease, type 2 diabetes mellitus, and stage 4 chronic kidney disease presented for right radiocephalic fistula creation. He had no known preoperative peripheral neuropathy, and physical examination was unremarkable.

An ultrasound-guided, in-plane axillary block was performed using a 21-gauge, 4-in needle. A 20 ml mixture of 0.5% bupivacaine (10 ml) and 1% mepivacaine (10 ml) without adjuvants was deposited. There was no pain or paresthesia during injection of local anesthetic. The block was utilized as the sole anesthetic for the procedure which was completed in 105 minutes with standard patient positioning.

The patient was contacted by phone on postoperative day one, at which point he reported complete resolution of his nerve block. Three months postoperatively, however, he presented for surgical follow-up, reporting that his right thumb and index finger felt paresthesias, as if they were “dipped in a bucket of ice water.” He also reported an episode of dropping his pistol, which was interpreted as motor weakness. Surgical opinion was that the neurologic deficit was not related to vascular steal or operative trauma, and it was attributed to the regional block.

Neurologic consultation 4 months postoperatively revealed hyperalgesia, sensitivity and numbness around the right thumb and thenar eminence, consistent with injury of the superficial branch of the radial nerve, without motor involvement. The neurological consult deemed surgical trauma versus compressive injury from the fistula as the likely cause. Given the classic anatomical distribution of this sensory nerve, electromyography/nerve conduction studies were deferred.

By 6 months, the patient reported ongoing improvement of symptoms while managed on Gabapentin.

DISCUSSION
Nerve injury is a significant perioperative risk. Identifying its etiology, particularly in the setting of peripheral nerve blockade, presents a challenge to anesthesiologists. In a similar clinical setting, one retrospective study identified neuropathies in patients undergoing upper extremity surgery under axillary block, with 11% clinically identified as anesthesia-related and 89% as of surgical etiology (Horlocker et al. 1999).

This patient’s subjective “ice-cold” sensation of this thumb and index fingers, initially suggested a vascular cause.
of the deficit. Furthermore, the evolution of the patient's neurologic deficit make it unclear as to the initial extent of the nerve injury. This patient's atypical and delayed presentation in a specific distal sensory nerve distribution suggest a non-anesthetic cause, and possibly due to an expanding arteriovenous fistula.
Novel Airway Management in a Patient with Penetrating Trauma to the Neck

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Matthew Bergsten 1, Dr. Lev Deriy 1

1. University of New Mexico Hospital

Background: Patients that have sustained penetrating trauma to the neck are at increased risk for a myriad of airway complications. These can include swelling and direct trauma to structures in the oropharynx/pharynx, aspiration of blood or even damage to the trachea. Securing the airway of these patients can pose particular difficulty to anesthesiologists, and sometimes requires unique management.

Case Description: A 31-year-old male sustained a self-inflicted neck laceration with a serrated bread knife. Upon arrival to the emergency department closer examination revealed a linear laceration extending from the angle of the mandible in a full thickness wound with a clear view into the pharynx and visible epiglottis. There was no apparent damage to surrounding vascular structures. The patient maintained normal oxygen saturation despite his injury and was hemodynamically stable. The patient was taken emergently to the operating room to establish a definitive airway and repair the pharynx as well as to perform bronchoscopy and possible esophagoscopy. Upon arrival to the operating room the patient was given midazolam for sedation but was otherwise kept awake to maintain spontaneous ventilation. The Ear Nose and Throat (ENT) physicians attempted intubation through the wound but intubated the esophagus. Afterward an Anesthesia provider lifted the epiglottis with a laryngoscope blade through the incision and the endotracheal tube was placed via direct visualization through the vocal cords. The patient was then induced with general anesthesia. After the airway was secured the ENT surgeons explored the wound, determined there was no injuries to any of the major neck arteries or veins. The decision was made to close the laceration at which point the ENT surgeons placed an endotracheal tube via the oropharynx, replacing the tube originally placed through the pharyngotomy. After closure of the laceration a tracheostomy tube was placed. Bronchoscopy and esophagoscopy were negative for injury to either the trachea or esophagus. The patient was transported to the Intensive Care Unit for further management.

Discussion: Airway management in patients with acute penetrating trauma to the neck can be difficult to manage for anesthesia providers. Depending on the exact location and extent of the injury various techniques can be used to secure the airway including direct laryngoscopy, video assisted laryngoscopy, fiberoptic bronchoscopy, tracheostomy, or direct intubation via the incisional wound. It is important to have a multidisciplinary approach when possible including ENT or general surgery for potential surgical airway.
Obstetric Anesthesia Consideration and Management of a Parturient Patient with Neurofibromatosis

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Andrew Mai¹, Dr. Taizoon Dhoon¹, Dr. Fiyinfoluwa Ani¹
¹. UCI Medical Center

Case Description: 25 year old female G3P0020 37.1 weeks gestation age with past medical history of neurofibromatosis type 1 (with disseminated numerous cutaneous neurofibromas and caufe-au-lait spots) and medically refractory seizure disorder presents to labor and delivery department for scheduled cesarean section.

Evaluation: Patient had an in person consult with obstetric anesthesia team two months prior to review her CT images of her lumbar region (vertebral, epidural, and spinal anatomy), perform a detailed physical exam, and discuss the anesthetic options for her planned cesarean section at term.

Learning objectives:
- Review of neurofibromatosis
- Anesthetic considerations for patients with Neurofibromatosis
- Obstetric considerations/options for parturient patients with neurofibromatosis and decision process for this particular patient
Occlusion of a Aberrant Right Subclavian Artery From Insertion of a Transesophageal Echocardiographic Probe and Implications During Cardiac Surgery

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Steven Larsen ¹, Dr. Ned Morgan ¹

¹ University of Utah Hospitals and Clinics

Intraoperative Transesophageal Echocardiography (TEE) is an invaluable tool in cardiac surgery, due to the combination of its excellent ability to aid in real-time evaluation and management of intraoperative conditions and its low reported complication rates. Many comprehensive papers examining these complications, however, failed to even mention the consideration and implications of an Aberrant Right Subclavian Artery (ARSA), a rare but normal aortic arch variation where the Right Subclavian Artery takes off distal to the Left Subclavian Artery. The ARSA sometimes takes a retroesophageal course, making it susceptible to compression by intra-esophageal structures, such as a TEE probe. Based on autopsy findings, ARSA has a prevalence of ~0.7%, yet around 70% of people are asymptomatic, making its diagnosis and the suggestion of it in discussions related to TEE complications quite rare. However, given the large amount of TEE exams performed and ARSA’s prevalence of nearly one in a hundred people, occlusion likely happens more often than it’s reported.

Compression of an ARSA with TEE probe placement, significantly diminishes, if not entirely occludes blood flow to the right upper extremity depending on the degree of obstruction. This leads to loss of blood-flow dependent monitors and, more worrisome than the inconvenience of losing reliable monitors, the concern of downstream ischemia from arterial occlusion.

We present a case here where the existence of ARSA in a previously asymptomatic patient disrupted peri-induction anesthetic management and subsequently played a role in delaying weaning from extracorporeal membrane oxygenation (ECMO). A 78 year-old, 64 kg woman presented for ascending aorta repair and two-vessel CABG. Preoperative evaluation confirmed arch disease, as well as high grade stenotic coronary lesions. Intraoperatively, an awake Right radial arterial line was placed followed by straightforward induction and intubation. Then, as shoul-der roll and TEE probe was placed, arterial waveform completely dampened. Right-sided NIBP cuff also did not register. Left extremity pulse oximeter plethysmography appeared unchanged, there was no change in EtCO2, a strong right carotid pulse was appreciated, and NIBP cuff switched to the left side returned normal values. Subsequent placement of left radial arterial line confirmed hemodynamic stability. Examining patient’s prior chest CT scan revealed the ARSA. The TEE probe was removed and right radial arterial waveform returned, matching that of the left side. TEE continued to be intermittently used in the case as needed, particularly while coming off pump. Arch repair and CABG with LIMA to the LAD and RIMA to the RCA were successfully completed. However, right ventricular function surprisingly limited ability to come off pump and patient went to the ICU from the OR on VA-ECMO. Over the next two days, the patient was twice brought back to the OR for ECMO decannulation after passing ICU weaning trials, failing both attempts. It was then realized that with placement of RIMA to RCA, blood supply to the right ventricle was dependent upon the ARSA. Thus, the right ventricle struggled to wean off ECMO due to ischemia each time the TEE probe was placed to assess for ability to come off ECMO.
Opioid free management of a pediatric patient undergoing open inguinal hernia repair with an Erector Spinae Plane Block

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. Caleb Stalls**, **Dr. Jorge Rocha**, **Dr. Andrea Sandoval**, **Dr. Timothy Petersen**, **Dr. Jessica Ming**, **Dr. Ricardo Falcon**, **Dr. Codruta Soneru**

1. University of New Mexico Hospital

**Introduction:**
The most common regional procedures used to assist with analgesia for inguinal hernia repair (IHR) are ilioinguinal nerve block, transversus abdominis plane (TAP) block, and paravertebral (PVB) block. Paravertebral blockade at the T12 and L1 levels is effective at reducing postoperative pain scores, analgesic requirement, and decreasing incidence of nausea/vomiting when compared to ilioinguinal nerve block or TAP block in the adult population(1), but is rarely used in children at our institution.
The erector spinae plane (ESP) block is a novel fascial plane block first described to treat thoracic neuropathic pain that provides very similar analgesia as PVB.(2) It has also been used successfully for IHR for a premature infant.(3) We describe opioid free intraoperative and postoperative course in a pediatric patient that underwent IHR with an ESP block for analgesia.

**Case presentation:**
A healthy 4 y/o 19.5 kg male presented for right IHR. After induction and securing of the airway, the patient was placed in the left lateral decubitus position and the skin prepped with chlorhexidine. ESP block was performed under ultrasound guidance at L1 with 7 ml of 0.25% Bupivacaine. The probe was placed in the midline and the sacrum identified and then the lumbar transverse processes identified one by one as the US probe was moved cephalad. Needle tip was visualized and adequate local anesthetic spread was noted both cephalad and caudad at the L1 transverse process.
No narcotics were used intraoperatively or postoperatively. Toradol 10 mg was administered at the end of the case. FLACC score was zero in PACU. Intravenous Tylenol was administered in PACU preemptively before changing clothing. Parents reported 1 dose of Tylenol given preemptively at bedtime, not for a specific complaint of pain.

**Discussion:**
In adults, chronic pain after IHR has a reported incidence of up to 24%. (4) Strategies to reduce the risk of persistent post-surgical pain have been proposed including preemptive analgesia, aggressive management of acute pain, and multimodal analgesia.(5) Therefore, minimizing opioid use while providing adequate pain control is a reasonable goal for patients undergoing IHR.
The TAP and ilioinguinal blocks carry the risk of small/large bowel perforation. Also, several case reports and clinical studies have described leg weakness after this technique and suggest that it may be caused by inadvertent femoral nerve block (6). Should the local anesthetic track down in the inguinal canal, it might distort the anatomy and increase the difficulty of surgery.
The PVB decreases perioperative opioid consumption and post-operative nausea when compared to ilioinguinal nerve block, but carries the risk of pneumothorax, pleural puncture, epidural spread, and longer time to perform. The ESP block provides an alternative technique that appears to have less of the risks associated with PVB, and is technically easier to perform. Additionally, the ESP block requires less depth to reach the transverse process and has been used recently in morbidly obese patients undergoing bariatric surgery with promising results. (7) Future studies should include comparison of PVB to ESP block, and the effects of ESP block on persistent post-surgical
pain.
**Optimization of COLDS scoring system: A pre-anesthetic risk assessment tool**

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. Robert Shaw**, **Dr. Catherine Nguyen**, **Dr. Marsha Kristel Bernardo**, **Dr. Lisa Lee**

1. UCLA

**Background:** Upper respiratory tract infections (URIs) in the pediatric population are frequently encountered in the perioperative setting. Anesthesia providers need to utilize various tools in order to deem a patient safe to proceed with surgery. The COLDS score was developed by Lee and August as a way to risk stratify pediatric patients with upper respiratory infections. Previously we showed that this score to have a good predictive value for perioperative respiratory complication (AUC=0.69), however we postulated that there was room to improve this scoring system. This study aimed to optimize the current COLDS score to yield better predictive value.

**Methods:** IRB approval was obtained prior to data collection. Patients 6 years old and under presenting for any type of procedure were included. Exclusion criteria were current endotracheal tube or tracheostomy and patients with congenital heart disease. For optimization of the COLDS score, we attempted to improve the predictive ability of the scoring system by changing the key from a 1, 2 and 5 score for each category to one determined by integerizing the beta values obtained by logistic regression. We also attempted to improve the predictive ability of COLDS by weighting each of the 5 categories that compose the COLDS Score by logistic regression. Finally, we created a Cox proportional hazards model to predict the likelihood of any perioperative respiratory complication and a negative binomial model to predict the number of expected perioperative respiratory complications with a given COLDS score.

**Results:** Data was collected on 436 patients over 6 months. Re-keying of the COLDS score improved AUC to 0.70, while reweighting the COLDS score categories improved the AUC to 0.71. We found in our logistic regression model that the terms for onset and surgery type were not significant. Removing these from the COLDS score (CLD score) yielded an AUC of 0.70. Since the real question to be answered is whether to proceed or not with a recent URI, rather than whether or not to have the surgery at all, we separated the variable risk factor of having a URI, from the rest of the immutable risk factors (lung disease, airway device to be used and surgery type) and created a Cox Proportional Hazards model and a negative binomial model to show risk of perioperative respiratory complications with and without URI.

**Discussion/Conclusions:** The re-keying of the COLDS score greatly increased the complexity of the scoring system without commensurately improving its predictive value, so the 1, 2, 5 scoring key is good as it stands. Reweighting the categories did improve its predictive value. The predictive models presented may be useful as teaching tools for providers to their families about the expected increase in risk of a respiratory complication when the patient has had a recent URI. Additionally, this validated scoring system can be a useful decision-making tool for practitioners.
Technological advancements in medical devices have increased positive outcomes in difficult airway management. Although the Glidescope Video Laryngoscope (Verathon Inc.) has been demonstrated to have a higher intubation success rate than Macintosh direct laryngoscopy in novice physicians, there have been reports of complications. Despite reduced lifting force required and optimized glottic exposure, a significantly higher rate of injury was also reported with use of video laryngoscopy compared to direct laryngoscopy. In this case report, we describe a recent incident while using the Glidescope in an anticipated difficult intubation.

A 61-year-old male with trigeminal neuralgia, obstructive sleep apnea, and poorly controlled hypertension (ASA 3) was evaluated preoperatively for right trigeminal nerve decompression with cranioplasty. Airway assessment revealed Mallampati III, short thyromental distance (<6.5 cm), class 1 upper lip bite test, and short-thick neck with normal extension. Dentition, inter-incisor gap, palatal conformation, and mouth opening (>4 cm) were normal. Intravenous Midazolam was administered prior to transport into the operating room. Following adequate preoxygenation and hemodynamic stability (BP 160/85, P75, SaO\textsubscript{2} 100%), induction with Fentanyl, Propofol, and Succinylcholine was uneventful.

Intubation was attempted by an off-service intern with limited experience. The Glidescope 4 and Gliderite reusable stylet properly inserted into a Covidien Mallinckrodt 7.5 Endotracheal Tube (ETT) were utilized. This was unsuccessful despite a Cormack-Lehane Grade 1 view, due to mild resistance. Between ventilation attempts, a small amount of blood was noted in the oropharynx and suctioned. On second attempt, minimal resistance was met as the ETT passed the oropharynx and a grade 1 view was visualized on the video monitor. The attending anesthesiologist assisted in placing the ETT through the vocal cords, as the resident had difficulty with rotation and alignment. Placement was confirmed by EtCO\textsubscript{2}, bilateral chest rise, and auscultation.

Upon removal of the video laryngoscope, the attending anesthesiologist noted soft tissue encircling the ETT. On further inspection, the ETT punctured soft palate and anterior tonsillar pillar, lateral to the uvula, making a through-and-through injury. Nonetheless, the patient was successfully intubated. An Otolaryngology consult was obtained for the right anterior tonsillar pillar perforation. With ENT at bedside, the ETT was removed and replaced using the Glidescope, paying special attention to removal and passage of the ETT in the oropharynx. Minimal bleeding and edema was noted. ENT placed Epinephrine soaked pledgets at the site of injury.

The case proceeded as planned ending with simple repair of 2-3 cm palatopharyngeal laceration with six interrupted chromic sutures while noting minimal swelling and blood loss. Viscous lidocaine was used postoperatively for throat pain and the patient was discharged without further complications on post-operative day one.

Precipitating these injuries can be multi-factorial circumstances including, but not limited to, operator expertise, use of the rigid stylet, and lack of direct observation passing the ETT into the oral cavity prior to visualization on distally placed video laryngoscope camera. When any resistance is encountered, there must be heightened awareness of adjacent anatomic structures and their proximity to the insertion path. Ease of use should not result in preventable injuries.
Paravertebral Catheter Placement for Post-Mastectomy Pain Management

Dr. Delara Brandal, Dr. Neesa Patel, Dr. Shabnam Majidian
1. UCLA Department of Anesthesiology and Perioperative Medicine

Background:
Over 35,000 women undergo mastectomy annually. Acute post-mastectomy pain is a significant perioperative concern, and pain during the acute postoperative period is frequently moderate or severe. Advanced anesthetic strategies for management of post-mastectomy pain have traditionally been limited to paravertebral blocks and thoracic epidurals. Recent randomized trials have demonstrated that extending a single-injection paravertebral block with a multiple-day infusion results in improved analgesia following mastectomy.

In this case series, we describe three patients who received paravertebral catheters for management of their post-mastectomy acute pain and how we translated the recent findings in the literature into our routine clinical practice. Unlike the majority of prior studies, our paravertebral catheters were placed lower at the T4-5 level rather than the T3 level.

Case Descriptions:
Informed consent was obtained from all patients. All catheters were placed in designated block rooms prior to surgery with the patient in prone position. Standard monitors were applied, and patients received sedation with intravenous midazolam and/or fentanyl. Patients were followed postoperatively with visits while on the floor and then with daily phone calls after discharge until the ambulatory catheter was discontinued.

We report three cases of successful paravertebral catheter utilization for management of acute post-mastectomy pain. All three patients in our case series were discharged home by the morning of postoperative day two and reported pain scores of zero by postoperative day three. Patients required at most one dose of intravenous or oral rescue pain medication postoperatively (Table 1).

Discussion:
Our cases corroborate recent randomized trials demonstrating that paravertebral catheter infusion results in improved analgesia following mastectomy. Our findings augment the current literature in that our paravertebral catheters were placed at the T4-5 level, whereas the majority of recent investigations involving breast surgery and paravertebral catheters utilized the T3 level for catheter insertion. Potential advantages of placement at a lower thoracic level include decreased risk of high spinal anesthesia and other adverse events. The T4-T5 level may be a safer and equally efficacious level for paravertebral catheter placement.

Our case series demonstrates that variable infusions with both bupivacaine and ropivacaine can be successfully utilized to optimize patients' outcomes. A recent study explored the benefits of paravertebral catheters for breast reconstruction, but showed that pain scores were similar to patients receiving a single paravertebral injection alone. Our patient who received a paravertebral catheter for combined mastectomy and breast reconstruction was discharged home on postoperative day two and reported a pain score of zero on postoperative day three. Our successful use of paravertebral catheter for breast reconstruction is encouraging, and larger randomized trials are needed to investigate the potential benefits of extending the use of paravertebral catheters to breast reconstruction surgery.

In summary, our case series demonstrates that paravertebral catheters inserted at lower than conventional
level (T4-5) and including variable infusions of local anesthetic are a safe and effective strategy for multimodal analgesia in post-mastectomy patients and may be extended to breast reconstruction procedures.
Patient Outcomes of AngioVac Procedures and Anesthetic Management

Dr. Isaac Jenabi¹, Dr. Komal Patel¹, Dr. John Moriarty², Mr. Tristan Grogan², Dr. Johanna Schwarzenberger¹

¹. UCLA Anesthesiology & Perioperative Medicine, 2. UCLA Medical center

Objective:
The introduction of transcatheter aortic valve implantation through the PARTNER trials stressed a multidisciplinary approach using extended time-outs and checklists to reduce learning curve associated morbidity and mortality. Other percutaneous, potentially invasive, procedures appeared in the non-operating room suites without such recommendations. AngioVac aspiration cannula (AngioDynamics, Latham, NY) uses extracorporeal veno-venous bypass to remove intra- and extra-cardiac thrombi. It has gained popularity as a minimally invasive alternative to surgical thromboembolectomy, with success rates of more than 80%.

Such procedures require attention to patient selection and risk stratification, and particularly to the appropriate care team who is comfortable with percutaneous approaches to clot retrieval. We sought to delineate clinical conditions and physician expertise that yielded a favorable patient outcome. We hope that this data can be used to create a predictive model and protocol to govern future anesthesia support of high risk interventional procedures.

Methods:
Single center retrospective chart review of AngioVac procedures performed August 2013 to February 2017.

Three primary outcomes were selected: hypoxia, hypotension, and extubation following the procedure.

33 patients were reviewed and 2 were excluded due to use of MAC anesthesia. The remainder underwent general anesthesia. 1 patient died intraoperatively. All patients had some form of intra-, extra-cardiac clot or both.

Hypoxia was defined as an SpO2 <92%, hypotension was defined as a 20% change from baseline blood pressure for >5 minutes. Other data points were reviewed including ASA Physical Status, involvement of cardiac or ICU trained anesthesiologists, number of hand-offs, time of day, invasive line placement, TEE monitoring (by anesthesiologists versus cardiologists), patient's disposition to the Post Anesthesia Recovery Unit or Intensive Care Unit, and mortality.

Patient demographics and surgical variables were compared between groups using the t-test for continuous measures and chi-square test (or Fisher’s exact test) for categorical variables. Statistical analyses performed in SPSS V25 (Armonk, NY). P-values <0.05 were considered statistically significant.

Results:
Patients with hypoxia were more likely to have intra-cardiac pathology. They required higher number of vasopressors/inotropes 2.3 vs .76 (P=0.001), as evidenced by a higher inotrope score 8.5 vs 1.53 (P = .0040). The majority of patients that remained intubated post-procedurally (n=16) were those that arrived intubated to the procedure 43.8% vs 6.7% (P = 0.037). In addition, they received more vasopressors/inotropes 1.88 vs 0.6 (P = 0.004) and were post-procedurally admitted to ICU (P<0.001). These patients were more likely to be deceased 75% vs 33.3% (P =0.020).

Criteria such as age, sex, ASA physical status, presence of cardiac and/or ICU-trained anesthesiologists versus general anesthesiologists, time of day, number of hand-offs, TEE use, TEE Operator type, did not reach clinical significance.

Conclusion:
Our data shows that use of the AngioVac procedure in ICU patients show poor outcomes, likely due to underlying morbidities.
A larger sample size is required to discern differences in the other data points in order to construct a predictive model for optimal clinical coverage for AngioVac interventions.
Mixon Lance, Der Christopher, Chawla Gulraj
Harbor-UCLA Medical Center Department of Anesthesiology

Background: Radical mastectomy has been known to be a painful surgical procedure. Anesthetic options include paravertebral thoracic block which has been the mainstay for postoperative analgesia. More recent literature suggest that pecs block is superior to paravertebral block in terms of post-op analgesia requirements. However none have been reported on parturients undergoing radical mastectomy.

Case Presentation: We report this case of a 43 YO G2P1 at 25 weeks with inflammatory breast CA and recent chemotherapy with subsequent radiation undergoing radical mastectomy.

Methods: Our choice of anesthetic included a preoperative pectoralis nerve block and general anesthesia for OR maintenance, while monitoring intraoperative fetal heart rate, with preparation for emergency C-section.

Conclusion: Three weeks post operatively, at 28 weeks a Cesarean delivery was performed in the setting worsening fetal heart tracing. No supplemental narcotics were required until post operative day number five.
Background: Pectoralis nerve blocks are a relatively new ultrasound-guided technique that have been very beneficial in managing post-operative thoracic pain from procedures such as mastectomies, thoracotomies and rib fractures. However, the nerve blocks have rarely been utilized as the primary form of intraoperative anesthesia for mastectomies. Given the surgical field for a mastectomy, it is worth considering coverage for both anterior chest wall as well as the axilla. Being able to use regional anesthesia in lieu of general anesthesia for a mastectomy has significant potential benefits, particularly in cancer patients with significant cardiac or pulmonary disease, and/or chronic pain at baseline.

Case description: This case describes a 51-year-old woman with unilateral breast cancer, status post chemotherapy treatment, who received two pectoralis injections as the primary anesthetic for a left breast simple mastectomy and axillary lymph node dissection: specifically, between the pectoralis major and minor (also known as a pectoralis I block) and between the pectoralis minor and serratus muscles (pectoralis II block). Her significant medical history included anxiety, chemotherapy – specifically, docetaxel, carboplatin, Herceptin, and perjeta – and an EF of 50% upon recent cardiac workup.

The pectoralis nerve injections were performed in the preoperative area, using ultrasound, with no sedation. A few minutes later, the patient’s sensory perception to sharp prick was tested, and deemed sufficiently blocked. Intraoperatively, the patient received 2mg midazolam, as well as a total of 25mcg fentanyl, and a propofol infusion (ranging 0-150mcg/kg/min) for the majority of the case for additional sedation. The patient did not have significant pain, tolerated the anesthetic and the surgery well, and remained alert enough to follow commands and remain still when needed.

Discussion: Multiple studies have evaluated pectoralis nerve blocks for management of post-surgical mastectomy pain. A randomized controlled trial (RCT) by Bashandy and Abbas in 2015 found lower visual analog scale pain scores and lower opioid requirements in patients who received combined Pecs I and II blocks as opposed to a control group; another RCT by Kulhari in 2016 found increased duration of analgesia with the pectoralis nerve block as compared to paravertebral blocks. In addition, patients with pectoralis II blocks have been demonstrated to be superior for pain control in comparison to serratus anterior and paravertebral nerve blocks. However, there has been little investigation in the use of these blocks as the primary method of intraoperative anesthesia and analgesia. Benefits include avoidance of general anesthesia, superior pain control, and opioid sparing. From one RCT, there is also support that the Pec II nerve block may provide better analgesia than the Pec I block, if a catheter is used. Given that this patient tolerated the mastectomy well, without requiring general anesthesia, there are strong implications that these nerve blocks could be used successfully for future patients receiving mastectomies - further investigation needs to be done to pursue the pectoralis nerve blocks for intraoperative anesthesia.
Pediatric Abdominal Neuroblastoma Causing Severe Restrictive Lung Disease and Hypertension: Perioperative Management

Dr. Jeffrey Chan ¹, Dr. Corrie Anderson ²

¹. University of Washington, Department of Anesthesiology, ². Seattle Children’s Hospital, Pediatric Anesthesiology

Background: Neuroblastomas are catecholamine secreting tumors that arise from the sympathetic nervous system and account for 7-8% of pediatric tumors. Although they can synthesize catecholamines, hypertension is quite uncommon. We present a case of not only the largest pediatric intrabdominal neuroblastoma published among case reports, but one that also caused severe restrictive lung pathology and hypertension to highlight an atypical presentation of a pediatric malignancy and the importance for multimodal therapy for anesthetic care.

Case Description: A term 2-year-old 17kg boy with no medical history presented with abdominal distention. Computed tomography (CT) demonstrated a 19x17x14cm mass in the abdomen, and biopsies confirmed the diagnosis of a stage III neuroblastoma. Additional chest imaging demonstrated diminished lung volumes from the encroaching tumor which was paralleled clinically with worsening respiratory distress requiring BiPAP ventilation. The child was also hypertensive with mean arterial pressures as high as 140mmHg. Given the clinical deterioration, surgical excision was pursued.

Upon arrival in the operating room, intravenous induction via a preexisting chest-port with 20mg of propofol alongside infusions of hydromorphone (3mcg/kg/hr), dexmedetomidine (0.8mcg/kg/hr), and nicardipine (0.75mcg/kg/min) was performed. Intubation was successful with a 4.0-cuffed endotracheal tube via direct laryngoscopy with sevoflurane maintenance. A radial arterial line was placed as well as a T9/T10 epidural infusing 0.1% ropivacaine with clonidine (1mcg/ml) at 5ml/hr. Hemodynamics through induction and maintenance were stable with our pharmacologic interventions and neuraxial anesthetic.

Flow-volume loops demonstrated an obstructive pattern of the inspiratory limb with peak airway pressures >25cmH2O prior to incision. Pressure control ventilation with 5-6mm Hg of positive-end-expiratory-pressure (PEEP) and a prolonged inspiratory/expiratory(I:E) ratio allowed us to achieve adequate weight-based tidal volumes(TV). TV's improved from approximately 150ml to 250ml and inspiratory obstruction of the flow/volume loop decreased with surgical debulking and our ventilator settings. However, as blood loss accumulated over the 18-hour surgery, hypovolemic hypotension required 6 units of packed red blood cells, 2 units of fresh frozen plasma, and 6 units of platelets with subsequent ABGs demonstrating adequate resuscitation. Epinephrine (0.1mcg/kg/min) and dopamine (20mcg/kg/min) were initiated towards the end of the case for support. The patient tolerated the procedure well and was transferred to the intensive care unit for recovery.

Discussion: We demonstrated the safe anesthetic management of a critically ill pediatric patient with a massive intrabdominal neuroblastoma with uncommon features. The patient presented with a neuroblastoma far larger than commonly seen and the associated hypertension and restricted lung physiology is exceedingly rare. Hypertension was likely secondary to tumor compression of the renal arteries, making the typical preoperative treatment with alpha and beta blockers as used in the management of pheochromocytomas inappropriate. Rather, multimodal therapy with neuraxial anesthesia, multiple continuous vasodilators including alpha2 agonists, calcium-channel-blockers, and opioids, and ventilator setting optimization was ideal for this atypical presentation. Without our...
comprehensive preanesthetic planning unique to the patient’s pathologies, the patient’s predisposition to hemodynamic instability and ventilation difficulty would most likely have caused severe intraoperative complications and poor outcomes.

References:

Pediatric Myringotomy Tube Placement in an Ambulatory Surgery Center: Leveraging Real World (EMR) Data and SPC Charts to Optimise Quality Improvement Cycles

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Holly Snyder 1, Dr. Laura Duling 2, Dr. Daniel Low 2
1. University of Washington, 2. Seattle Children’s Hospital, Pediatric Anesthesiology

Introduction:
Myringotomy tube placement is one of the most common surgical procedures performed in the pediatric population. Oftentimes, these procedures are done without intravenous access which limits pain management options. There is little evidence in the literature to inform best anesthesia management. We are attempting to establish which anesthetic protocol gives the best patient outcomes in the context of PACU length of stay and postoperative pain scores.

Methods:
Healthy ASA1 and ASA2 patients aged from 2-12 years undergoing day case myringotomy tube placement under sevoflurane general anesthesia who were given no premedication versus oral acetaminophen versus intranasal fentanyl. Outcomes were PACU length of stay and postoperative pain as a numerical value of highest pain score by FLACC, FACES or numerical scores. Retrospective review of aggregated patient outcomes from 944 patient charts was performed using QI advisor (MDmetrix, Seattle, USA) utilizing standard process control rules with outcomes measured by special cause variance to determine if outcomes improved, deteriorated or were unchanged following a change in protocol.

Results:
Analysis of the first protocol change from no analgesia to preoperative acetaminophen, PACU length of stay mean time was stable. No special cause variation detected before or after protocol change. For postoperative pain scores, the mean is stable but there are 8 consecutive points below the mean which constitutes special cause variation towards improvement. Analysis of the second protocol change from preoperative acetaminophen to intranasal fentanyl, mean PACU length of stay was stable throughout. The maximum pain scores demonstrated a stable mean. Sporadic breaches of the lower control limit were detected, but no trends post change detected. Overall, max pain score for no analgesia (2.50), preoperative oral Tylenol (1.60), intranasal Fentanyl (1.58).

Conclusions:
In healthy pediatric patients age 2-12 years, preoperative oral acetaminophen significantly improves PACU pain scores when compared to no analgesia for myringotomy tube placement and PACU length of stay is unchanged. There is no change in either pain score or length of stay when comparing preoperative acetaminophen to intranasal fentanyl.
Pentalogy of Cantrell: Case Report and Review of Maternal and Fetal Anesthetic Management

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Michael Jung 1, Dr. Stephanie Lim 1, Dr. John Markley 1, Dr. Pedram Aleshi 1
1. UCSF Medical Center

Background: Pentalogy of Cantrell is a rare congenital condition consisting of the pentad of a ventral abdominal wall defect, anterior diaphragmatic defect, lower sternal defect, pericardial defect, and intracardiac anomalies. The disorder is estimated to be in 5.5 in 1 million births and can be associated with life-threatening complications. Prognosis depends on the severity of the defects and associated cardiac anomalies.

Case Description: We present a case of a 28-year-old G3P2 female with a male fetus at 38 weeks gestation with severe form Pentalogy of Cantrell with ectopia cordis and omphalocele. The mother underwent repeat caesarean section under combined spinal epidural anesthesia. A classical caesarean section with large abdominal incision was utilized to minimize pressure on fetal sternal and abdominal defects. The fetus was born with APGARs 4 and 6, underwent planned intubation and was admitted to the neonatal ICU. Postnatal cardiac imaging revealed tetralogy of fallot and major aortopulmonary collateral arteries. At 3 months old, the infant completed a prolonged ventilator wean to CPAP and course complicated by omphalitis, feeding intolerance, and agitation. Staged surgical repair including cardiac repair, tissue expanders, and possible tracheostomy is planned. Maternal course was complicated by postoperative incisional pain.

Discussion: A review of the literature accompanies this rare but significant disorder. Pentalogy of Cantrell patients will require surgical intervention and anesthetic management for repair of cardiac, diaphragmatic, and additional associated defects. Anesthetic management of the mother includes analgesia for classical caesarean delivery, whereas fetal anesthetic management will be influenced by multiple factors such as the cardiac, pulmonary, and abdominal defects. In addition to radiographic and echocardiographic workup, cardiac catheterization may be indicated in the early neonatal period. Intraoperatively, hemodynamic monitoring, careful positioning, and attention to fluid losses and sequelae of prolonged neonatal ventilation are among critical factors. In most cases, the disorder is fatal without intervention and affected infants will require complex medical care.
Pericardiectomy for severe constrictive pericarditis of uncertain etiology

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. John Thurston, Jr. MD
1. Cedars Sinai Medical Center

Introduction:
Constrictive pericarditis is defined by scarring and inflammation of the pericardium. This renders pliable pericardial tissues, rigid and inelastic. Diastolic filling becomes impaired as a result of impaired relaxation. The consequences are low cardiac output with preserved ejection fraction and cardiogenic shock.

Case Presentation:
80 y/o male PMH of, MI with LAD stent, HLD, Afib, PAD, mild AS, ESRD on HD, Hilar mass, recurrent pleural effusions. Long course of declining health with admission for chf exacerbation with persistent pressor requirement. A cardiac MRI and CT chest were performed on day 2 and were consistent with constrictive pericarditis, pericardial thickening, bilateral pleural effusions. Left Heart cath – equalization of diastolic pressures in RV, LV, preserved EF, and a patient stent

Presented to surgery on HD 9 on norepinephrine and vasopressin infusions. Initial vitals were HR: 91, BP: 84/54, RR: 24, spo2: 99% access included PICC line, dialysis access catheter RIJ, Radial A-line. After pre O2:100% O2 by anesthesia was induced and a double lumen tube secured and confirmed by fiberoptic. maintainace included inhalational gas and IV versed. TEE and 9F cordis placed in RIJ under ultrasound and swan ganz catheter inserted to 20cm.

Instability during case necessitated blood products and escalation of vasopressors. surgery was uncomplicated and patient was taken to ICU intubated on pressors. Weaned pressors at POD 12.
Post op course complicated by recurrent pleural effusions, respiratory failure requiring tracheostomy, ESRD on HD, cirrhosis.

Discussion:
constrictive pericarditis is diagnosed by H&P, ECG, Echo as indicated Left heart cath, Cardiac CT or Cardiac MRI. Pericardial thickening with or without effusion, diminished ECG voltage and Venticular interdependence on echo and Marked respiratory variation in mitral and tricuspid inflows are characteristic findings. Tissue Doppler shows preservation or increase of normal e’ velocities with reversal of medial/lateral relationship.

Treatment includes trial of supportive care with temporizing measures followed by Definitive therapy with early pericardiectomy and decortication. It is a high risk procedure performed by median sternotomy or left anterior thoracotomy with cpb on standby. Damage to cardiac chambers or adjacent structures are a concern.

Outcomes vary in this condition depending on etiology (idiopathic, post surgical, post radiation, connective tissue disease) and higher mortality associated with incomplete pericarctectomy compared to complete pericardectomy.

References:
Sivakumar Ardhanari, Bharath Yarlagadda, Vishal Parikh, Kevin C. Dellsperger, Anand Chockalingam, Sudarshan Balla, Senthil Kumar, Systematic review of non-invasive cardiovascular imaging in the diagnosis of constrictive pericarditis, In Indian Heart Journal, Volume 69, Issue 1, 2017, Pages 57-67
Stefan C. Bertog, Senthil K. Thambidorai, Kapil Parakh, Paul Schoenhagen, Volkan Ozduran, Penny L. Houghtaling,
Perioperative Anaphylactoid Response

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Derek Sing 1, Dr. Carlos Casamalhaupa 1, Dr. Nicole King 1

1. Naval Medical Center San Diego, CA

Introduction: Anaphylaxis during the perioperative period is considered a rare but deadly complication of anesthesia, with incidences estimated at 1 in 3500 to 1 in 20,000 surgeries and mortality rates between 3 to 9%. It can manifest differently from cases not associated with anesthesia, most commonly presenting with cutaneous symptoms, hypotension, difficulty in mechanical ventilation, and cardiovascular collapse.

Case: A 29 year-old male status post oral surgery 3 weeks ago presented with increasing submandibular pain concerning for abscess formation requiring incision and drainage. Following a rapid sequence induction, he was intubated quickly with no secretions or purulence noted in the oropharynx and bilateral breath sounds confirmed on auscultation. Oxygen saturations were initially 92-94%, so positive end-expiratory pressure was increased with minimal improvement. Soon after surgical incision, the patient became hypotensive with inadequate responses to repeated phenylephrine and vasopressin boluses. The patient then experienced oxygen desaturations to the high 70s with a rapid onset of bradycardia from 70-80bpm to the 40s. Heart rate and blood pressure improved with repeated boluses of epinephrine. Saturations improved back to low 90s with manual ventilation and multiple rounds of albuterol puffs delivered through the endotracheal tube. The patient was also given dexamethasone and diphenhydramine. An intraoperative crisis management checklist was reviewed during this time; the only intervention on the checklist not employed was the use of an H2 antagonist as none were readily available in the operating room. On exam, lung sounds were louder in the upper fields; no urticaria or rash was present. The endotracheal tube was suctioned with no secretions or mucous plug noted. Bronchoscopy was performed using a fiber optic bronchoscope; a thin mucous strand was found in the trachea, but lung tissues otherwise appeared pink and open. Following conclusion of the surgery, the patient was transported to the ICU sedated, mechanically ventilated, and on an epinephrine infusion. Tryptase levels drawn post-operatively were negative.

Discussion: This case illustrates a characteristic presentation of a patient experiencing intraoperative anaphylaxis. In addition to the cardiovascular collapse, oxygenation and ventilation became increasingly difficult prior to pharmacologic intervention. Since tryptase levels were negative, this case was thought to be a non-IgE mediated anaphylactoid event, presumably due to mast cell degranulation that was triggered by infectious antigens seeding the bloodstream following surgical incision. While allergic IgE-mediated anaphylaxis and non-IgE mediated anaphylactoid responses present and are treated similarly, early recognition and initiation of resuscitation is critical to mitigating adverse outcomes.
Perioperative diagnosis and management of a patient with mirror syndrome

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Sanhita Reddy¹, Dr. Larry Weinstein¹, Dr. Jason Meeks¹

¹UCSD

Mirror syndrome, also known as Ballantyne syndrome or maternal hydrops, is a rare disorder associated with pregnancy. The condition most frequently occurs in parturients whose fetus demonstrates hydrops fetalis, and carries a high incidence of maternal morbidity and fetal mortality. Women typically present with anasarca, proteinuria, and mild hypertension. The presenting feature of maternal anasarca pathologically “mirrors” the edematous hydropic fetus. Treatment is delivery of the baby, though manifestations of the disorder may present or persist postpartum, making it difficult to definitively diagnose. This patient’s unique presentation of post-operative, post-delivery, mirror syndrome highlights the challenge in diagnosis and need for awareness of this condition among anesthesiologists. Mirror syndrome is underreported in both obstetric and anesthesia literature. This case report would add to the current body of literature that exists to help manage care of these patients.

The patient is a 23yo G2P0010 female scheduled for a dilation and evacuation after a missed abortion at 17w6d. The etiology of fetal demise was hydrops fetalis. The patient presented with bilateral lower extremity edema and an otherwise uncomplicated pregnancy course. After a discussion of the benefits and risks of neuraxial and general anesthesia, the patient opted for a general anesthetic.

The patient was induced and intubated uneventfully and the intraoperative course was unremarkable. In addition to anesthetic agents, the patient received two doses of methylergonovine intramuscularly, rectal misoprostol, and oxytocin 20 units intravenously. Estimated blood loss was 400 mL. The patient was extubated and brought to the post-anesthesia care unit (PACU) breathing spontaneously and following commands. Shortly after admission to the PACU, she began to experience respiratory distress (tachypnea to the 30-40s), hypertension, and tachycardia. Course breath sounds were heard bilaterally on lung exam. A stat chest X-ray demonstrated bilateral pulmonary edema, cardiomegaly, and a left sided pleural effusion. Arterial blood gas revealed hypoxemia with a significant alveolar-arterial gradient. After a trial of BiPAP ventilation, the patient started to exhibit altered mental status. At this point it was decided to intubate the patient and admit her to the intensive care unit. An extensive workup ruled out ARDS, infection, and congestive heart failure. With a lack of an alternative underlying cause for the pulmonary edema, the obstetric and ICU teams concluded that the patient likely had mirror syndrome, which may have been exacerbated by the positive pressure ventilation utilized intraoperatively. During her ICU admission, the patient was adequately diuresed and weaned off ventilator support after 24 hours. She was stable for discharge on post-op day 2.

This case highlights the subtlety in presentation of mirror syndrome, and the need to consider the diagnosis in the setting of fetal hydrops. In the future, such patients should undergo a comprehensive lung exam to evaluate for the possibility of pulmonary edema prior to any anesthetic administration. One might also consider, on an individual basis, avoiding positive pressure ventilation in these patients.
**Perioperative management of a Patient with Ischemic Cardiomyopathy and Metastatic Pheochromocytoma for Open Adrenalectomy**

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. Robert Bellerose**, **Dr. Orode Badakhsh**

1. University of California Davis

**Background**: Pheochromocytomas are catecholamine-secreting tumors originating from the chromaffin cells of the adrenal medulla and in rarer instances along the sympathetic chain (known as paragangliomas). The mainstay of treatment is surgical resection and improvements in preoperative preparation, surgical approach, and anesthetic management have led to a significant decrease in the morbidity and mortality associated with the procedure. Prior to venous clamping, patients may experience extreme elevations in heart rate and blood pressure in response to noxious stimuli (e.g. laryngoscopy, patient positioning, or abdominal insufflation) or tumor manipulation. This can lead to arrhythmias, myocardial ischemia, or stroke, especially in patients with underlying cardiovascular disease. We present a case of open adrenalectomy in a patient with pheochromocytoma and ischemic cardiomyopathy and the use of transesophageal echocardiography (TEE) to guide treatment.

**Case Description**: A 57-year-old male with a 10 cm right pheochromocytoma on prazosin was transferred to our facility following aborted laparoscopic adrenalectomy in the setting of uncontrolled hypertension. His antihypertensive regimen was switched to phenoxybenzamine and metoprolol and he was given isotonic maintenance fluids. Myocardial perfusion scan was consistent with prior MI but there were no significant areas of reversible ischemia. On the day of surgery, a pre-induction arterial line and thoracic epidural were placed. The patient underwent general endotracheal anesthesia using an opioid-based induction. A 9-Fr double-lumen central venous catheter was placed. Baseline TEE showed euvolemia and an estimated ejection fraction of 30%. Episodes of hypertension were noted during right upper quadrant palpation and tumor manipulation and were treated with nitroprusside and esmolol. Post-operatively, the patient was treated with vasopressin for mild hypotension and dextrose for hypoglycemia. MIBG scan showed bony metastasis to the axial skeleton.

**Discussion**: Our case highlights many of the unique considerations in the management of pheochromocytoma, including the role of TEE. Preoperative preparation is critical and includes initiation of one or more antihypertensive agents and volume expansion. The first line antihypertensive agent is an alpha blocker. The non-selective alpha blocker phenoxybenzamine tends to provide better blood pressure control intraoperatively but more hypotension post-operatively as compared to the selective alpha blockers terazosin, prazosin, and doxazosin. Patients with pheochromocytomas experience chronic vasoconstriction in setting of excess catecholamines and possibly decreased intravascular volume. Therefore, volume expansion leading up to surgery has traditionally been recommended to prevent hypotension post-operatively. Preoperative cardiac evaluation is important as patients may have a catecholamine-induced, Takotsubo-like cardiomyopathy. Given our patient's underlying ischemic heart disease and the hemodynamic changes anticipated with the procedure, TEE was utilized as a monitoring device. It was particularly helpful to guide fluid resuscitation and to monitor for ischemia. For blood pressure control intraoperatively, we selected nitroprusside and esmolol given their short durations of action and rapid titratability. For treatment of hypotension post-resection, we confirmed adequate fluid resuscitation with TEE and started vasopressin for suspected vasodilation from catecholamine withdrawal. We selected vasopressin as it acts on the V1 receptor whereas agents acting on alpha or beta receptors were expected to be ineffective given concurrent alpha...
and beta blockade.
Pyloric stenosis is a neonatal condition that presents with projectile vomiting and requires surgical management with a pyloromyotomy. Typically, these neonates present with a hypochloremic metabolic alkalosis that should ideally be corrected prior to surgical intervention. We present the case of a patient with a chronic respiratory acidosis presenting for pyloromyotomy.

A 4.9kg ex-26 week 4-month old girl developed projectile vomiting in the intensive care nursery. Further workup revealed hypertrophic pyloric stenosis, and the patient was scheduled for pyloromyotomy. The patient's history was significant for being born via elective cesarean section at 26 weeks 2 days due to maternal HELLP syndrome. Her delivery was complicated by respiratory distress initially managed by CPAP but eventually requiring intubation within the first 24 hours of life. After delivery, the patient was never well enough to be discharged home primarily as a result of her pulmonary status. She was diagnosed with chronic lung disease attributed to prematurity that was treated with surfactant and varying degrees of respiratory support, ranging from oxygen via nasal cannula to intubation and mechanical ventilation. Pre-operatively, on the day of surgery, she had a combined chronic respiratory acidosis and a hypochloremic metabolic alkalosis. On a capillary blood gas, her pH was 7.39, PCO2 70, bicarbonate 41, chloride 92, and sodium was normal. Though her electrolytes did not meet typical standards for surgical repair, we elected to proceed with surgery in the setting of her chronically altered electrolyte status. Following the completion of the case, we elected to leave the patient intubated. She was extubated uneventfully within 24 hours following surgery.

To our knowledge, there are no case reports of this type of chronic electrolyte disturbance in a patient with pyloric stenosis. Management of pyloric stenosis is a medical emergency, requiring corrected electrolytes before going to the operating room. It is recommended that prior to a pyloromyotomy, a patient should be well hydrated and have normal electrolytes including a chloride greater than 100 mmol/L in order to decrease the risk of post-operative apnea. This was difficult to achieve in our patient because of her pre-existing chronic respiratory acidosis in the setting of her chronic lung disease. Our patient presented an unusual anesthetic dilemma. By keeping the patient intubated, we were able to complete the surgery and prevent the consequences of post-operative apnea.

References:
Perioperative Methamphetamine Use: A Case Report and Literature Review

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Emilee Borgmeier 1, Dr. Joshua Zimmerman 1, Dr. Natalie Silverton 1

1. University of Utah Hospitals and Clinics

Methamphetamine is a highly addictive Schedule II stimulant with a rate of abuse that is growing in the US. According to the National Survey on Drug Use and Health, in 2012 there were estimated 440,000 individuals in the United States who were current users of meth, with an estimated 133,000 new users in that same year. Persons who are both current and past methamphetamine users are seen often for surgical intervention. They also have various potential comorbidities that are significant to anesthesia, including cardiomyopathy in chronic users, increased risk for serotonin syndrome, aortic dissection, malignant hypertension, pulmonary hypertension and anecdotal reports of idiopathic hemodynamic collapse.

Our case is of a 31-year-old female with a history of asthma, reportedly remote methamphetamine use, syncope and dynamic left ventricular outflow tract (LVOT) obstruction with mitral regurgitation scheduled for a septal myectomy with mitral valve replacement. She was seen in the anesthesia preoperative clinic where she was noted to be hyperactive with many excoriations. A drug screen was ordered for the day of surgery, despite the patient denying recent use. General anesthesia was induced with no significant hemodynamic changes. Just after induction and transesophageal echo revealed no signs of cardiomyopathy, the urine toxicology screen resulted positive for stimulant amines, and the surgery was canceled out of concern for potential cardiac complications. The procedure was rescheduled for three months later, and another urine screen and subsequent quantitative test were positive for stimulant amines and amphetamines. The anesthesia provider elected to proceed with the case, the patient had an uneventful intraoperative course, and was successfully weaned from bypass after septal myectomy and tissue mitral valve placement. After an uneventful perioperative course was discharged from the ICU two days later.

Despite existing opinion regarding potentially extreme perioperative risk for users of methamphetamine receiving general anesthesia, the literature provides only a handful of case reports to support this belief. In this case report, two courses of action were taken on the same patient: delay and proceed while positive for meth. Within the practice of anesthesia the subsequent course of action is largely left to professional opinion, with little data to support the decision-making. At the University of Utah we would like to propose a guideline for providers regarding such patients, taking into account several factors including but not limited to: urgency of surgery, presence of acute intoxication, and limited bedside TTE. By appropriately risk stratifying and adequately preparing, categories of risk could be examined and offer future anesthesiologists data to support decision making.
 Persistent Hiccups Following Cervical Epidural Steroid Injection with Betamethasone

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Matthew Ritz, Dr. Christopher Bailey, Mrs. Katherine Overstreet, Dr. Andrew Gorlin
Mayo Clinic

Introduction:
Singultus (hiccups > 48 hours) is a described complication following epidural steroid injections, sacroiliac joint injections, and facet joint injections. The underlying etiology is not completely understood but it is a condition that can be distressing to patients. We present here a case of persistent hiccups following a cervical epidural steroid injection.

Case Presentation:
The patient was a 62 year old male with a past medical history significant for coronary artery disease, hypertension, as well as bilateral neck and shoulder pain. Cervical spine MRI showed bilateral foraminal stenosis at C5-C6 and mild right foraminal stenosis at C6-C7. He underwent an uneventful C7-T1 epidural steroid injection under fluoroscopic guidance. 12 mg of betamethasone mixed with 2 ml of preservative free normal saline was injected into the epidural space without complication. The next day the patient called the pain clinic after developing hiccups that had started in the morning and persisted into the afternoon. Patient had tried traditional, non-pharmacologic therapies with symptom resolution. After telephone interview and ruling out serious pathology, the patient was prescribed Thorazine 10 mg q6 hours PRN and his hiccups had resolved by the following day.

Discussion:
The involved structures in the hiccup reflex arc can be divided into the afferent limb, the reflex center, and the effector limb. The afferent limb is composed of the vagal and the phrenic nerves as well of portions of the thoracic sympathetic chain. The reflex center is believed to be located in the hypothalamus, the brainstem, and the cervical spinal cord. The differential diagnosis for singultus is extensive and includes multiple organ systems. Most commonly, pathology in the GI tract is implicated. Diseases of the CNS, cardiovascular system, and toxic metabolic syndromes such as uremia are all on the differential as well. For hiccups following image guided injections, potentially life threatening causes must be excluded; possibilities include vertebral artery dissection, epidural hematoma, infarction of the spinal cord, and CVA. Previous studies have postulated that the mechanism could involve alteration in CSF volume, composition, and pressure as well as the systemic effect of corticosteroid, specifically interacting with steroid receptors located along the effector limb of the reflex arc. Additional proposed mechanisms include sympathetic blocks of the sympathetic chain located along the thoracic vertebrae leading to an overdrive of parasympathetic activity. Stimulation of the phrenic nerve and the vagus nerve by the injectate has been proposed as well. In the presented case betamethasone was used, and there have been reports of persistent hiccups following betamethasone epidural injection with/without local anesthetic. Different steroids have been implicated in different reports and switching steroids has prevented recurrence. Interestingly there have been reports of cervical epidural injections of local anesthetic without steroid for the treatment of singultus. Treatment algorithms generally start with non-pharmacologic, conservative management, with progression to pharmacologic therapy. This includes monotherapy with gabapentin, baclofen, and pregabalin and may progress to dual therapy or addition of other medications. For the most persistent cases, phrenic nerve blocks are an option as well as peripheral nerve stimulation.
Congenital heart disease represents a substantial public health burden with an estimated nine in every one thousand births suffering from some form of congenital heart defect, approximately 1.35 million new cases yearly. Of these children, eight percent will have pulmonic stenosis, while ten percent will have Tetralogy of Fallot. Many of these children who receive operations to correct their congenital defect will also require additional interventions later in life. In both disorders, these patients can develop dysfunctional right ventricular outflow tracts, pulmonary arteries and pulmonary valves. Due to the large and irregular surface of the right ventricular outflow tract, transcatheter placement of a pulmonary valve can be difficult. Edwards Life Sciences has a new trial using the Alterra Adaptive Pre-stent with SAPIEN 3 Transcatheter Heart Valve to provide a circular semi-rigid landing zone for the valve.

Our patient is a 47 year old white female who was diagnosed at birth with severe valvar pulmonary stenosis, infundibular stenosis and a large secundum atrial septal defect. She received definitive repair at age eight. She did well after her initial surgery until 2012 when she started to develop dyspnea and fatigue with exertion. Her TEE at the time showed a small residual ASD with left-to-right shunting and severe pulmonary regurgitation. Due to the large size of her right ventricular outflow tract, it was not felt that she would be a good candidate for a transcatheter pulmonary valve on its own. She enrolled in the trial above using the Alterra pre-stent. On the day of the procedure she was induced with general anesthesia and maintained with sevoflurane, dilaudid, propofol and cisatracurium. Intracardiac echocardiography was used to confirm preoperative findings and guide both the Alterra Pre-stent and pulmonary valve placement. The pre-stent and valve placement were uncomplicated. She was discharged home with following day and quickly returned to her regular lifestyle.

The placement of the Alterra pre-stent across the pulmonic valve results in complete pulmonic regurgitation, until the new pulmonic valve can be deployed. Therefore, the anesthesiologist must be prepared to support the right ventricle and control pulmonary hypertension to mitigate this abrupt physiologic change. Our patient had compensated to severe pulmonic insufficiency and was able to tolerate the increased pulmonic regurgitation without hemodynamic compromise. As transcatheter technologies evolve, the anesthesiologist must keep abreast of these advances and their unique hemodynamic consideration.
Platelet Count of Zero: Anesthetic Implications of Splenectomy for Severe ITP

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Thomas Gulvezan 1, Dr. Bethany Benish 1
1. University of Colorado

Background
Autoimmune idiopathic thrombocytopenic purpura (ITP) is a common acquired bleeding disorder with incidence >1/10,000 across all ages. The pathogenesis of ITP is a combination of increased platelet destruction and impaired platelet production due to anti-platelet autoantibodies. Bleeding and or thrombocytopenia are the major clinical manifestations, with bleeding in up to 2/3 of patients, and serious bleeding in those with platelet counts less than 10,000 to 20,000/microL. [1]

Case Description
A 43 year old woman without significant past medical history initially presented to the Denver Health Emergency Department with a petechial rash, mucosal bleeding, and headache, and was subsequently found to have thrombocytopenia with platelets of zero. Further workup included negative HIV, HCV, HBV Ag, CMV, ANA, haptoglobin, LD, Monospot, and peripheral smear. HBV Ab was positive from a prior exposure but without chronic active infection and with negative viral load. EBV IgM was positive, and the patient described a viral illness about 1 month prior. She had no identifiable occupational or medication exposures. On Day 6 of admission, it was determined that the patient had failed medical therapy (IVIG for 2 days, dexamethasone 40mg daily for 4 days followed by prednisone 100mg/day), and was sent to IR for GDA embolization prior to scheduled splenectomy. Despite daily platelet transfusions, the patient's platelet count remained low at 11 and she was transferred to the MICU with the IR sheath in place. During the hospital course the patient received Hib, pneumococcal 13, and meningococcal vaccines. She was unable to receive Rituximab due to lack of insurance coverage. On Day 7 of admission, the patient presented to the OR for a laparoscopic splenectomy. In preparation for the OR, multiple blood products were made available including 4 units each of PRBCs, FFP, and platelets. A Level 1 rapid infusion setup was prepared and a second large bore peripheral IV and an arterial line were placed after induction of anesthesia. Blood pressure was tightly controlled and lability kept to a minimum for fear of spontaneous intracranial hemorrhage. The intraoperative course was uneventful, with minimal blood loss and maintenance of the laparoscopic approach. Platelets were administered by a slow constant infusion throughout the case, using 3 pooled platelet units in total. After extubation in the OR and transfer to PACU, the patient demonstrated clinical stability in the SICU over the next two days. She was discharged with follow up on Day 9 of admission with improving platelet count over 150,000/microL.

Discussion
With clinical manifestations of ITP including petechial rash, mucosal bleeding, hematuria, and platelets of zero, this patient was deemed extremely high risk for serious bleeding during a major intraabdominal procedure such as a splenectomy. Our lack of significant intraoperative bleeding from either surgical or spontaneous bleeding is likely attributable to multiple factors including tight control of blood pressure, patient optimization (GDA embolization), continuous intraoperative administration of platelets to combat active platelet destruction, and surgical approach and skill.

References
**Point-of-Care Ultrasound Diagnosis of Decompensated Cardiomyopathy in Pregnancy**

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. Anjali Dixit**, **Dr. John Markley**, **Dr. Julin Tang**

1. University of California San Francisco

**Background:** Peripartum cardiomyopathy occurs in 1 per 3,000-4,000 live births and is associated with high morbidity and mortality. Its diagnosis is easily missed, as presentation can be confused with normal physiologic changes of pregnancy.

**Case:**
A 30-year-old G1P0 woman at 33 weeks gestation with no prior exposure to the healthcare system presented with dyspnea to Labor & Delivery. The obstetric anesthesia team was consulted. Her vital signs were notable for hypertension (166/123), tachycardia (HR 126), tachypnea (RR 25), and SpO2 90% on 4 L/min nasal cannula. She had crackles in all lung fields but no elevated jugular venous pressure or lower extremity edema. Laboratory analysis revealed elevated troponin of 0.32 ng/mL, arterial blood gas showing PaO2 of 64 mm Hg on FiO2 30%, and urine protein:creatinine ratio of 2.3. Chest X-ray showed bilateral infiltrates and enlarged cardiac silhouette. EKG was significant for tachycardia. The patient was not in labor and the fetal heart rate tracing was reassuring. The cardiology service was consulted; in the meantime, the obstetric anesthesia team performed bedside transthoracic ultrasound. All views depicted moderate to severely reduced left ventricular systolic function. Over the course of her evaluation, the patient’s oxygen requirement increased to 6 L/min and she became somnolent.

The patient underwent urgent uncomplicated Caesarean delivery for severe preeclampsia under epidural anesthesia with invasive arterial and central monitoring. Intraoperatively, her blood pressure and CVPs normalized, and diuresis was initiated.

Formal transthoracic echocardiogram performed on post-operative day (POD) 0 corroborated the point-of-care ultrasound, depicting severe global hypokinesis and concentric hypertrophy of the left ventricle, with an estimated EF of 25-30% and PASP of 44 mm Hg plus CVP. Repeat echocardiogram on POD 2 showed mild improvement in systolic function along with severe diastolic dysfunction. Of note, her toxicology screen returned positive for methamphetamines. She was transitioned to an optimal pharmacologic regimen for heart failure and was discharged on POD 5. She was lost to follow-up.

**Discussion:**
This patient presented with decompensated heart failure in the context of severe pre-eclampsia. Our point-of-care ultrasound rapidly revealed severe left ventricular systolic dysfunction. We were therefore able to safely accelerate and escalate her care, which included urgent Caesarean delivery and ICU-level management of heart failure.

The differential diagnosis for dyspnea in pregnancy is broad. It includes the normal physiologic changes of pregnancy, pulmonary embolus, pulmonary edema secondary to pre-eclampsia, and peripartum cardiomyopathy. Transthoracic echocardiography is the main diagnostic study that allows for distinguishing these entities; however, it can be cumbersome to obtain, particularly in clinically decompensating patients. Point-of-care ultrasound allows for swifter diagnosis.

This patient’s case was ultimately confounded by her methamphetamine use, and it is unclear whether her cardiac disease was caused by peripartum cardiomyopathy and/or chronic methamphetamine exposure. Unfortunately,
because she was lost to follow-up and we could not obtain subsequent echocardiograms, it is difficult to narrow this differential.
Regardless of etiology, the patient’s heart failure shows the value of point-of-care ultrasound in evolving clinical situations. Our case bolsters the argument for ultrasound-proficient anesthesiologists in obstetric and other high-stakes settings.
Post-Surgical Inflammatory Neuropathy after ACL repair- A case report

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Ana Valdez 1, Dr. Lisa Sun 1, Dr. Matthias Braehler 2

1. University of California San Francisco, 2. University of California, San Francisco

Introduction
Post-surgical neuropathies are usually attributed to mechanical injuries, local anesthetic toxicity, and ischemia. However, they can also occur in the setting of post-surgical nerve inflammation, which has only recently been better characterized in the literature (1) and can present as focal, multifocal or diffuse neuropathy. These inflammatory neuropathies can occur temporally and spatially distant from the surgical time and site. There are a limited number of case reports of post-surgical inflammatory neuropathies, all with varying presentations (1-4).

Case report
A 25-year-old otherwise healthy male presented for left anterior cruciate ligament reconstruction. The patient received femoral and sciatic ultrasound-guided peripheral nerve blocks with 0.5% ropivacaine (25ml per site). The blocks were uneventful, with no paresthesia and no high pressure noted during manual injection. The patient received general anesthesia with a laryngeal mask airway. Tourniquet time was 30 minutes.

The patient developed shock-like pain, tingling and numbness in the plantar aspect of his foot as well as numbness along the left lateral leg on post-operative day 2, and his symptoms subsequently worsened over the following weeks. Neurological examination revealed decreased sensation to ice and pinprick in this distribution. He also demonstrated reduced toe flexion, toe extension, foot dorsiflexion and plantar flexion (4/5 according to the Medical Research Council scale). The left Achilles reflex was absent.

The patient was referred for neurological and pain management consultation. He received a variety of neuropathic and narcotic pain medications over his recovery course. Electromyography on post-operative day 23 showed small motor nerve conduction responses for the left peroneal and tibial nerves, and absent responses for the left sural and superficial peroneal nerves. The results suggested a sciatic neuropathy, likely due to perioperative inflammatory sciatic neuritis. MR neurogram on post-operative day 67 showed neuritis in the sciatic nerve distribution starting in the pelvis (above the level of surgery, tourniquet, and nerve blocks), consistent with an inflammatory neuritis.

On one-year follow-up, the patient had significant improvement with near resolution of symptoms, with a pain regimen consisting of duloxetine and diclofenac.

Discussion
The incidence of post-surgical inflammatory neuropathy is unclear, and it may be under-appreciated. The cause of this condition is likely multifactorial, and given its heterogeneous presentation in prior case reports, it may encompass multiple different entities. This condition should be included in the differential diagnosis for post-surgical neuropathy. Evaluation of postoperative nerve injury should include neurological consultation. Electrophysiological studies can be useful for defining the type of neuropathy. Magnetic resonance imaging can help to identify areas of nerve injury. Nerve biopsy is less often considered, but it can show lymphocyte-mediated inflammation (as opposed to macrophage infiltration, which is seen in axonal degeneration related to mechanical insult). Some cases have improved with immunotherapy, including steroids and intravenous immunoglobulin, while others have improved with conservative management, as with our patient.

References
Postoperative Airway Emergency In A Patient With An Unknown Tracheal Cartilaginous Sleeve

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. Aaron Bernadette**, Dr. Michelle Petrie, Dr. Jared Spilka, **Dr. Benjamin Roper**

1. Navy Medical Center San Diego

Introduction: Tracheal Cartilaginous sleeve (TCS) is a rare airway malformation where a continuous tracheal cartilaginous structure envelops the airway. At least 20% of patients presenting with craniosynostosis have concomitant syndromic conditions which may not be known to the anesthesiologist. We describe the case of an unknown TCS in a pediatric patient requiring emergent tracheostomy postoperatively.

Background: Syndromic craniosynostosis has a strong correlation with TCS in over 150 described syndromes. The most common syndromes associated with craniosynostosis and TCS are Crouzon, Apert, and Pfeiffer. The presence of TCS has been associated with premature death in almost all cases with a mean age of death of 3 years. Davis et al proposed that the tracheal dispensability is altered leading to turbulent air flow and obstruction. These changes are thought to lead to impairment in clearing secretions and respiratory infections. There is a benefit to early tracheostomy which bypasses the upper airway that can become obstructed in patients with CTS.

Case Description:

A 12 month old, 10-kg male presented for elective craniosynostosis repair due to trigoncephaly. He was born premature at 28+6 weeks by primary cesarean section due to twinning and breech presentation and required NCPAP for 37 days in NICU. He had a history of chronic sinusitis and asthma. For the surgical procedure a general anesthetic was performed. A grade 3 airway was viewed and ETT was placed after two atraumatic attempts. Operation was completed in four hours and was uneventful. The patient had an estimated blood loss of 100 mL and received 80 mL in packed red blood cells and 440 mL of lactated ringer’s solution. The patient was given 0.5 mg/kg dexamethasone and 65 mcg of fentanyl total for the procedure. The patient was extubated and then transported to the PICU.

Morphine dose was increased in PICU from 0.1 to 0.2 mg/kg/dose Q2 due to increased pain. The patient also received Tylenol and a 20cc/kg bolus of fluid. 12 hours postoperatively the patient developed inspiratory stridor and ultimately respiratory distress despite racemic epinephrine and naloxone. Patient desaturated and developed bradycardia despite bag mask ventilation. CPR was started and bradycardia resolved in 5min. Anesthesia arrived and a glidescope was used to perform intubation and showed extensive supraglottic edema and no visualization of the glottis. After 9 unsuccessful intubation attempts, ENT performed an emergent bedside tracheostomy successfully.

The following day a direct laryngoscopy was performed by ENT and findings included a Grade III view and a tight omega shape epiglottis, subglottic persistent swelling and complete dynamic collapse was reported. Trachea with cartilaginous sleeve was diagnosed. In addition, ENT was unable to pass flexible scope retrograde to subglottis from tracheostomy site due to severe swelling.

Discussion: Patients presenting for craniosynostosis repair with a history of frequent respiratory infections, postpartum stridor and airway reactivity, could have an undiagnosed syndrome associated with TCS especially in the setting of other syndromic features. Early ENT evaluation could be warranted.

References:
1. Lertsburapa, et.al.
2. Stater, Brian J, et.al.
3. Lin, Sandra Y, et.al.
Postpartum Coagulopathy in Setting of Suspected Vitamin K Deficiency

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Darcey Schultz
1. University of California Davis

Introduction:
Coagulopathies of pregnancy and the postpartum period can have various etiologies. This case report presents an unusual reason for postpartum coagulopathy: a pre-existing comorbidity resulted in coagulopathy secondary to suspected vitamin K deficiency.

Case Report:
A 33 yo G1P0 woman presented for placement of a labor epidural. She had a past medical history of type II diabetes mellitus secondary to a necrotizing pancreatitis (7 years prior). 2 months before her current admission, she was diagnosed with choledocholithiasis. Two cholecystostomy tubes were placed as two attempts at ERCP had failed and cholecystectomy was deemed safest after delivery. Coagulation studies were normal at that time.

Prior to epidural placement, a normal platelet count was confirmed but no further clotting studies were sent. Epidural placement was uncomplicated. The patient subsequently underwent an uncomplicated cesarean section due to failure to progress. The epidural was removed on POD1. An hour after removal, the patient was found to have increased and darkened output from her cholecystostomy tube, hypoglycemia and abdominal pain. INR was elevated to 6.04. AST, ALT and total bilirubin remained within normal limits. Although the patient had initially reported improved sensation and strength in her legs after cessation of the epidural, she now complained of acute worsening of her symptoms. This raised the concern for a possible epidural hematoma. The decision was made to reverse the coagulopathy immediately with FFP and IV vitamin K supplementation. Ultimately, a MRI was negative for hematoma and the INR normalized after FFP administration. The etiology of her coagulopathy was suspected to be secondary to vitamin K deficiency. It was assumed that due to the longstanding biliary drainage the patient became deficient of the fat soluble vitamin K. The patient was ultimately discharged home on POD4 with improvement of lower extremity weakness and sensation and no further coagulopathy was observed.

Discussion:
The differential diagnosis for the patient's postpartum coagulopathy included HELLP syndrome, acute fatty liver disease of pregnancy, DIC and the ultimate diagnosis of vitamin K deficiency. HELLP syndrome typically includes thrombocytopenia in combination with elevated transaminases and hemolysis. Acute fatty liver disease of pregnancy was considered due to elevated INR and hypoglycemia. However, typical characteristics of decreased fibrinogen and thrombocytopenia were not observed. DIC was deemed unlikely as fibrinogen levels were unremarkable.

The absorption of fat soluble vitamins (ADEK) requires intact pancreatic and biliary function. In healthy adults, bile is secreted into intestines where it facilitates transport and absorption of dietary vitamin K through solubilization. Patients with cholecystostomy drains in place are at risk of malabsorption of vitamin K through bile salt wasting. Vitamin K is an essential cofactor for a number of proteins involved in blood coagulation. Vitamin K deficiency can lead to significant coagulopathy due to low activity of vitamin K dependent coagulation factors (II, VII, IX, X).
Although the patient was not found to have an epidural hematoma and was discharged with resolution of symptoms it is important to consider all comorbidities of the obstetric patient in our anesthetic management.
Practical Utility of Pocket Ultrasound Devices in Anesthesia Care

Dr. Peter Wingfield ¹, Dr. Timothy Maus ¹, Dr. Byron Fergerson ²

¹ UCSD, ² University of California San Diego

The poster explores the utility and potential for peri-operative ultrasound examination of patients through a pilot study using a handheld, pocket ultrasound probe at bedside in an ICU and a regular OR setting. It considers the strengths and weaknesses of four commercially available handheld ultrasound devices: the V-scan by GE, the Lumify by Phillips, the Clarius by Clarius Mobile Health, and the Butterfly by Butterfly Network Inc. with information on battery life, data storage and transfer options and ultrasound imaging features and capabilities. The current literature is reviewed regarding utility, accuracy and validity of pocket ultrasound data, viability of training programs for medical students, residents and fellows, and the potential for ubiquity of pocket ultrasound devices in future medical practice.
Prehabilitation to Improve Post-Operative Outcomes in the Frail Population

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Nicole Andonian ¹, Dr. Sumit Singh ¹, Dr. Soban Umar ¹, Dr. Cathy Lee ¹, Dr. Michelle Braunfeld ¹, Dr. Marcia Russel ², Dr. Marineh Bojianian ², Dr. Steven Castle ²

1. UCLA Medical center, 2. WLA Veterans Health Administration

Background:
More than a third of surgeries are done in those older than sixty-five years of age, increasing the risk of complications, increased length of stay (LOS) and readmission rates. Preoperative rehabilitation or ‘prehab’ is designed to both improve patient physical fitness and mental preparedness for surgery.

Methods:
We are piloting different measures of frailty screening to identify appropriate referrals to the prehab Gerofit exercise program. Fitness assessments are done to individualize a 4-8 week prehab exercise program (cardio, weight resistance, balance & inspiratory muscle training) & participants are provided expected complications using the National Surgical Quality Improvement Program (NSQIP) Risk Calculator. Patient-centered care features are discussed include patient preferences (food, sleep, entertainment) and social support with discussion of what care might be needed in the immediate post-operative setting. Pre-operative management is coordinated while the patient is in the gym to facilitate medical optimization.

Results:
Seven patients, mean ages of 73.1±5.3 years with 2.1 ‘trigger factors’ (ADL/IADL assistance, high comorbidity, cognitive decline, decline in vision or hearing, chronic opioids and PTSD) have completed a mean of 118±163 prehab workouts. Actual LOS is 1.0±2.1 days longer than NSQIP expected LOS. There was one complication (cellulitis) and one 30 day readmission (UTI).

Conclusions:
Collaboration between geriatrics, primary care, surgery and anesthesiology has improved as well. We intend to use this multidisciplinary platform to develop effective and user friendly frailty screening, fitness optimization (fitness testing, muscle imaging, biomarkers) and care/transition coordination to develop high quality perioperative management of older, at risk adults.
Preoperative Optimization for a Transfusion Free, Recipient Living-related Transplant

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. Sona Doshi**, **Dr. Arash Motamed**, **Dr. Ashraf Sedra**

1. University of Southern California

A patient of Jehovah’s Witness faith with history of Primary Sclerosing Cholangitis (PSC) and subsequent cirrhosis was scheduled for a living related donor liver transplant as the recipient. In concurrence with her faith, our patient did not accept allogenic blood transfusion including whole blood, pure red blood cells, fresh frozen plasma, and platelets. All other blood products or reconstituted products were allowable. In light of the high risk of intraoperative bleeding and coagulopathy, the patient underwent close perioperative transfusion free complete blood count optimization including preoperative hemoglobin and platelet optimization, intraoperative bloodless surgery and blood salvage, and postoperative reversal of coagulopathy. Due to careful management both preoperatively and intraoperatively, the patient successfully underwent the liver transplant without any life threatening events. During routine post-operative ultrasound, however, she was found to have asymptomatic complete occlusion of the hepatic artery, and was immediately re-listed for cadaveric liver transplant. Having suffered from a mild drop in her hemoglobin and platelet count from her first liver transplant, her second transplant was deemed exponentially riskier due to preoperative anemia, coagulopathy and a potentially complicated surgical environment. Once again, the patient’s preoperative anemia was addressed immediately upon relisting the patient, which allowed for a successful repeat cadaveric liver transplant. That patient was extubated postoperative day one and was discharged home within 1 week of second surgery. The combination of perioperative optimization, bloodless surgery, careful intraoperative fluid management and blood sparing techniques ultimately allowed the patient to safely undergo not one, but two liver transplants. This case highlighted the extreme importance of preioperative optimization, monitoring, and management in a patient of Jehovah’s Witness faith undergoing high risk surgery.
Pseudocholinesterase Deficiency Following Exploratory Laparotomy

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Title: Pseudocholinesterase Deficiency Following Exploratory Laparotomy

Authors: Michael J. Molloy, M.D., Jeremy M. Alvord M.D., Jeff T. Mueller, M.D.

Introduction: Pseudocholinesterase or butyrylcholinesterase (BCHE) deficiency causes prolonged duration of neuromuscular blocking agents, including succinylcholine and mivacurium. In addition to this quantitative deficiency, qualitative pseudocholinesterase defects present in a similar manner.

Case Presentation: A 55 year old male with a past medical history including end stage renal disease on dialysis secondary to type II diabetes mellitus, hypertension, coronary artery disease status post three-vessel bypass, and morbid obesity status post bariatric surgery. He presented for fascial dehiscence and renal allograft biopsy status post kidney transplant. The patient denied a history of previous anesthesia complications.

Induction medications included 100 mg of succinylcholine. Approximately 12 minutes after induction, peripheral nerve stimulation at the left facial nerve demonstrated the expected train-of-four (TOF) of 4/4 twitches. Six mg of cisatracurium was administered for the duration of the case. Prior to administering reversal agents the facial nerve TOF was 3/4. Subsequently, shallow and rapid spontaneous ventilation was observed. The peripheral-nerve stimulator was then placed at the left ulnar nerve, which revealed TOF 0/4. The patient was discharged without further complications.

Testing adductor pollicis muscle, via the ulnar nerve, allows for stimulation generated by a nerve impulse rather than direct muscle stimulation. Frequently, providers will place electrodes on the face to test the orbicularis oculi muscle, which may lead to direct muscle stimulation and erroneous assessment of neuromuscular recovery.

Testing for pseudocholinesterase deficiency is accomplished with laboratory evaluation of pseudocholinesterase levels and dibucaine number. Dibucaine is an amide local anesthetic which inhibits the butyrylcholinesterase enzyme to a greater extent than a dysfunctional enzyme. When patient plasma is mixed with dibucaine, normal individuals will have a reduction in butyrylcholinesterase activity by 80% and individuals with atypical enzyme can have their activity reduced by only 20%. Treatment of pseudocholinesterase deficiency includes continued sedation and mechanical ventilation until resolution of weakness which usually occurs in 4-8 hours.

Reference:
2. Pseudocholinesterase Deficiency Clinical Presentation. 
Rare cause of delirium and hypoxemia after coronary bypass surgery: transdermal lidocaine patch-associated methemoglobinemia

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Fidel Acevedo\textsuperscript{1}, Dr. Esther Kim\textsuperscript{1}, Dr. david chyatte\textsuperscript{1}, Dr. Vance Nielsen\textsuperscript{1}

\textsuperscript{1}University of Arizona

We present a case of a patient administered parasternal transdermal lidocaine patch therapy as part of a multimodal analgesic regime designed to diminish opioid-associated delirium after coronary bypass surgery. The patient presented with delirium and severe methemoglobinemia (41%) that responded to discontinuation of lidocaine therapy, oxygen administration, and methylene blue administration. The clinical contributors and medico legal implications of this degree of lidocaine-associated methemoglobin-mediated delirium are presented in the hope of avoiding similar complications in the postoperative setting after coronary bypass surgery.
Reducing low value care in the preoperative assessment and preparation for cataract surgery.

Dr. Hayk Minasyan, Dr. Eilon Gabel, Dr. Aviva Regev, Dr. Maxime Cannesson, Dr. John Bartlett, Dr. Kevin Miller, Dr. Catherine Sarkisian, Mr. Johnny Quach, Mrs. Carol Lee, Dr. Ji Qi, Dr. Antonio Pessegueiro, Dr. Victor Duval

1. UCLA

Background:
There is a strong consensus that routine pre-operative (pre-op) testing for cataract surgery is unnecessary. Yet despite these widely endorsed evidence-based recommendations, most patients undergoing cataract surgery receive inappropriate testing. Cataract surgery is the most common medical procedure among Medicare beneficiaries. Widespread reduction of routine pre-op testing for cataract surgery would save billions of dollars, and reduce exposure to unnecessary and potentially harmful tests. Through the implementation of a multi-disciplinary, evidence-based pre-op guidelines for patients undergoing cataract surgery, we hypothesize a decrease in unnecessary pre-op testing without significant increase in day-of-surgery (DOS) cancellation rates.

Methods:
A group of surgeons, anesthesiologists, and hospitalists utilized current evidence and created guidelines for pre-operative testing of patients undergoing cataract surgeries. Patients undergoing cataract surgery at the UCLA Stein Eye Institute (SEI) with one of two surgeons (surgeon A and B) were offered a preoperative visit in the UCLA Hospitalist Preoperative clinic. The twenty UCLA hospitalists who were part of the intervention group were educated on the created guidelines via handouts provided to them through e-mail and in person. Pre-intervention data included all patients who underwent cataract surgery at the SEI during the 42 months leading up to the intervention date and post-intervention data included all patients who underwent cataract surgery at the SEI during the 12 months following the intervention date. The results obtained were also compared to patients undergoing cataract surgery at the SEI by surgeons other than A and B who were seen for their pre-operative visit at UCLA by a provider who was not part of the designated hospitalist group.

Results:
About one-third of the patients in this study were treated by Surgeons A and B. Out of all patients undergoing cataract surgery with Surgeons A and B, about one in every six was seen at the new dedicated pre-op clinic (intervention group), while the rest were seen by any of the other UCLA primary care providers (control group). Before the intervention, hospitalists were less likely to order pre-op testing on their patients (84.3% vs 58.2%). However, the rate of day of surgery cancellation was much higher for this group (1.9% vs. 3.9%). Following the intervention, there was a decrease in pre-op testing in the intervention group (58.2% vs 55.2%), particularly in blood testing (34.9% vs 13.8%) and EKGs (53.4% vs 41.4%). These reductions were not associated with any increase in DOS cancellation rates.

Conclusion:
This pilot study demonstrates that a collaboration between surgeons, anesthesiologists and primary care physicians is associated with reductions in low value care in the pre-op assessment and preparation for cataract surgery without significant increase in adverse events resulting in DOS cancellations. Further studies need to be conducted to determine the cost-effectiveness of such interventions, the effect on overall patient satisfaction, the effect on the
rate of other adverse events apart from DOS cancellations (case delays, unexpected perioperative complications, ER visits, etc.), and whether these results can be extended to other procedures.
Removal of A Giant Left Ventricular Thrombus after Pulmonary Thromboendarterectomy in a Patient with Protein C Deficiency

Dr. Debbie Fretwell 1, Dr. Swapnil Khoche 1
1. UCSD

Thrombosis after pulmonary thromboendarterectomy is unusual, but thrombus formation in the left ventricle (LV) while on anticoagulation is rare. We present a case of a 28-year-old male with protein C deficiency who developed a large, mobile LV thrombus post pulmonary endarterectomy for severe chronic thromboembolic pulmonary hypertension (CTEPH). Embolism from it resulted in acute myocardial infarction and stroke, necessitating an urgent LV thrombectomy. TEE monitoring was key to assess the impact on left ventricular filling and thrombus stability intraoperatively. Surgery, the definitive cure for CTEPH, carries a high success rate at experienced centers, though ongoing thrombosis can complicate its outcome.
Repeated Subdural Hematoma after Lumbar Drain Discontinuation

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Ms. Lauren Rosario¹, Dr. Govind Rajan¹
¹University of California Irvine

Background:
62M was admitted to the hospital for repair of an asymptomatic thoracoabdominal aortic aneurysm (TAAA). PMH significant for hypertension and 10-year history of atrial fibrillation.

Case Report:
Prior to his TAAA procedure, anesthesia placed a lumbar drain for prophylaxis against spinal cord ischemia in the post-operative setting. A 14-G Tuohy catheter was placed on first attempt with visualization of clear CSF. TAAA repair proceed without complication, and patient remained intubated upon transfer back to the ICU.

On POD1, there was minimal CSF drainage, which prompted drain removal on POD2. On POD6, he was extubated without issue. However, he was noted to have some mild, but persistent confusion without complaints of headache.

On POD8, he became somnolent and unresponsive. Prior, patient was having appropriate conversations and moving all extremities. He underwent CT head and was found to have a left subdural hematoma (SDH) with midline shift. He was emergently taken to the OR for left craniotomy. He was extubated after surgery and repeat CTH showed improved SDH. However, over the course of the next 3 days patient remained difficult to arouse and continued to have difficulty moving all extremities. Repeat CTH showed re-accumulation of left SDH, and on POD12, he underwent repeat left craniotomy and SDH evacuation.

At this point, it was suspected that patient might have a CSF leak from previously placed and removed lumbar drain. He underwent a lumbar MRI and this suspicion was confirmed. On POD18, a blood patch was completed by anesthesia without complication. The day after, he was extubated. He made a slow but complete recovery.

Discussion:
A known complication secondary to lumbar drain placement is the risk of intracranial subdural hematoma due to increased CSF drainage. It is also a rare complication after lumbar puncture, but it is typically proceeded by and/or associated with post lumbar puncture headache. However, the risk of repeated SDH in the setting of uncomplicated lumbar drain removal has not been reported in the literature.

The delayed onset of the first SDH was likely secondary to negative subdural pressures that only became clinically evident after extubation and elevation of the head of the bed. Concern for CSF leak was not on the differential because his drain course was uncomplicated. Although rare, dural puncture leak should be considered when a patient presents with post-drain removal altered mental status, especially in the setting of increased upright activity. Head trauma and herniation should also be on the differential. As seen with this patient, an epidural blood patch can be an effective and safe treatment for persistent CSF leak.

We present two instances of pulse oximeter desaturation artifact secondary to infiltrated intravenous (IV) lines. Although rare, if unrecognized this complication could cause harm.

One patient was an otherwise healthy 16 month old boy who presented for removal of bilateral cervical congenital cartilaginous rests. The IV catheter was placed in the wrist after two attempts, and he was positioned with arms tucked. During surgery, \( \text{SpO}_2 \) slowly fell to 88%, with good waveform and without other hemodynamic or ventilator-associated changes. \( \text{FiO}_2 \) was increased to 100% and bilateral air entry was confirmed by auscultation, but \( \text{SpO}_2 \) remained at 92%. Patient positioning prevented access to the oximetry probe. On drape removal, IV infiltration was noted. The probe was moved to the toe, and saturation returned to 99%. The IV was removed and the patient recovered without complication. The IV catheter had been dripping slowly throughout the case.

Second patient was a 7 year old girl who underwent an uneventful trigger finger release. On arrival to PACU, the RN found the IV operating normally. Later, the \( \text{SpO}_2 \) fell into the 60s and did not respond to increased \( \text{FiO}_2 \). The patient was in no distress. The IV was then noted to be infiltrated. Pulse oximeter was moved to the other hand and \( \text{SpO}_2 \) returned to 100%.

Desaturation during anesthesia requires prompt recognition and diagnosis. In these cases, an unrecognized infiltrated IV caused inaccuracy. Others have reported intraoperative detection of extravasation injury by dampened waveform and arterial line tracing (1). In another report, infiltrated IV was recognized only on degradation of the pulse oximeter waveform quality (2). Low perfusion from vasoconstriction, low cardiac output, venous congestion, and hypothermia have caused inaccurate pulse oximetry readings (3). Recognition of an infiltrated peripheral IV can be hindered with anesthetized patients, when drapes or warming devices cover the site, or when an IV in situ is used infrequently for medication administration (1, 2, 3).

Complications of infiltrated IV lines and extravasation of potentially damaging medications can result in liability claims including skin necrosis, swelling, nerve injury, compartment syndrome, and air embolism (4). Fortunately, out two cases exhibited no lasting harm. This occurrence is an unexpected cause of misleading pulse oximeter desaturation. Awareness of this phenomenon may allow faster diagnosis and decrease the risk of complications or potential claims. Infusion pump alarm settings may not trigger until pressure of 300 PSI is attained. This could lead to limb threatening extravasation.
Residency Decision Making: Does media influence where applicants rank residency programs?

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Timothy Ward ¹, Dr. Ryan Matika ¹, Mrs. Trish Angiulo ¹, Mr. Samwel Ochieng ¹, Dr. Peter Lichtenthal ¹
¹. The University of Arizona

Background: In this age of technology, resident applicants have abundant sources of information now available to them regarding anesthesiology programs and hosting institutions when making their potential residency decisions. Although many studies have looked at the effect of a program’s website, the literature on alternate social media and printed sources and their effect on decision-making has not been well studied. The objective of this study was to evaluate the impact of specialty specific message boards and blogs, social media, and traditional media on potential applicants’ ranking decision.

Methods: Anesthesiology residency interviewees during the 2017-2018 application cycle were anonymously surveyed regarding their use of these outlets when searching for and its effect on ranking a residency program.

Results: On a scale from 1 to 10 (1 = never, 10 = always), Traditional News searches regarding programs were given a rank of 3.1, Social Media a 3.4, and Specialty Specific Blogs and Message Boards a 7.4. With regards to the effect of positive and negative news on the likelihood of ranking a program (1 = no effect, 10 = major effect), News Articles were given a rank of 4.8 and 5.9, Social Media a 4.4 and 4.9, and Specialty specific blogs and message boards a 6.7 and 6.4, respectively. Given these outlets as well as word of mouth by other applicants and word of mouth from members in different residency programs, respondents were asked to assess the influence of each. Our study reported, on a 100 points scale, that the influence on likelihood of ranking a residency program high was 8.2 for News Articles, 8.3 for Social Media, 25.6 for Specialty Specific Blogs and Message Boards, 28.1 for Word of Mouth from Other Applicants, and 29.1 for Word of Mouth from Other Residency Programs.

Conclusions: Of the various media outlets, applicants primarily utilized specialty specific blogs and message boards, word of mouth from other applicants, and word of mouth from other residency programs when making decisions regarding where to place a program of their rank list.
Resident-Based Assessment of Intraoperative Teaching in Anesthesiology

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Anna Bettini 1, Dr. Pedro Tanaka 2
1. Stanford, 2. Stanford University School of Medicine

Anna Bettini MD, Pedro Tanaka MD PhD, Stanford University

Background
Intraoperative teaching by expert anesthesiologists through an apprenticeship model is one of the primary ways that anesthesia residents acquire knowledge and skills. Although several studies describe effective teaching of residents outside the operating room (OR), there is little formal data about resident preferences for anesthesia teaching by faculty in the OR or the frequency of such practices. The present project elaborates on the work done by Wakatsuki, et al in which 30 randomly selected anesthesia residents at our institution were interviewed to determine what the best faculty teachers are doing in the OR to educate residents. Interviews were audio recorded, transcribed, converted into codes, and grouped into themes. Residents repeatedly described 27 core behaviors and approaches used by effective teachers, which were then codified based on a cognitive apprenticeship framework as modeling, coaching, scaffolding, articulation, reflection, and exploration. This study adapts the resident transcripts from Wakatsuki’s research into an evaluation tool, with the aim of creating a resident-based assessment of intraoperative teaching that can be used to identify the frequency of practices most valued by residents, identify barriers to effective OR teaching, and inform efforts at improving clinical teaching for nine core rotations within our residency program.

Methods
A 35 item assessment tool was created encompassing 27 core behaviors of effective teachers as described by anesthesia residents. Original language from resident transcripts was used in each question stem. Survey invitations were emailed to residents on completion of selected rotations from June 2017 to March 2018. Intraoperative, non-subspecialty rotations were chosen, including Abdomen, Bariatrics, Electrophysiology, Head and Neck, Neuroanesthesia 1, Neuroanesthesia 2, Orthopedics, Thoracics, and Urology. Responses were anonymous. Residents received a ten dollar electronic gift card as compensation for survey completion.

Results
One hundred and four surveys were completed and the response rate was 70%. The most frequently reported social characteristics were: psychological safety (approachable and open to questions from resident), equanimity (calm and collected), and clinical confidence. The most frequently reported teaching methods were: autonomy (steps back and allows resident to work through a procedure or problem), reasoning (explains rationale behind certain choices), and discussion (two way conversation about the anesthetic). Of note, autonomy and reasoning were the two standards deemed most valuable by resident learners by Wakatsuki. Frequency of these methods was associated with a smaller number of faculty per rotation, but not with resident seniority. The least frequently reported teaching methods were: teach back (ask resident to explain back concept in their own words) and literature (bring papers relevant to the case).

Conclusion
Best practice for OR teaching as perceived by anesthesia residents includes social characteristics and specific teaching methods, which are practiced with variable frequency at our institution. Further studies can determine if these methods can be taught to anesthesiology faculty to increase the caliber of daily teaching in the OR during patient
care and to determine if this teaching evaluation strategy could be applied to other residency programs.
Residual esophageal contents despite appropriate NPO time in context of foreign body ingestion

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Caleb Stalls¹, Dr. Ricardo Falcon², Dr. Timothy Petersen², Dr. Codruta Soneru²

¹. univer, 2. University of New Mexico Hospital

Aspiration of gastric contents leads to significant morbidity and mortality. Residual gastric content is a risk factor for perioperative aspiration. NPO guidelines are helpful to minimize the risk of perioperative aspiration; however, these guidelines may lose significance in patients who present with an ingested foreign body. We report a case where a patient had large pieces of chicken entangled in an esophageal foreign body, despite adequate NPO time.

A 27.6 kg, ten-year-old girl with no significant past medical history presented with an esophageal foreign body. She accidentally swallowed a necklace while laughing with it in her mouth, about two hours after eating. Abdominal plain films revealed a heart-shaped locket projected over the junction of the antrum and pylorus of the stomach. The last solid food and clears were 12 and 4 hours prior to endoscopy, respectively. The patient was retching after the necklace was stuck in her throat, but her parents reported no vomiting since it happened.

Oral midazolam was administered, the peripheral intravenous catheter was placed under nitrous oxide, and endotracheal intubation was facilitated with rapid sequence induction. Direct laryngoscopy showed no evidence of aspiration or organic debris in the oropharynx.

EGD revealed a locket engulfed in large chunks of partially masticated chicken in the stomach. Gastric contents shape anesthesia plans during induction, maintenance, and emergence. Preoperative evaluation of fasting status should assess factors that may delay stomach emptying, e.g. acute pain, distress and anxiety, and opioid intake. Adequate fasting time by current guidelines may not ensure empty status before surgery when these factors are present. Literature suggests that more than 0.8 ml/kg of gastric contents combined with other risk factors, e.g. difficult airway, bucking or coughing, or incompetent lower esophageal sphincter, can increase aspiration risk.

This case presentation suggests that a gastric foreign body might also obviate conventional predictions of gastric status. The respiratory consequences of aspiration are related to aspirate volume and characteristics such as acidity and particulate nature. There is no validated standard method to evaluate these characteristics of residual gastric contents in the perioperative period. Gastric ultrasound can be a useful noninvasive technique to assess gastric volume, but cannot assess acidity. Gastric suctioning is also useful, but may not guarantee a completely empty stomach, and in this case the pieces of solid food and the foreign object were too large to be removed through suction.

In our case, rapid sequence intubation was preferred due to concern of altered gastrointestinal motility subsequent to the presence of a large gastric foreign body. Providers should be aware of aspiration risk even after appropriate NPO time in this context.
Right Ventricular Failure after LVAD

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Steven Hur

UCSF

39 year old male with non-ischemic dilated cardiomyopathy, severe pre and post capillary pulmonary hypertension, and multiple valvular abnormalities on a Milrinone drip scheduled for AVR, MVR, TVR and LVAD. Post op course complicated by acute RV failure requiring ECMO and prolonged ICU stay involving inotropic and vasopressor support and eventual intraparenchymal hemorrhage resulting in withdrawal of care. Questions to explore from this case include (1) What are implications of RV failure? (2) How can RVF be predicted pre-operatively? (3) Why does RV failure occur in LVAD patients (4) What are the anesthetic considerations for LVAD patients undergoing non-cardiac surgery?

With the growing number of stage D heart failure patients exceeding the finite number of heart transplants (2000 a year in the US), the use of LVADs for destination therapy and not just bridge to transplant has increased. Post LVAD right ventricular failure is a common complication occurring anywhere from 9%-40% of recipients. It is associated with higher morbidity and mortality, longer ICU LOS, and lower survival to transplant.

Preoperative identification of at risk patients may help select those with extreme RVF refractory to medical therapy who would benefit from biventricular assist devices or earlier LVAD placement and thus reduce complications of RVF. Many preoperative lab values, clinical features, hemodynamic indices, and echocardiographic features have been associated with post-op RVF. However, many of these variables have inherent limitations and no one variable has been strongly predictive in multivariate analyses. Echocardiography based assessment of RV mechanics with speckle tracking technology is a burgeoning and promising area of research that could be used to predict RVF.

How RVF occurs is not completely understood, but it is generally thought that an already deconditioned RV starts experiencing increased RV preload from LVAD augmented CO resulting in further dilation and dysfunction. Furthermore, leftward displacement of the intraventricular septum from LVAD suction can impair septal contribution to RV contraction.

LVAD patients presenting for non-cardiac operations can be safely anesthetized by non-cardiac anesthesiologists. Pre-op considerations include anticoagulation, allosensitization, non-palpable pulse, difficulty with auscultation, baseline device parameters (flow, power, pulsatility index, and speed). Intra-op considerations include additional monitoring (a-line and cerebral oximetry for non-pulsatile flow, PAC for CO, BIS for abnormal SNS response to stimulation), careful attention to preload, afterload and RV function, avoiding chest compressions and dislodgement of LVAD inflow cannula, how positioning/insufflation affect flows.
Sacral Radiculitis Following a Repeat Epidural Blood Patch: A Case Report and Review of the Literature

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Jeremy Wolfson, Dr. John Liaghat, Dr. Cristina Chandler
1. University of California Davis, 2. UC Davis Department of Anesthesiology & Pain Medicine

Epidural blood patches (EBP) are the gold standard of treatment for post dural puncture headache (PDPH) with success rates of 90% for an initial and 95% for repeat EBP. However, the placement of an epidural blood patch is not without risk as demonstrated by our case of the rare complication of sacral radiculitis following EBP for PDPH in the post partum period.

A 32-year-old G2P1 female presented at 41 weeks in labor, requesting a epidural. She had no significant medical history with a normal platelet count and coag panel. Initial placement of her epidural via 17G Tuohy at the L4/5 interspace was complicated by a dural puncture, requiring a 2nd attempt at L3/4 interspace, which was successful. A negative test dose of 3ml of a 1.5% lidocaine w/epinephrine was bolused through the catheter, which was subsequently infused at 5ml/hr with bupivacaine 0.1%/fentanyl 2mcg/ml for 4 hours before the patient delivered and the catheter was removed without complication. On POD #2, the patient PDPH symptoms, and subsequently received an epidural blood patch of 20ml of blood given in 5ml increments without any back pressure or paresthesia during injection. The patient experienced modest relief, and on POD4, received a second epidural blood patch for PDPH; given 20ml of blood in 5ml increments without complication. Her PDPH symptoms resolved, however, on POD #11, the patient complained of significantly worsening lower back pain at the L3/4 site that radiated to her buttocks bilaterally. She was afebrile and denied any motor, genitourinary, or gastrointestinal symptoms. A stat L-spine MRI was negative for hematoma and abscess, but demonstrated a small volume of layering blood products within the intrathecal sac at the level of the sacrum. After a consultation with neurology, a diagnosis of sacral radiculitis secondary to blood patch placement was made. She was evaluated at our chronic pain clinic and started on a therapy of timed heating pads, TENS unit, OTC and prescription anti-inflammatories, and clinical acupuncture. Watchful waiting ultimately led to a full recovery.

We believe the imaging demonstrated sacral radiculitis secondary to EBP has not been described and therefore makes our case interesting. Cases of radiculitis are sparse, with these cases mimicking meningitis and arachnoiditis. Migration of blood products into the intrathecal space is not inconceivable, particularly after receiving 2 EBP, as described in this case. Blood is a known irritant to nerves and this inflammatory response explains the patient's pain.

Literature on the topic is sparse. However, with the frequency of inadvertent dural puncture during labor epidural placement ranging from 1-5% and up to 50% endorsing PDPH symptoms afterwards, this provokes the question of why this complication has not occurred in other patients who received EBP afterwards for treatment of PDPH? Or has it occurred and gone undiagnosed secondary to the increased cost of imaging? Our team believes that sacral radiculitis secondary to blood products in the intrathecal space after EBP placement may be more common than previously thought and suggests that more research into this question is necessary in the future.
Saphenous neuropathy after adductor canal block in a patient undergoing unicompartmental knee arthroplasty treated successfully with a perineural dexamethasone/ropivicaine injection

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Wendy Ma¹, Dr. Lindsay Borg², Dr. Rachel Wang¹, Dr. Jean-Louis Horn¹
¹. Stanford University School of Medicine, 2. Kaiser Sunnyside Medical Center

Background

The adductor canal (AC) continuous peripheral nerve block (CPNB) is an increasingly popular component of the multimodal analgesic regimen for total knee arthroplasty (TKA). However, there are few studies examining its use in unicompartmental knee arthroplasty (UKA) and the block’s incidence of complications is not well described. A 2015 case series by Tran et al. characterized five patients after TKA with conservatively managed saphenous neuropathies possibly from AC block. We present a case of significant saphenous neuropathy following AC block and UKA successfully treated with a dexamethasone/ropivacaine perineural injection.

Case Description

A 59-year-old man with chronic low back pain and right knee anteromedial osteoarthritis without preexisting neuropathy was scheduled for right UKA. Preoperatively, an uncomplicated right AC CPNB was placed with no paresthesia elicited and confirmation of a block in the appropriate distribution. The patient received a spinal anesthetic with moderate sedation. A thigh tourniquet was inflated to 300 mmHg for 107 minutes. Postoperatively, 0.25% bupivacaine was infused via his CPNB at 6 mL/hour alongside a multimodal pain regimen. The patient described minimal pain and participated with physical therapy. The nerve catheter was removed with tip intact on postoperative day (POD) 1 prior to discharge.

On POD 12, the patient reported new right medial thigh, knee, and calf “discomfort” (later characterized as paresthesia). Physical exam was notable for decreased sensation in the anterior medial leg. Infection, deep venous thrombosis, and spinal cord etiologies were ruled out immediately. The differential diagnosis also included muscle cramps, peripheral mono/polyneuropathy, lumbar radiculopathy, and lumbosacral plexopathy. Gabapentin slightly improved symptoms. MRI revealed degenerative changes and L4-5 disk bulge. The patient underwent an electromyogram and nerve conduction study demonstrating a right saphenous mononeuropathy with axonal loss. Thereafter, a physiatrist performed an ultrasound-guided right saphenous nerve block with 2 mL 0.5% ropivacaine and 1 mL dexamethasone 10 mg/mL. The patient’s symptoms resolved over the following days, enabling him to taper off of pain medications.

Discussion

Neurophysiologic changes resulting from peripheral nerve injury generally appear after 14-21 days. After unsuccessful conservative management, our patient’s paresthesias were relieved by a perineural injection of local anesthetic and steroid. The saphenous mononeuropathy may have been caused by the AC CPNB, surgery, or tourniquet. Injury of the infrapatellar branch of the saphenous nerve during knee joint surgery is well documented although does not explain the patient’s symptoms. A thigh tourniquet increases risk of compression neurapraxia, albeit most commonly of the peroneal nerve. This case highlights the potential value of perineural injection to treat peripheral neuropathy.
BACKGROUND: Although encountering patients with facial defects may be rare, anesthetic management of such patients may be challenging. Abnormal anatomy in the setting of orbital exenteration and maxillectomy can make it difficult to provide positive-pressure ventilation and may even require creative approaches to safely maintain the airway.

CASE DESCRIPTION: A 67-year-old man with a history of hypertension, diabetes mellitus, end-stage renal disease from drug-induced nephritis, and remote invasive mucormycosis presented for deceased donor renal transplant. Detailed records from his previous anesthetic encounters were not available. Nearly a decade before his presentation, the patient had a root canal that resulted in severe invasive mucormycosis involving his right orbit and sinuses. He underwent multiple surgeries, including right orbital exenteration, radical maxillectomy, frontal sinusotomy, total ethmoidectomy, sphenoidotomy, split-thickness graft, and cheek and deep pterygoid resection. In addition to his operative treatment, he received lifelong oral anti-fungal therapy. His exam on the day of his renal transplant was notable for a well-healed right orbit and sinus tract with continuous communication to his oropharynx.

In the operating room, an occlusive dressing was placed over the patient's right eye. He was preoxygenated, and after induction, a two-handed technique was used for mask ventilation. Although there were some volume losses through his orbit, a tidal volume of approximately 300 mL could be generated. Only after video laryngoscopy provided a grade 1 view was neuromuscular blockade given, and the patient was intubated with a 7.0 mm endotracheal tube without any problems. The remainder of his operative course was uneventful, and he was extubated prior to recovery-room transfer.

DISCUSSION:
Abnormal facial apertures may create unexpected challenges, especially as the ability to provide positive-pressure ventilation is critical in anesthesia. Where possible, occlusion of these additional openings – as in patients with tracheostomies who are orally masked and intubated – are key. Occlusion may be achieved by various means, including dressing as in this case, or saline bag as in one case report. In other situations, rather than providing positive pressure via the oral orifice, mask ventilation was performed through the orbit.

In some cases, transorbital intubation may be indicated. Awake versus asleep induction should be considered based on the patient's anatomy; patients with history of maxillectomy may have had previous head and neck radiation creating airway challenges. There are reports of patients who have achieved transorbital intubation via both direct laryngoscopy and fiberoptic visualization.

REFERENCES:
Severe Complex Regional Pain Syndrome (CRPS), Mast Cell Activation Syndrome, and Central Sensitization Treated with Monthly Ketamine Infusion

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Anoosh Javaherian ¹, Dr. Kevin Vu ¹, Dr. Duraiyah Thangathurai ¹

1. Keck School of Medicine of the University of Southern California

Background: Complex Regional Pain Syndrome (CRPS) is a condition that is characterized by severe pain, disability, and loss of function which could severely debilitating daily life. It can also cause significant physical, psychological, mental, and emotional distress. While conventional therapies exist for CRPS which may control the symptoms and progress of the disease, a subset of patients are resistant and require alternative aggressive approaches to control symptoms.

Case Description: We present the case of a 30 year old white female with a history of severe CRPS with symptoms in her head, eyes, abdomen, lower back, pelvis, bilateral hands, bilateral knees, and bilateral feet. Her comorbidities are Ehler’s-Danlos syndrome, mast cell activation syndrome, postural orthostatic tachycardia syndrome, mitochondrial disorder, central sensitization, and hypothyroidism. She has been seen by numerous physicians specializing in pain management, orthopedic surgery, and neurology without resolution of symptoms. She has undergone multiple procedures including lumbarepidural steroid injections, intraarticular injections x 7, lumbar sympathetic blocks x 8, selective nerve root blocks x 3, trigger point injections, and scrambler therapy without any benefit. Botox injections and an infusion of lidocaine, toradol, and magnesium have had limited success. A lumbar sympathetic block under local sedation helped her temporarily without long-term symptom relief. Ultimately, the patient has had adequate pain relief with a ketamine infusion consisting of 600 mg per once a month with one to one observation in the ICU. She also receives prophylactic ondansetron, midazolam, lorazepam, and diphenhydramine 30 minutes before the ketamine infusion. She has been following this regimen for the last 3 years and is satisfied with the pain relief.

Discussion: Several treatment modalities are available for CRPS which includes sympathectomy with regional sympathetic blocks, analgesics, vasodilators, anti-depressants, mood stabilizers, exercises, physical therapies, acupuncture, hypnosis and several non-conventional therapies. Ketamine is an analgesic, amnestic and anesthetic which acts on the NMDA receptors in the central nervous system. Clinically, it is used for anesthesia in high-risk patients including high-risk cardiac patients, trauma and patients in shock states. It is used in low doses for pain relief in both acute and chronic situations in patients resistant to other therapies. It has minimal effect on respiration and hemodynamics. Recently, its use has expanded to treat severe and resistant depression, prevent PTSD, and detoxify patients with addiction, mainly narcotics. Ketamine therapy has been tried in patients with CRPS with moderate success. We followed a regimen that is appropriate for particular patients who have multiple comorbidities without any adverse effects. Patient and family members have indicated that the response is excellent with improvement in pain, anxiety and depression.
Severe Hypoglycemia in Fasting Pediatric Cancer Patient Undergoing Intrathecal Chemotherapy Treatment

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Brian Lin ¹, Dr. Elysia M. Alvarez ², Dr. Cathy R. Lammers ¹

¹. UC Davis Department of Anesthesiology & Pain Medicine, 2. UC Davis Pediatric Hematology and Oncology

Background
Pediatric patients scheduled for intrathecal chemotherapy under sedation are typically instructed with fasting times in accordance to ASA guidelines. We present a unique case of a 4-year-old with pre-B ALL scheduled for repeat intrathecal chemotherapy found with severe symptomatic hypoglycemia.

Case Description
A 4-year-old male, past medical history significant for ALL on maintenance therapy, was scheduled for LP. Home medications included methotrexate 7.5mg weekly, dexamethasone 2mg BID, mercaptopurine 25mg qHS, pentamidine 60mg IV monthly. Famotidine 6.4mg BID (with steroids), zofran 2mg TID, and miralax were taken as needed. The patient’s last oral intake of rice and beans was at 1830 the prior night. Admission vitals at 1000 were BP 108/63, HR 96, and RR 18. At 1120, port was accessed and 2mg IV zofran was administered. The nurse requested that he be moved up earlier given he was sleepy and not himself. At 1158, he was brought to the procedure room and appeared awake but tired, tachycardic with HR 130-140. When asked questions, he replied by whispering in mom’s ear. A glucose checked from the port was 20 mg/dL. Given the possibility of error, the test was repeated from the port which read 29 mg/dL. IV D50 (1mL/kg) was given and the patient was started on D5/0.45% NaCl infusion. With the severity of hypoglycemia, the LP was delayed to ensure the glucose stabilized and symptoms resolved. Glucose check 30 minutes later at 1230 was 185 mg/dL and he was observed playing with others. At 1415, a repeat glucose showed 80 mg/dL and he was brought back for LP with MAC and intrathecal methotrexate was administered. In recovery, the patient ate a meal and was observed for another hour with glucose checks within normal limits prior to discharge home. Parents were given instructions to continue clear liquids with sugar until 2 hours prior to arrival for the next procedure.

Discussion
ASA fasting guidelines recommend 2 hours for clear liquids prior to any elective procedure. Many hospitals will often implement an NPO after midnight, regardless of procedural time. However, this may not be the safest practice as the case described above demonstrated. As anesthesiologists, we are responsible for patients in the preoperative area even before we meet them. The patient's medical history and medications must be reviewed carefully. Anecdotally, pediatric oncology patients are more likely to be hypoglycemic but it is infrequent. Two previous studies linked mercaptopurine and methotrexate with hypoglycemia [1, 2]. Steroids are thought to contribute to glucose dysregulation, though no studies have demonstrated this. Furthermore, cancer patients often have poor appetite which can worsen hypoglycemia. More studies are needed to determine if checking glucose should be more frequent or even standard of care in these patients.


1
Severe Hyponatremia and Preeclampsia in Pregnancy

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Rupa Prasad ¹, Dr. Larry Weinstein ²

¹. University of California San Diego, 2. UCSD

Background: Preeclampsia is a disorder of pregnancy defined by hypertension and proteinuria occurring after 20 weeks gestation. Severe cases are associated with liver and renal failure, disseminated intravascular coagulation and central nervous system abnormalities. Hyponatremia is a rare but potentially serious complication of pre-eclampsia as it can be associated with seizures and coma due to brain edema. To date, there are limited studies discussing the presentation and management of patients with severe hyponatremia and preeclampsia.

Case Description: 33 year-old female, gravida 4, para 0, at 29 weeks presented with new onset elevated blood pressures, marked proteinuria of 1305 mg in 12 hours, and lower extremity edema with a weight gain of 20 lbs in 3 weeks. She was diagnosed with preeclampsia, which was complicated by severe but asymptomatic hyponatremia with a sodium of 119, reaching an nadir of 117.

Patient was taken forces a Cesarean section on hospital day 3 due progressive renal insufficiency suggesting preeclampsia with severe features. The patient received spinal anesthesia with 0.75% hyperbaric bupivacaine and a pre-operative arterial line for frequent lab draws to monitor sodium levels. Per nephrology recommendations, crystalloids were initially limited to the minimal rate necessary for delivery of Pitocin and other drugs, and albumin 25% was used for volume expansion to avoid rapid correction of hyponatremia. Starting sodium on the day of cesarean section was 123, and the goal was to maintain a sodium level below 130.

However, cesarean section was complicated by intraoperative hypotension due to hemorrhage, from a suspected placental accreta, which required boluses of crystalloid and phenylephrine to maintain blood pressure followed by transfusion of 4 units of packed red blood cells, 4 units of fresh frozen plasma, 1 unit of platelets and placement of a Bakri balloon to reduce postpartum hemorrhage. Postoperatively, the patient was transferred to the intensive care unit.

Despite boluses of lactated ringer’s solution to manage acute hypovolemia, sodium level remained within goal at 127 following cesarean section and corrected with fluid restriction by postoperative day 3 without any adverse neurological effects. The patient was ultimately discharged on postoperative day 8. She required a prolonged hospital stay because her course was complicated by postpartum hemorrhage, requiring bilateral uterine artery embolization, as well as worsening severe preeclampsia with a rising creatinine and severe range blood pressures, requiring a nicardipine drip. By the time of discharge, the patient was hemodynamically stable with normal coagulation studies, creatinine had normalized, and blood pressure was well controlled on oral medications.

Discussion: Severe hyponatremia is a rare occurrence in pregnancy. It is thought to be related to preeclampsia due to increased incidence in this population, but its pathophysiology remains unclear. Hyponatremia poses unique challenges to anesthesiologists caring for patients undergoing cesarean section as care must be taken to avoid rapid correction of sodium, which is associated with brain injury. However, as this case illustrates, certain clinical situations can complicate ideal management of hyponatremia. Ultimately, additional research is required to better understand the etiology, pathophysiology, and optimal management of these patients.
Severe Hypoxemia in the Setting of ARDS, Pulmonary Embolism, and Fluid Overload

Dr. Alexander Maglunog Jr 1, Dr. Dianne Bach 1, Dr. Jessica Lee 1, Dr. Deep Chandegara 1, Dr. Erin McNamara 1, Dr. Victor Slupski 1, Dr. Peter Roffey 1, Dr. Duraiyah Thangathurai 1

1. Keck School of Medicine of USC, Department of Anesthesiology

In the spectrum of acute lung injury, severe acute respiratory distress syndrome (ARDS) is associated with the highest mortality, up to 45%. Supportive treatment with lung protective ventilation is the standard of care. We describe the additional treatment measures for a patient who postoperatively developed refractory hypoxemia in the setting of severe ARDS, pulmonary embolism and fluid overload.

A 59 year-old woman with hypertension, chronic kidney disease, anemia, and diabetes developed lumbarepidural abscess for which she underwent a 2-level lumbar laminectomy. She presented to our institution one month later, and the infection had progressed to L5 vertebral body osteomyelitis. She subsequently underwent 2-stage spine surgery for corpectomy and L2-pelvis spinal fusion.

Postoperatively, she was treated with broad spectrum antibiotics for severe sepsis. She was subsequently re-intubated after an episode of acute respiratory distress. An IVC filter had been in place preoperatively for known bilateral lower extremity DVTs. However, CT angiogram showed thrombus above the IVC filter and pulmonary embolism to the left main pulmonary artery. She was not a suitable candidate for therapeutic heparinization because of a likely antithrombin deficiency and thus was placed on argatroban drip.

Early attempts at weaning her off the ventilator had failed. She had worsening pulmonary status with several contributing factors. First, there was a component of severe ARDS. Chest x-ray showed white out of bilateral lung fields, and she had progressively increasing FiO2 and PEEP requirements to maintain oxygenation. Even with a lung protective ventilation strategy, she had episodes of hypoxemia and eventually required 100% FiO2 and PEEP of 15 to maintain oxygenation. SpO2 reached 80-85% on maximal settings. Lung compliance worsened, requiring pressure of 40-50 cm H2O to deliver sufficient tidal volume. Secondly, there was a component of hydrostatic pulmonary edema. She had become approximately 15 liters positive from third spacing. Aggressive diuresis was started with mannitol infusion, furosemide and bumetanide. Thirdly, she developed pulmonary hypertension. A PA catheter was placed and showed systolic PA pressure in the 60s. She also was requiring vasopressor support to maintain adequate blood pressure. The patient had worsening hypoxemia to PaO2 52 on 100% FiO2, and ECMO would have been the next step.

We started nitric oxide which resulted in slight improvement of oxygenation and PA pressure. Nitroglycerin infusion was added, which helped further lower PA pressure. She was maintained on a lung protective ventilation strategy. Stress dose IV steroids were given. Even with aggressive diuresis she remained fluid overloaded with worsening respiratory status, thus we started her on CRRT. Over the course of several days, we removed the 15 liters of fluid she had gained. Serial CXRs showed improvement of pulmonary congestion. She showed progressive improvement on ABGs, FiO2 requirement, and ventilatory support. She was successfully extubated, and later discharged to a SNF from the hospital.

This patient developed ARDS secondary to major surgical procedure, PE, and sepsis. Our goal was to remove fluid and minimize her PA pressure by using nitric oxide donors including nitric oxide and nitroglycerin which facilitated rapid improvement.
SEVERE INTRATHORACIC TRACHEAL COMPRESSION AND AIRWAY MANAGEMENT UTILIZING AWAKE ECMO

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Tomas Carvajal¹, Dr. Andrew Murray¹
¹ Mayo Clinic

BACKGROUND
Patients with anterior mediastinal masses (AMM) can experience significant airway, vascular or cardiac compression. Under general anesthesia or during any point in the perioperative time this can progress to fatal major airway, and concomitant cardiovascular collapse.

Extracorporeal membrane oxygenation (ECMO) has been widely utilized in different settings, including as support during procedures where neither standard nor surgical airway management was deemed to be a safe.

We describe a case of a patient with a significant mediastinal mass where ECMO was utilized prior to induction.

CASE REPORT
71 year old male presented with two days duration of increasing dyspnea, in the setting of a known mediastinal mass. Contrasted CT scan of the chest revealed large mediastinal mass (10 x 7 x 11.7 cm) with significant compression and stenosis (to a minimal area of 2.0mm intrathoracic)(Figure 1A, 1B).

Under mild sedation with Midazolam and Dexmedetomidine and using local anesthesia Femoral-Femoral (veno-veno) ECMO was established in 23 minutes. After flow and oxygenation were ensured to be adequate, general anesthesia was induced; subsequently video-laryngoscopy failed to pass a 5.5 ETT beyond the tumor. (Figure 1D). Once the tumor was completely removed (Figure 1C), with a pediatric-size fiberoptic bronchoscope a 6.5 ETT was advanced to position. Patient was then successfully ventilated and rapidly weaned from ECMO (total ECMO duration: 215min). Patient was kept intubated for < 24hr in the ICU. Patient had excellent outcome with no long term complications up to 9 months follow-up.

DISCUSSION
Patient with compressive pathology such was described above should be approached with significant caution.

Neuromuscular blockade drugs and general anesthesia augments the risk of airway collapse, thus maintaining spontaneous respiration should be a priority. We achieve this utilizing Dexmedetomidine as sedating agent, and providing support with veno-veno ECMO pre-induction of general anesthesia.

Awake fiberoptic intubation of the trachea passing the compression is a possibility, but our CT (Figure 1A) demonstrated the distal maximal point of significant stenosis. We acknowledge that intubation and positioning of the ETT would be challenging and therefore we avoided any manipulation of the airway before ECMO support.

Cardiopulmonary support for non-cardiac surgery has been described since 1966. Similar case reports describe prophylactic use of cardiopulmonary bypass and ECMO for airway and hemodynamic management during AMM cases.

Our case is unique given the presence of neck, airway and mediastinal components, with a significant airway stenosis (2mm minimal diameter). We had complete VV-ECMO support initiated before general anesthesia induction, consequently completely preventing any airway, ventilation or oxygenation decompensation.

Good outcomes are possible if a reversible, methodical and careful anesthetic plan is followed. Strategies include; preservation of spontaneous ventilation, avoidance of muscle relaxants, awake intubation, intubation distal to the compression, rigid bronchoscopy, position changes and elective cardiopulmonary support, including peripheral cardiopulmonary bypass and as utilized in our case ECMO.
Sodasorb™ appears to outperform LithoLyme™ in the OR setting

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Cedar Fowler¹, Dr. Mark Burbridge¹, Dr. Richard Jaffe¹, Dr. John Brock-Utne¹

¹Stanford University School of Medicine

In the search for efficiency, increasing focus is being paid to CO₂ absorbers of the anesthetic machine. Litholyme™ has been reported to have particularly favorable data in respect to CO₂ absorbent capabilities compared to other absorbers. This study is a direct comparison between Litholyme™ and Sodasorb™ in the clinical setting. We found that Sodasorb™ outperforms Litholyme™ in our clinical practice.
Spiking of Intravenous Bags Does Not Cause Time Dependent Microbial Contamination.

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Sara Smith ¹, Dr. Richard Jaffe ², Dr. John Brock-Utne ²

¹. Stanford Hospital, ². Stanford University School of Medicine

Background: The objective of this study is to determine if spiking intravenous bags under ordinary non-sterile anesthesia workroom conditions could result in a time-dependent microbial contamination of the intravenous solution at any time up to nine days during standard non-sterile storage conditions.

Method:
Containers of intravenous fluids were spiked at our institution by our anesthesia technologists in the anesthesia workroom. In order to avoid affecting standard procedure, the technologists were not informed about the study prior to bag spiking. The intravenous solutions were divided into 4 groups. Group 1 was normal saline (NS) and Group 2 was 5% dextrose in lactate Ringer's (D5LR). Both groups 3 (D5LR) and 4 (NS) were deliberately contaminated with 100 cfu/L E. coli to act as positive controls. Twenty milliliter samples were collected at days zero, one, two, five, and nine from one of the bags in each group. Ten milliliters from each sample were injected into each of two blood culture bottles and monitored for both bacterial and fungal growth.

Results:
At days zero, one, two, five, and nine, no growth of bacteria or fungi was observed in any sample from groups 1 and 2 during five days of incubation, while groups 3 and 4 showed the expected growth of E. coli.

Conclusions:
Under the ordinary non-sterile anesthesia workroom conditions in which our saline and D5LR bags were spiked, no growth of bacteria or fungi occurred at any time up to nine days after spiking of these commercially prepared IV solutions.
Subdural spread following right-sided paravertebral blocks.

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Jarred Hicks 1, Dr. Jennifer Davis 1
1. University of Utah Hospitals and Clinics

Background: The incidence of subdural spread for paravertebral blocks (PVBs) is unknown but can be as high as 0.83% for thoracic epidurals. The reason for the difficulty in quantifying the incidence of subdural spread for PVBs is that it is both a rare complication and heterogeneous in its presentation.

Case Description: Patient is a 65-year-old female scheduled for a right-sided VATS, right upper lobectomy, and mediastinal node dissection for adenocarcinoma of the lung. In preoperative holding, right-sided PVBs were placed at the T3, T5, and T7 levels using a total of 24 mL of 0.5% ropivacaine with 1:200,000 epinephrine and 4 mg of dexamethasone. Block placement was uncomplicated with no aspiration of heme, CSF, or air at all three levels. Patient’s mean arterial pressure (MAP) prior to PVB placement was noted to be in the mid-80’s. Before the induction of general anesthesia, the patient reported paresthesias in her left hand (the blocks had been performed on the right side which was the correct side). On exam, the patient demonstrated sensory abnormalities primarily in a C8-T1 dermatomal distribution as well as left-sided finger abduction weakness. This was followed shortly thereafter by the onset of paresthesias bilaterally in her toes extending proximally to her mid calves, but no motor deficit in the lower extremities. The patient also became hypotensive during this time with MAPs in the 50’s, but responded well to several small boluses (5-10 mg) of ephedrine.

After consultation between the anesthesia and surgical teams, the patient was taken to the PACU for one hour for continuous monitoring. Over the next hour, the patient’s neurological symptoms completely resolved with the exception of minor left-sided finger abduction weakness. The decision was made to proceed with surgery, which was uneventful, and the patient was extubated without difficulty in the operating room. She was evaluated by the block team upon arrival to the ICU 6 hours after block placement. Sensory abnormalities in her left arm/hand and legs had completely resolved, but she was still noted to have minor weakness (4+/5) with left hand finger abduction. This weakness completely resolved by the following day.

Discussion: This patient’s patchy neurologic symptoms following thoracic paravertebral placement were thought to be most consistent with subdural spread of local anesthetic. Subdural spread of local anesthetic following paravertebral blocks is a complication not often described in the literature owing to its rarity and heterogeneous presentation. In addition, it is a complication normally associated with epidural placement, not paravertebral blocks. Regardless, local anesthetic spread into the subdural space is often described as a gradual onset of primarily sensory (not motor) manifestations that is complicated by sympatholysis, all of which were seen in this patient. Given the progression of the patient’s neurologic symptoms, the decision was made to postpone surgery and monitor the patient closely for resolution of symptoms. This case demonstrates that if subdural spread of local anesthetic is suspected, surgery can be performed after a period of careful observation provided the patient’s neurologic symptoms have improved.
Successful Erector Spinae Plane Block for Axillary Sentinel Lymph Node Biopsy Under Deep Sedation in Morbidly Obese Patient

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Richard Kim1, Dr. Quentin Baca1, Dr. Sesh Mudumbai1, Dr. Edward Mariano1

1. Stanford University School of Medicine

We present a case where general anesthesia was averted for a 70-year-old morbidly obese veteran with multiple medical comorbidities who presented for a left hand melanoma excision and left axillary sentinel lymph node biopsy. Due to his obstructive sleep apnea, pulmonary sarcoidosis, rheumatoid arthritis, and past episodes of respiratory failure due to delayed emergence requiring intensive care management, regional anesthesia with monitored anesthesia care was opted. In addition to a supraclavicular block, the patient also received an erector spinae plane block between the rhomboid major and erector spinae using mepivacaine 1.5% for both blocks. He underwent opioid-free deep sedation using dexmedetomidine infusion while on bilevel positive airway pressure therapy. Intravenous acetaminophen 1000 mg was given and local injection of lidocaine 1.5% with 1:200,000 epinephrine was administered as needed. He remained hemodynamically stable throughout the operation. He altogether received 10 mL of lidocaine 1.5% (150 mg) and 40 mL of mepivacaine 1.5% (600 mg). Postoperatively, the blocks resolved without neurological sequela. Upon return to surgery clinic one week later, he denied any axillary pain. Brachial plexus blocks do not provide adequate analgesia to the axilla. Furthermore, technical challenges and monitoring needed for thoracic epidural and paravertebral blocks limit their usefulness in ambulatory surgery. The erector spinae plane block can offer adequate axillary pain relief to facilitate more outpatient procedures.
Successful Management of a Primigravida Patient with Hypertrophic Obstructive Cardiomyopathy (HOCM) undergoing Cesarean Section with an Epidural

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Harjot Singh 1, Dr. Taizoon Dhoon 1
1. University of California Irvine

Background:
Hypertrophic obstructive cardiomyopathy (HOCM) is the most common genetic cardiovascular disorder with a prevalence of 0.2% in the general population and an incidence of 0.1 - 0.5% in the pregnant population. The disorder is characterized by varying degree of left ventricular hypertrophy that can lead to left ventricular outflow obstruction (LVOT), diastolic dysfunction, myocardial ischemia, and mitral regurgitation. Sudden unexpected death, caused by acute LVOT obstruction or a fatal cardiac dysrhythmia, is possible in an asymptomatic patient.

Case Description:
We present the case of a 29-year-old female, primigravida, with a history of HOCM with severe septal hypertrophy and severe mitral regurgitation. The patient also had a history of staphylococcal endocarditis 10 years ago due to a tooth infection as well an embolic stroke with no residual deficits. She had an AICD in place for nine years, replaced three years ago, without any discharge events. At 34 weeks’ gestation a multi-disciplinary meeting with obstetrics, cardiology, and anesthesiology was held to optimize the patient and discuss a delivery plan. The plan included induction of labor at 38-39 weeks with a vaginal delivery, interrogation of the AICD device, an early epidural placement with slow infusion rate, and 24-hour post-delivery stay in the ICU. The patient presented for induction of labor at 40 weeks and 5 days. An ICU nurse was assigned to the patient and she was started on continuous cardiac monitoring. The patient was encouraged to not valsalva or bear down as this would cause a significant decrease in her preload. On hospital day 3 the patient met criteria for failed induction of labor and the decision was made to proceed with cesarean section with an epidural. The patient was then consented for a central line and an arterial line was placed in the operating room prior to the procedure. A magnet was placed over the AICD device and pacer pads were used in case of an arrhythmia. Following a negative test dose, the patient's epidural was then bolused with 2% lidocaine in 5cc increments every 10 minutes for a total dose of 15cc. After a T4 dermatomal level was reached a phenylephrine drip was started to prevent any decrease in the patient's blood pressure and maintain adequate afterload. She delivered without any complications and was then transferred to the ICU. The phenylephrine drip was successfully weaned off overnight and the patient was discharged home on post-operative day 2.

Conclusion:
We present this case to highlight the successful management of a primigravida patient with HOCM undergoing cesarean delivery with an epidural. Pregnancy can pose a challenge to these patients given the decrease in afterload (secondary to hemorrhage or neuraxial anesthesia), and preload due to uterine compression of the inferior vena cava. A successful management strategy must include an interdisciplinay approach, adequate availability of resources, and close monitoring throughout the admission.
Successful pre-emptive management of Amniotic Fluid Embolism (AFE) developed during Cesarean Section (C-section)

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Brian Lin ¹, Dr. Cristina Chandler ²

1. UC Davis, 2. UC Davis Department of Anesthesiology & Pain Medicine

Introduction: AFE is the second leading cause of maternal death in the US with a mortality rate of up to 80% (1). 50% of patients die within the first hour of cardiorespiratory collapse and 50% of those who survive develop coagulopathy. Several pre-existing risks factors: age>35, premature rupture of membrane (PROM), C-section, may be linked to an increased risk of AFE. We present a survivor who received early cardiorespiratory support and anticipatory treatment of coagulopathy.

Case presentation: A 41 year old G6P5 female was admitted at 34 weeks gestation for PROM. Past medical history was significant for gestational diabetes, responsive to insulin.

On day 4, the patient underwent C-section due to breech presentation. Spinal anesthesia (12 mg bupivacaine, 15 mcg of fentanyl and 150 mcg of morphine) resulted in bilateral T5 block. The infant was delivered 43 minutes into surgery. 5 minutes after delivery the patient became unresponsive with seizure-like activity, accompanied by hypoxia, hypotension, and bradycardia. She was intubated and her BP improved following 150 mcg IV epinephrine. She remained acidotic (pH 7.22/35/53/14/50%, BE -13) and hypoxic on FiO2 1.0. EBL was 600mL. Studies later included the following: head CT (negative); lung CT angiogram (multiple peripheral artery emboli); TEE (acute RV strain).

Hypotension recurred 3 hours post-surgery, managed with fluids and a dopamine infusion. The patient then developed microvascular bleeding and pre-emptively received RBCs and coagulation factors. A follow up DIC screen was normal except for increased D-dimer. She was weaned from the ventilator the following day and discharged to home in one week. She had returned to baseline by her 6-week visit.

Discussion: AFE is caused by entry of fetal squamous cells into the maternal circulation, mimicking an anaphylaxis-like reaction with 2 phases: a cardio-respiratory phase characterized by acute onset respiratory failure and cardiac collapse, followed by a hemorrhagic phase manifest with consumptive coagulopathy for the survivors of the first phase (3). Diagnosis is one of exclusion. AFE can be differentiated from a “high spinal” block or PE by a characteristic coagulopathy. It is also different than local anesthetic systemic toxicity; AFE usually occurs later from the onset of the block. Most cases have been described during labor (70%) and the rest during C-section (19%) or vaginal delivery (11%).

Advanced supportive resuscitative measures are critical to survival. Treatment of AFE is essentially supportive requiring a multidisciplinary approach and directed towards rapid recognition and early resuscitation by maintaining oxygenation, cardiac output and blood pressure and correcting coagulopathy and delivery of the baby should take priority.

In our case, the patient had risk factors for AFE (advanced maternal age, multiparity, C-section) and developed initial cardiorespiratory collapse followed few hours later by clinical coagulopathy. She survived an AFE with early specialist supportive cardiorespiratory care, reversing coagulopathies and was discharged home without serious sequelae and morbidity.

References:
Sugammadex for Reversal of Neuromuscular Blockade by Rocuronium in a 10 Week-Old Infant

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Justin Teng¹, Dr. Gabriel Sarah¹, Dr. Marla Ferschl¹
¹. University of California San Francisco

BACKGROUND:

Sugammadex is a modified gamma cyclodextrin that tightly encapsulates aminosteroid neuromuscular blocking agents. It was approved for reversal of neuromuscular blockade (NMB) for adult patients in the United States in 2015; however, the safety and effectiveness of sugammadex has not been established in pediatric patients. We present a case report of an otherwise healthy 10-week-old male undergoing inguinal hernia repair who received reversal with sugammadex.

CASE DESCRIPTION:

An otherwise healthy, 10-week-old, ex 33 week 5.22kg male infant underwent unilateral left inguinal hernia repair under general anesthesia. Anesthesia was induced with sevoflurane, nitrous oxide and 5mg of IV rocuronium (0.96mg/kg). A caudal block was performed with injection of 4.5mg of .25% bupivacaine. Anesthesia was maintained with sevoflurane during an otherwise uneventful 3 hour procedure. At the conclusion of the procedure, the patient was on Pressure-Controlled Ventilation, with an EtCO2 of 40, HR 150s, BP 70/30 and oxygen saturation of 100%. Reversal was given with 0.35mg (0.07mg/kg) neostigmine and 0.07mg (0.2mg glycopyrrolate / 1mg neostigmine) of glycopyrrolate. After 12 minutes without spontaneous movement despite no additional administration of anesthetic agents and an end-tidal sevoflurane of 0%, inadequate reversal was considered. Vital signs were noted to be elevated with HR 170s and BP 120/50. Train of Four (TOF) ratio was tested with a manual twitch monitor applied to the right ulnar nerve with a resulting 1 twitch count. 21mg (4mg/kg) of Sugammadex IV was then given with immediate emergence. The patient was subsequently extubated and recovered uneventfully in the PACU with no signs of residual NMB or recurarization, and was discharged home on postoperative day one.

DISCUSSION:

The use of sugammadex in pediatrics, particularly under two years of age has not been well-described. A multicenter, randomized parallel group study in France (1) examined dose response and safety in 91 patients, 8 of whom were infants (28 days to 23 months) and 24 of whom were children (age 2-11 years). A dose response relationship was seen in the children, adolescents, and adults but not in infants due to small sample size. Alonso et al.(2) evaluated 23 neonates aged 1-7 days who were reversed with 4mg/kg sugammadex to a TOF 0.9, without any adverse events. Liu et al.(3) reviewed ten randomized controlled trials totaling 580 pediatric patients, 517 of which were 2-17 years old and compared the efficacy and safety of sugammadex to neostigmine or placebo. Sugammadex reversed rocuronium-induced neuromuscular blockade more rapidly, with less bradycardia and without other adverse events.

The use of sugammadex in preterm infants has not been studied. This case report describes the successful use of sugammadex as a rescue medication in a preterm infant. Future studies of sugammadex are needed in the patient population.
Sugammadex use in an 8 Month Old Boy s/p Ileostomy Revision that was Re-intubated and Re-relaxed 20 Minutes After Initial Extubation

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Leah Sag ¹, Dr. Hnin Htun ²

¹. Naval Medical Center San Diego, CA, ². Navy Medical Center San Diego, CA

Background:
Sugammadex (BRIDION) is a neuromuscular reversal agent that is not approved in patients ≤ 17 years of age by the Food and Drug Administration (FDA).

Case Presentation:
This is a case of an 8-month-old with trisomy 21, Hirschsprung’s Disease (HD) and congenital heart disease s/p diverting loop ileostomy at 2 months of age who was scheduled to undergo end ileostomy revision and repair. On the day of the surgery, the patient had an inhalational induction and intubation with a 3.5 cuffed ET tube using Propofol, Fentanyl and Rocuronium. Per surgeon’s request, complete paralysis was achieved with total Rocuronium dose of 3mg based on 0.6mg/kg dosing. The case was otherwise uneventful, lasting 57 minutes. The patient had 1 posttetanic count without twitch response to TOF stimulation at the end of the case and was reversed with 4mg/kg of BRIDON. 4 twitches and sustained tetany was demonstrated immediately after reversal. 20 minutes after giving the reversal agent and after successful extubation, the surgeon noted active prolapse of bowel through the ileostomy repair site. The patient had to be reintubated at this time for a more substantial repair to include new mucus fistula creation. Intravenous induction and intubation with 3.5 cuffed ET tube was performed. Rocuronium was re-dosed at 3mg. 0/4 twitches were documented at the beginning of the case to confirm adequate relaxation. At the end of the case, the patient had 3 twitches with TOF stimulation and was reversed with BRIDON 2mg/kg. 4 twitches and sustained tetany was demonstrated immediately after administration. The patient was successfully extubated and transferred to PACU.

While in PACU, the patient cried robustly with some upper airway stridor. Two doses of Racemic epinephrine were administered, and the patient was admitted to PICU for further observation. The patient was observed overnight without acute events and was promptly discharged home on POD#1.

Discussion:
Sugammadex (BRIDON) is a new neuromuscular blocking agent that received approval for use by the FDA in December 2015. Unique mechanism of action includes inactivation of Rocuronium and Vecuronium through stable encapsulation and excretion by the kidneys. In addition, full reversal of deep motor block is possible in less than 2 minutes. Although not FDA approved in children, anecdotal use in the literature suggests safety and efficacy in pediatric patients. This case is unique in that it demonstrates the agility to re-intubate and re-dose Rocuronium after 20 minutes of BRIDON administration in a pediatric patient. Possible application for use of this drug in Pediatric population includes reduction in incidence of malignant hyperthermia or hyperkalemia by avoiding succinylcholine and as a rapid reversal drug in difficult intubation situation after a dose of rocuronium has been given.

Superior Hypogastric Plexus Block with an Unintended Lumbar Plexus Block

Dr. Peter Huynh¹, Dr. Gulraj Chawla¹, Dr. David Cho¹
¹Harbor-UCLA Medical Center

Background: The sympathetic hypogastric plexus is located in the retroperitoneum at the level of the fifth lumbar vertebrae and first sacral vertebrae. Interruption of this plexus has been used to treat pelvic visceral pain, pelvic cancer pain, chronic non-cancer pelvic pain, and refractory penile pain. The procedure is regarded as relatively safe and with a low risk of complications. We present a case involving a superior hypogastric plexus block with inadvertent concomitant lumbar plexus block.

Case Description:
A 55 year old female with chronic abdominal and pelvic pain presented for a left superior hypogastric nerve block to treat visceral-type left upper quadrant abdominal pain. Patient informed consent was obtained for submission of a case report. With intermittent fluoroscopy, the L5-S1 interspace was identified and a 22-gauge, 5 inch spinal needle was advanced until the anterolateral aspect of the vertebral body was contacted. The needle was then “walked” forward in an anterior and inferior direction toward the sacral promontory anterior to the L5 and S1 interspace. The needle location was confirmed with anterior-posterior and lateral views. Initial aspiration was positive for blood. The needle was withdrawn several millimeters and the position was reconfirmed with imaging. Following negative aspiration, 1 mL of contrast was injected. Imaging revealed appropriate placement of contrast along the distribution of the superior hypogastric plexus. Five milliliters of 0.2% ropivacaine and 2% lidocaine with epinephrine was injected and showed good spread.

In the recovery unit, the patient complained of profound left lower extremity weakness and sensory deficits. She was unable to flex her knee and had problems with dorsiflexion. Vital signs continued to be stable. We performed serial examinations over the next 5 hours. There was gradual improvement in her lower extremity prior to discharge. Follow up two days after the procedure revealed continued improvement but with pain in the left lateral thigh. With the exception of 4/5 strength for left plantar flexion, her strength, sensation, and reflexes were normal. In comparison to an older MRI study, repeat imaging showed worsening spinal canal stenosis but this was unlikely related to the procedure.

Discussion:
Superior hypogastric plexus blocks are regarded as relatively safe and serious complications are unusual. After a review of the available literature, it is our understanding this is the first case of an inadvertent concomitant injection of the lumbar plexus. Upon closer inspection, the contrast dye appeared to be in the psoas muscle, further verifying that local anesthetic may have infiltrated into the lumbar plexus. The patient reported profound weakness for the first 5 hours that progressed to a generalized weakness for the next 12 to 18 hours before returning to her baseline. This progression of symptoms closely follows the typical duration that is seen from these types of medications. While this procedure is regarded as relatively safe, the close proximity of other nerve structures need to be considered when new neurological deficits are discovered.
Methamphetamine is a stimulant drug that is often abused recreationally. The illicit drug has many systemic effects including serious cardiovascular sequelae such as arrhythmias, heart failure, and acute coronary syndrome. In this case, our patient developed supraventricular tachycardia (SVT) following acute usage of methamphetamine prior to a monitored anesthesia care case. The patient was a 23 year old with no past medical history who initially presented with a soft tissue infection that required multiple debridements and was scheduled for a right third digit amputation. Prior to surgical incision, the patient developed stable supraventricular tachycardia. The dysrhythmia was refractory to vagal maneuvers and two dosages of adenosine. Heart rate was eventually controlled with beta blockade. Supraventricular tachycardia after methamphetamine usage is exceedingly rare. In one study of 158 patients with methamphetamine dependence, there were no cases of SVT. In a separate study looking at 230 patients with acute methamphetamine usage presenting to the hospital, only one patient developed SVT. There have been no other documented cases of SVT secondary to acute methamphetamine usage prior to surgery.
Synovial Sarcoma Presenting as an Anterior Mediastinal Mass in a Parturient

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Joshua Santos, Dr. Eli Torgeson, Dr. Emily Bui

1. Department of Anesthesiology and Critical Care Medicine, University of New Mexico, Albuquerque, NM

Background
Mediastinal masses are a rare occurrence that present the anesthesiologist with the risk of airway compromise and cardiovascular collapse. Loss of spontaneous ventilation, patient positioning, and hemodynamic changes associated with induction of general anesthesia can precipitate cardiopulmonary compromise. The physiologic changes occurring in a parturient only increase the risk of perioperative complications. We present a case of a gravid woman found to have a mediastinal mass with impending respiratory failure.

Case presentation
A 25 year-old healthy female at 34 weeks gestation was transferred to our institution with hemoptysis and pleural effusion. CTA of the chest demonstrated a 12 cm right-sided mediastinal mass with near complete occlusion of the distal trachea up to the level of the carina and complete occlusion of the right mainstem bronchus. The right main pulmonary artery and superior vena cava were also compromised. Given these findings, there was concern for impending airway failure. A multi-disciplinary conference was held with all involved teams, and it was decided that Cesarean section should be performed followed by intubation and endobronchial biopsy of mediastinal mass.

Given the high risk for cardiopulmonary compromise, rescue extracorporeal membrane oxygenation cannulas were placed preoperatively. Cesarean section was then performed with a combined spinal-epidural technique. Towards the end of the procedure, the patient noted intense pressure sensation and was given small boluses of IV ketamine and placed on a remifentanil infusion.

Following completion of the cesarean section, airway topicalization was performed via lidocaine nebulization, gargle, and atomization device. Sedation was achieved with remifentanil infusion and small boluses of ketamine and dexmedetomidine. A flexible bronchoscope loaded with a 6.0 cuffed MLT was then passed into the trachea. Severe narrowing was noted at the distal 1/3 of the trachea, but bronchoscope was able to be passed into the left mainstem bronchus. Propofol infusion and sevoflurane 1.5% were initiated and remifentanil infusion continued for induction of general anesthesia. Rigid bronchoscope was then used to deploy overlapping distal trachea and left main bronchus stents. Endobronchial ultrasound with mass sampling was performed and 7.0 ETT placed proximal to tracheal stent. The patient was transferred to the MICU for further care. Pathology results were consistent with synovial sarcoma.

Discussion
Anesthetizing a patient with an anterior mediastinal mass can be a risky endeavor. There have been numerous reports of serious complications resulting from anesthetizing a patient with an anterior mediastinal mass. Creating a multidisciplinary treatment plan prior to the procedure can mitigate these risks. Pre-operative risk assessment based on symptomatology and imaging should be the first step in dictating an anesthetic plan. Those patients at risk for cardiopulmonary compromise should undergo procedures with local anesthetics and minimal sedation. If
this is not feasible, the airway should be secured while maintaining spontaneous ventilation via awake fiberoptic intubation. Care should be taken to have rescue therapies readily available in the event of airway or vascular compromise. These interventions include rigid bronchoscopy and extracorporeal membrane oxygenation as a last resort.
TEE Guidance for Type A Dissections: Identifying High Risk Features to Inform Surgical Interventions

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. STEPHANIE DSOUZA 1

1. Department of Anesthesiology, Cedars-Sinai Medical Center, Los Angeles, California

Author: Stephanie Dsouza, MD
Faculty Mentor: Rebecca Aron, MD
Affiliation: Department of Anesthesiology, Cedars-Sinai Medical Center, Los Angeles, California

Background: Acute Type A aortic dissections are highly fatal with mortality rates approaching 1-2% per hour for the first 48 hours. Intra-operative TEE can evaluate high risk features of Type A dissections thereby altering the operative course. These include coronary ostial occlusion, regional wall motion abnormalities, hemorrhagic pericardial effusion and tamponade, acute severe aortic regurgitation (mechanism) and extension of the dissection to the head/neck vessels. We present a case where real-time TEE evaluation of an acute Type A dissection excluded the presence of the above high risk features thereby proving to be an integral tool for pre-procedural planning, intra-operative guidance, and post-repair assessment.

Case Presentation: An 84-year-old woman with a history significant for coronary artery disease was admitted with acute chest pain radiating to her back. CT revealed an acute Type A aortic dissection and patient was scheduled for emergent surgical intervention.
Intra-operative TEE confirmed an aortic dissection originating at the level of the STJ and extending into the descending aorta consistent with a Type A dissection. TEE also revealed severe ascending aorta dilation to 5.7 cm, severe AI (resulting from prolapse of the non-coronary cusp and annular dilation) with normal biventricular function, and no regional wall motion abnormalities.
Direct intraoperative examination correlated well with TEE findings. The ascending aorta was surgically replaced from the STJ to the aortic hemiarch just proximal to the origin of the innominate artery. The aortic valve was repaired with a subcommisural valvuloplasty and resuspended.
Post repair intra-operative TEE revealed mild AI and preserved cardiac function. The patient's postoperative course was complicated by atrial fibrillation but was otherwise uneventful and patient was discharged on postoperative day nine. Repeat TTE upon one year follow-up demonstrated preserved cardiac function and competency of the aortic valve and graft.

Discussion: TEE can be rapidly and safely performed peri-operatively to provide real time guidance in a hemodynamically unstable and clinically evolving aortic dissection patient requiring lifesaving surgery. TEE provides invaluable information for cardiac surgery - the proximal extent of the dissection flap, coronary involvement, site of entry tears, the severity and mechanism of aortic regurgitation, head/neck vessel involvement, left ventricular function. Post bypass, TEE can assess the competence of the repaired aortic valve and the integrity of the aortic graft.
Telemetry interrogation of bilateral deep brain stimulator pulse generators and electrocardiogram artifact

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Elisa Lund ¹, Dr. Ryan Pong ¹

1. Virginia Mason Medical Center

Background: 65 year old male with Parkinson's disease with bilateral subthalamic nucleus deep brain stimulators presents for bilateral implantable pulse generator replacement

Case Description: A 65 year old male with Parkinson's and bilateral subthalamic nucleus deep brain stimulators presented for bilateral Activa SC pulse generator replacements due to low voltage and progressively worsening Parkinsonian symptoms. Patient's other past medical history and physical exam were unremarkable. The generators were interrogated via telemetry and shown to have therapeutic impedances of 731 on the left and 1077 on the right. In the operating room, standard monitors including pulse oximetry, electrocardiogram (ECG), end-tidal carbon dioxide (etCO2) and blood pressure using a Phillips IntelliVue were connected and confirmed functional. Induction and LMA 5 placement was uneventful. Approximately 8 minutes after induction, the generators were reevaluated via telemetry by the surgical team. At this time, the ECG abruptly developed an uninterpretable tracing. No change to pulse oximetry, etCO2 or blood pressure were noted and on physical exam patient had good brisk radial pulses bilaterally. ECG leads and monitor cables were replaced and placed at least 6 inches from generators without resolution. At this time, discussion with surgical team resulted in pausing the generator evaluation and ECG tracing returned to baseline. Evaluation was able to proceed with intermittent pauses to reevaluate the ECG tracing with no noted change in ECG waveform. After interrogation was completed, pulse generators were turned off and replaced with new preprogrammed Activa SC pulse generators. The ECG tracing remained stable through the completion of the case and emergence. In the post-anesthesia care unit, integration of the new devices did not cause any ECG artifact.

Discussion: As Implantable Electrical Devices (IEDs) are becoming more prevalent, anesthesia providers must be familiar with risks unique for patients with IEDs. Radio frequency and electromagnetic interference between implantable devices and other electronics is a known but unpredictable complication. Medtronic's Activa SC manual has warnings indicating potential interference between IEDs and equipment with risks ranging from minor inconveniences to device malfunction and patient death. This interference can impact device programming as well as an anesthesia provider's ability to provide safe care. There are multiple case reports highlighting the interference a deep brain stimulator pulse generator can have on ECG while active; however, limited reports discuss the temporary ECG interference during telemetry interrogation of a pulse generator. This case highlights the steps necessary to evaluate a malfunctioning monitor while simultaneously providing a safe and effective anesthetic. First, at the first sign of monitor malfunction, the patient's physical exam was reassuring for bilateral radial pulses and perfusion. Second, evaluating all monitors showed only ECG impacted with stable pulse oximetry, etCO2 and blood pressure. Replacing monitoring devices did not resolve the malfunction. Ultimately, communicating with the surgical team and requesting a temporary halt on interrogation resolved the errant ECG tracing. Programming was able to proceed with temporary interruptions to reevaluate ECG tracing with no harm or adverse event to patient.
Temporal control of microglial reactivity reveals sex-independent functional contribution of microglia to long-lasting pain

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Mr. Thomas Forman 1, Ms. Elena Haight 1, Dr. Yoshinori Takemura 2, Dr. David Clark 1, Dr. Vivianne Tawfik 1

1. Stanford University School of Medicine, 2. University of Toyama

INTRODUCTION

Complex regional pain syndrome (CRPS) is a form of chronic pain affecting the limbs, often after trauma such as fracture or minor surgery. Pain is ultimately mediated by neurons, which are heavily influenced by circulating and resident innate immune cells including monocyte-lineage cells peripherally as inflammatory monocytes and centrally as microglia activated in part through TLR4. We sought comprehensive evaluation of microglial involvement in CRPS progression in male and female mice to better understand whether these cells can be modulated to alter the post-injury pain trajectory.

METHODS

We used a mouse model of traumatic CRPS involving unilateral tibial fracture followed by three weeks of casting. Upon cast removal, we evaluated edema, temperature, weight bearing and nociceptive responses at multiple time points to understand the pain trajectory after injury. We then used complementary pharmacologic and genetic strategies to manipulate monocyte-lineage cells either at the time of fracture or cast removal, and evaluated spinal cord microglial activation via markers CD11b and TLR4.

RESULTS

As previously demonstrated, both male and female mice developed allodynia, edema, unweighting and increased temperature of the injured hind paw. Within the spinal cord, microglial expression of CD11b and TLR4 increased as early as 3 days post-fracture in males and persisted for up to 7 weeks. In contrast, increases in microglial expression of CD11b and TLR4 were delayed until three weeks post-fracture in females, but persisted for as long as 20 weeks.

In order to elucidate any time-dependent, microglia-specific contributions, we utilized mice with a monocyte lineage, tamoxifen-inducible Cre-recombinase to express the human diphtheria toxin receptor allowing for spatiotemporal control of microglial depletion. Microglial depletion in male mice at the time of cast removal caused an immediate decrease in nociceptive responses with effects outlasting the time to microglial repopulation. Microglial depletion in female mice at the time of cast removal caused a delayed and persistent reversal of nociceptive responses.

We then sought to examine whether specific inhibition of microglial activation via TLR4 can produce similarly improved pain trajectories. We utilized a systemically available TLR4 antagonist, TAK242 (resatorvid). Administration of TAK242 either at the time of fracture or at cast removal almost immediately decreased allodynia and CRPS-related changes, with effects outlasting drug dosing in males. Consistent with our time course data, TAK242 had a delayed
effect in females, reversing alldynia, edema and unweighting after 10 days of dosing.

Because TAK242 affects all TLR4-expressing cells (including peripheral monocytes), we then pursued a genetic strategy to discern the microglial TLR4-specific contribution to persistent pain. In Cx3CR1<sup>CreERT2;Tlr4<sup>fl/fl</sup> mice, peripheral cells quickly turn over and express TLR4 while CNS microglia remain TLR4-depleted. Microglia-specific TLR4 depletion resulted in decreased alldynia and CRPS-like changes in males, albeit to a lesser degree than that seen with microglial depletion with similar results in females.

**DISCUSSION**

These data indicate that microglia mediate nociception in both male and female mice after injury, and suggest that specifically timed modulation of CNS microglia, at least in part through TLR4, can restore proper microglial function and reduce pain after injury.
Temporization of ECMO Circuit Rupture for the General Anesthesiologist

Dr. Lindsay Jinkins, Dr. Lev Deriy, Dr. Timothy Petersen

1. University of New Mexico Hospital

We describe a case of ECMO circuit rupture which occurred secondary to ICU bed collision with the plastic oxygenator during patient transport. The ECMO emergency response for circuit rupture is described. Mentally rehearsing these management steps may improve outcomes for this rare scenario.
The Bezold-Jarisch Reflex as a Likely Cause of Asystole with Spontaneous Return to Normal Sinus Rhythm During a Kyphoscoliosis Repair in a 12 Year Old

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Shaishav Shah 1, Dr. Michelle Lieu 1, Dr. Reza Borna 1
1. UCLA Anesthesiology & Perioperative Medicine

Background: Intraoperative cardiac arrest is a rare but feared life-threatening complication that may occur with all types of anesthetics. The incidence of perioperative cardiac arrest varies per study but range from 2.7 to 22.9 cases per 10,000 anesthetics. Here we described an incident of intraoperative cardiac arrest in a 12-year-old patient undergoing Kyphoscoliosis Repair.

Case Description: Patient was a 12 year-old female with past medical history of short bowel syndrome secondary to jejunal atresia status post bowel resection shortly after birth, congenital kyphoscoliosis with no pre-operative neurologic deficits scheduled to undergo elective T11 hemivertebra excision and T5-L2 posterior spinal fusion with instrumentation. Patient had no known cardiac defects and had no prior complications with anesthesia. Five hours subsequent to surgical incision, the anesthesiologist noted complete absence of electrical activity on telemetry with no escape rhythms. This was confirmed with absence of pulsatility on arterial waveform and pulse oximetry with a dropping end-tidal carbon dioxide. Surgeons were notified to immediately halt with the surgery. A help call was sent. Prior to administration of epinephrine and approximately 20 seconds later, patient spontaneously returned to normal sinus rhythm with no changes to ST segments. No chest compressions were administered. An arterial blood gas was subsequently showed results of 7.34 / 39 / 327 / 23 / -1.8 with electrolytes within normal limits. Case proceeded with no other significant intraoperative events.

Post-operatively, patient had no neurologic deficits. Pertinent post-operative work up revealed an EKG with sinus tachycardia with QTC 438, ionized calcium at 0.94, and magnesium 1.3. An echocardiogram revealing normal LV and RV function, absence of LV outflow obstruction, absence of LV wall motion abnormalities, and no valvular pathologies. Patient was discharged on POD #6 after an uneventful post-operative course.

Discussion: The etiology of this brief arrest remains unproven. Table 1, adapted from a study by Bhananker et al of the Pediatric Perioperative Cardiac Arrest Registry, details an excellent differential of possible causes of intraoperative asystole.[6] Based on the data presented in the case discussion, a vast majority of potential causes can be eliminated. Despite being unproven, the best hypothesis to explain the asystole is from the Bezold-Jarisch reflex. [7] It is likely that downward pressure on the thorax resulted in IVC compression and loss of venous return triggering a vagal response. Similar events have been described in obstetric patients, occurring with IVC compression by a gravid uterus, in neuraxial anesthetics, occurring via peripheral vasodilation, and during acute hemorrhage. [8, 9, 11]
The Development and Implementation of a Surgical Site Infection Bundle for Cesarean Delivery

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Kar Wei Leung 1, Dr. Katherine Seligman 1, Dr. Emily Bui 1, Dr. Nichole Bordegaray 1, Dr. Lauren Hu 1
1. Department of Anesthesiology and Critical Care Medicine, University of New Mexico, Albuquerque, NM

Background:
Surgical site infections (SSI) are associated with increased morbidity, increased hospital length of stay, and re-admission (1). SSIs following cesarean delivery (CD) occur in 7-10% of cases (2). As cesarean delivery is the most common operative procedure in the US, this amounts to a large annual complication rate (3). There has been a recent push by the Institute for Healthcare Improvement and the Joint Commission to implement standardized care bundles to decrease the rates of SSI. This has been piloted in joint surgery, colorectal surgery, and gynecological surgery. Our OB Anesthesia division set out to develop a SSI bundle for CD at our academic hospital with 3,000 annual deliveries a year and a CD rate of 24%.

Methods:
Until recently, our institution did not track post CD SSI nor possess appropriate measures to reduce its occurrence. We conducted a literature review of best practices to examine the measures most appropriate for an SSI bundle for CD. These measures were discussed within our surgical site infection committee with the subsequent production of a SSI bundle with buy in from Family Medicine, Obstetrics, and Nursing.

The bundle consisted of measures to be taken by both the patient and the surgical team in the pre-operative, intra-operative and post-operative phases. Pre-op measures included 4% chlorhexidine showers, abstention of shaving after 37 weeks gestation and clipping hair at the surgical site. Intraop measures included appropriate antibiotic prophylaxis with a 1st generation cephalosporin & addition of azithromycin if in labor, placenta removal via traction on cord, surgical glove change before closure of fascia and deep tissue layers, and maintenance of maternal temperature of >36C. Post-op measures included new patient education handouts and emphasis on surgical site hygiene and returning to obstetric triage for any early signs of infection.

Discussion
Our CD SSI bundle was implemented in November 2017 following provider and nursing education. Audits have indicated that all the bundle elements are being followed 80-90% of the time for elective and urgent CD. Challenges with implementation included resistance to glove change, OR temperature change, and new antibiotic recommendations. We will continue to review SSI rates over the next year with the goal of reducing morbidity associated with SSI. This endeavor demonstrates the creation, implementation and application of a process improvement scheme in a multidisciplinary fashion and one in which anesthesia providers are stakeholders.

References:
1. JAMA Surg2017;152(8):784–791
The Effect of Intraoperative Sufentanil Infusion on Postoperative Pain after Complex Spinal Surgery

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Josi Schwan¹, Mr. Gabriel Rubio¹, Dr. Eric Sun¹, Mr. Alex Kou², Mr. Robert King², Dr. Tessa Walters¹

¹. Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, ². Anesthesiology and Perioperative Care Service, Veterans Affairs Palo Alto Health Care System

Complex spinal surgery is commonly associated with difficult to control postoperative pain. The intraoperative technique for narcotic pain management technique is not standardized, and varies between narcotic infusions and bolused opioids. To the best of our knowledge, there has never been a study investigating the effect of intraoperative administration of sufentanil for spinal surgery, though it has been shown to improve pain scores and reduce postoperative pain in other types of major surgeries. Sufentanil has a relatively long context-sensitive half-time, and perioperative infusion may be associated with longer-lasting postoperative analgesia as compared to bolused opioids. We hypothesized that in patients undergoing spinal surgery, intraoperative sufentanil infusion would decrease postoperative opioid use on postoperative day 1 as compared to a bolused opioid method. We retrospectively examined whether post-operative opioid consumption differed between (1) patients that underwent spinal surgery who received a sufentanil infusion (2) those who received a balanced anesthetic using bolused opioids for post-operative pain control. Our study included patients at the Veterans Affairs Palo Alto Hospital who underwent complex spinal surgery between 2013 and 2018. Our primary outcome was total opioid consumption 24 hours after surgery. Our secondary outcomes included: time spent in the post-anesthesia care unit (PACU), length of stay, post-operative visual analogue pain score (VAS), and incidence of post-operative complications. Further formal statistical analysis using a multivariate regression model is pending. In complex spinal surgery, administration of an intraoperative sufentanil infusion may improve post-operative pain control and reduce post-operative opioid use.
The Forgotten Opiate: Alfentanil Induction in an ASA IV Cardiac Patient

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Jeremy Laney 1, Dr. Jack Berger 1

1. University of Southern California

Authors
Jeremy Laney, MD; Jack Berger, MD, PhD

Affiliated Institution
Los Angeles County + University of California Los Angeles Medical Center
Keck School of Medicine

Background
Anesthetic induction frequently elicits hemodynamic instability due to the vasodilatory effects of commonly used agents and the catecholamine release that results from laryngoscopy. In patients with significant cardiac risk factors this can provoke undesirable morbidity. Opiate heavy inductions are common in cardiac cases to avert these undesirable effects; however, the use of alfentanil as a primary induction agent is vastly understudied. We used low dose alfentanil as a primary induction agent in an ASA IV patient with significant cardiac comorbidities undergoing an urgent orthopedic procedure.

Case Description
A 66-year-old male with Heart Failure with reduced Ejection Fraction (HFrEF, EF 35%) secondary to coronary artery disease (CAD) and active tricuspid valve endocarditis presented for right hip incision and drainage with debridement for septic right hip. He had an Automated Implantable Cardioverter-Defibrillator (AICD) which was removed on admission for infected hardware. He also had a history of atrial fibrillation/flutter, QTc prolongation and variable block (on Xarelto at home). Our report focuses on induction for general anesthesia with alfentanil, midazolam and ketamine and the hemodynamic stability that results with alfentanil as a primary induction agent.

Discussion
Induction
Our patient received 4mg of midazolam, 1mg of alfentanil (10.75 mcg/kg) and 10mg of Ketamine. Alfentanil was our opiate of choice due to the shorter duration of action and adequate attenuation of laryngoscopic stimulation.4 With a distribution half-life of 1-3 minutes4, we would benefit from the short duration by avoiding disastrous hemodynamic changes and difficult airway complications. Prior studies have shown maintenance of hemodynamic stability with low dose alfentanil (10mcg/kg) upon induction. Alfentanil has shown to blunt the catecholamine surge associated with endotracheal intubation.6 Initial studies assessing the hemodynamic effects of a catecholamine induction display the stability in low dose alfentanil, demonstrating approximate return to baseline heart rate (HR), mean arterial pressures (MAP) and plasma catecholamine levels one minute after induction.6

Our patient displayed similar hemodynamic patterns consistent with prior studies with low dose alfentanil induction. Approximately one minute after induction, our patient displayed return to baseline HR and MAPs. Our patient exhibited virtually no changes in HR on during induction and endotracheal intubation with minimal changes in MAPs and both return to baseline after approximately one minute. Given the patients numerous comorbidities, this allowed us to avert cardiac/hemodynamic instability in an otherwise extremely high-risk patient. Low dose alfentanil as an induction agent has been phased out with the introduction of newer agents and lacks adequate
recent data on hemodynamic effects. However, it still proves to be a safe anesthetic agent for induction and with a short duration of effect, is ideal for averting of disastrous induction complications.
The Implementation of Visual Trend Lines to Improve the Abilities of Physicians to Treat Pain

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. John Le¹, Dr. Andrea Poon², Dr. Siamak Rahman², Mrs. Tsione Holly², Mr. Tristan Grogan¹
1. UCLA, 2. UCLA Anesthesiology & Perioperative Medicine

INTRODUCTION
Utilizing a multi-modal analgesic approach to treat postoperative pain has been shown to improve outcomes. These medications include opioids, ketamine, lidocaine, local anesthetics, etc. The limitations of current electronic medical records include snap shots of pain scores and analgesic medications prescribed. Because of this, often times these medications are subjectively titrated, and when to increase or decrease the amount or rate of infusion of these drugs may be challenging for physicians to know. We hypothesized that the use of visual trend lines would help improve the ability of physicians to treat pain.

METHODS
We developed and implemented a novel database utilizing Microsoft Access and Tableau to better visualize trend lines of morphine milligram equivalents (MME), ketamine infusions, lidocaine infusions, local anesthetic infusions, and pain scores.

We surveyed all physicians on the acute pain service before and after the implementation of the visual trend lines for one month. A total of 10 physicians were surveyed with 100% correspondence. Surveys were completed anonymously through an online website. 95% confidence intervals for survey responses were constructed using the Clopper-Pearson method.

RESULTS
Participants were generally satisfied with the look and presentation of the data with trend lines (10/10 selected somewhat satisfied or more, a satisfaction rate of 100% (95% confidence interval from 69%-100%)). Participants felt the trend lines were helpful to improve their ability to understand a patient’s overall state of pain (10/10 selected somewhat helpful or above, a rate of 100% (95% CI 69%-100%)), and treat a patient’s overall state of pain (10/10 selected somewhat helpful or above, a rate of 100% (95% CI 69%-100%)). Lastly, participants generally felt the trend lines changed their management of a patient’s pain (9/10 selected somewhat or above, a rate of 90% (95% CI 56%-100%)), and were likely to recommend the use of trend lines to a colleague to treat pain (from 0-10 scale, all 10 were 6+, indicating a recommendation rate of 100% (95% CI 69%-100%)).

DISCUSSION:

The incidence of moderate to severe postoperative pain after surgery varies markedly between studies and type of surgery, but generally reveal a high incidence (40-60%). More importantly, postoperative pain trajectories seem to be risk factors for the development of chronic pain and 30 day hospital readmission. This study showed that physicians felt that visual trend lines were helpful in understanding, treating and managing a patient’s postoperative pain. In the future, these curves may be used as a stratification tool to flag patients at risk for chronic pain early in their recovery. For example, we may be able to auto-generate slope estimates for each patient and bin them into different risk strata. Limitations of this pilot study were small sample size, single center trial, and one month trial period. Visual trend lines seem promising, but further studies will be needed to see if patient satisfaction scores, hospital length of stay, development of chronic pain or hospital readmission rates are improved.
Waveform capnography is a widely accepted standard ASA monitor. It is commonly used to confirm tracheal intubation and allows anesthesiologists to monitor adequacy of ventilation. Information comes from both the measured gas values as well as the waveform shape.

The patient is a 51 year old male with a left nasal cavity mass scheduled for endoscopic anterior skull base tumor resection. Induction and intubation were uneventful. Placement of oral endotracheal tube (ETT) was confirmed by direct visualization with a glidescope, continuous end-tidal CO2, symmetrical bilateral breath sounds via auscultation, and palpation of endotracheal tube cuff in the trachea. Initially, the ETT was taped to the right side of the patient's mouth, but moved over to the left side per surgeon's request. After the adjustment, it was noted that the ETT depth relative to the teeth had not changed and proper placement was re-confirmed with continuous end-tidal CO2 as well as symmetrical bilateral breath sounds. To optimize use of endoscope, the patient's head was placed in pins in a rightward and flexed position. Surgical drapes were placed over the lower face and covered the ETT. About 30 minutes into the case, it was noted that the end-tidal CO2 values would jump back and forth between numbers in the 10s and 30s. The wave shape was also alternating between a flat plateau shape and a low plateau shape with a peak near end expiration. Additionally, there was a large gradient between administered and inspired oxygen and gas anesthetic. Given the patient's head position and the fact that surgical tools were being manipulated near the ETT, the concern was tube migration into the right mainstem. First, significant tube movement in relation to taping and tube kinking was ruled out. The tube was also suctioned for possible mucus plugs. Based on appearance of the waveform, another consideration regarded malfunctioning valves. Unfortunately, even after inspiratory/expiration sensors were replaced, the issue remained. Meanwhile, an arterial blood gas resulted with mild acidemia with pCO2 in the 60s suggesting hypoventilation. It was at this point, that it was deemed necessary to pause the surgery for further investigation. Ultimately, with a fiberscope, it was revealed that the end of the ETT migrated to the right main bronchus, but the left lung was intermittently ventilated through the Murphy's eye - leading to the alternating shapes in the waveform. The tube was re-positioned under direct visualization - yet the end-tidal CO2 wave still did change. Despite a repeat arterial blood gas showing resolution of the mild respiratory acidosis, the large gradient between end-tidal and inspired gases remained present. At this point, it was evident that the anesthesia machine was in error and the team began replacing parts. In the end, it was the expiratory gas sampler that was found to be the culprit of the aberrrent waveform capnography.

ETT tube in the right mainstem is a common complication of intubation. Yet, the most obvious reasons may not always be the problem. Ultimately, one would not be faulted for prioritizing patient safety.
Background
Bedside transthoracic echocardiography can be an important diagnostic tool in anesthesiology when a recent formal TTE is unavailable in a patient with known or suspected cardiac compromise. Ultrasound can provide valuable information about ejection fraction, valvular function, wall motion, and volume status, which can all significantly alter anesthetic management.

Case Description
An 80 year old male presented to the hospital with hematuria and was scheduled for diagnostic cystoscopy. The patient had multiple medical comorbidities, with history notable for CAD s/p CABG in 2004 with LIMA-LAD and SVG to OM, DES to left circumflex in 2011, and CHF secondary to ICM. He had poor functional capacity and exercise tolerance. His last echo, from 11 years prior in 2006, showed an EF of 40-50%. However, an NM scan from 2012 reported an EF of 24%. The severe discrepancy in EF and significant time period since his last formal TTE prompted us to use bedside echo to further investigate his cardiac function.

On echo, we found a dilated left ventricle with an EF about 20% with visually severe inferior hypokinesis. To date, no cardiac study had commented on insult to the inferior portion of the heart, and our patient had no known right coronary artery stenosis. Concerned about the patient’s ability to handle the sympathectomy of a spinal block or hypotension produced by a general anesthetic, the case was cancelled in favor of a cardiology follow up and pursuit of outpatient cystoscopy. A formal TTE performed the next day confirmed our findings, showing severe LV dysfunction and global hypokinesis, with an EF of 15-25% and wall motion only preserved in the septal wall.

Discussion
Bedside ultrasound can provide valuable information about a patient’s left ventricle function, volume status, wall motion abnormalities, and valvular function. In a patient with known left ventricle dysfunction, reassessment of LV function should be considered yearly prior to surgery. The parasternal view of the left ventricle in short axis is the best view to assess wall motion abnormalities of the left ventricle and to estimate cardiac function. However, the apical four chamber and parasternal long axis views can also be used to assess wall motion. An area of the heart is considered to be hypokinetic if endocardial movement appears to be decreased and endocardial thickening is <30% during systole. In this case, using bedside ultrasound, we found hypokinesis of the inferior portion of the patient’s heart and an ejection fraction much lower than reported from his last formal echocardiogram and subsequently changed our anesthetic plan.

References
Background: Maintaining adequate cerebral perfusion is paramount in procedures involving the aortic arch and carotid arteries. While cerebral blood flow and can be achieved with variety of both surgical and anesthetic techniques, cerebral oximetry monitoring using near-infrared spectrometry is simple and useful device that can help the anesthesia and perfusion teams monitor for cerebral hypoxemia and potentially avoid catastrophic neurologic complications. Neuroprotective strategies such as hypothermic circulatory arrest versus anterograde cerebral perfusion with moderate hypothermia have been well described. We report on the use of cerebral oximetry monitoring during a case of aortic root aneurysm repair with bilateral carotid artery bypass performed with only mild hypothermia and augmented native cerebral perfusion.

Case Description: A 19 year-old female with symptomatic severe stenosis of the bilateral common carotid arteries, total occlusion of the right innominate artery, and an aortic root aneurysm in the setting of Takayasu's arteritis was suffering from recurrent TIA's, facial and upper extremity claudication, and visual disturbances. She underwent surgical repair of her ascending aortic aneurysm with bilateral carotid artery bypass, however, due the location and extent of her disease the typical approach with either hypothermic circulatory arrest of anterograde selective cerebral perfusion with innominate artery cannulation were not technically feasible. The surgical approach utilized augmented native carotid artery perfusion during cardiopulmonary bypass with a Dacron Y-graft to the right carotid artery, then ultimately bilaterally. Cerebral oximetry was employed to carefully monitor for cerebral desaturation and remained largely stable with several brief periods of desaturation. The most significant was during the left carotid anastomosis, marked by a brief drop to 45% from her baseline of 72% with rapid recovery after appropriate interventions employed and flow restoration. The procedure was otherwise uneventful and the patient recovered with significant improvement of her neurologic symptoms.

Discussion: This case demonstrates and reviews the use of cerebral oximetry monitoring for complex aortic arch surgery. Maintaining adequate cerebral perfusion to ensure neuroprotective conditions for these procedures is critically important in order to prevent major post-operative neurologic sequelae. Cerebral oximetry monitoring by the anesthesiologist helps to identify and correct cerebral desaturations, especially in unique patient or surgical circumstances with a higher risk of neurologic injury.
The Use of End-Tidal Argon to Detect Venous Air Embolism: Foiled by “Fake Oxygen!”

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. James McAvoy 1, Dr. Mark Burbridge 1, Dr. Richard Jaffe 1, Dr. Tyler Schertz 2, Dr. John Brock-Utne 1

1. Stanford University School of Medicine, 2. Ametek

Venous air-embolism (VAE) is a potentially catastrophic complication of many procedures. Changes in end-tidal nitrogen concentrations are observed in experimental models of VAE; however, common anesthetic agents interfere with its detection. 2-5 We hypothesized that changes in end-tidal argon (EtAr) may be an indicator of VAE whose detection may avoid contamination by volatile agents or nitrous oxide. We sought to determine if a commercial mass-spectrometer (PCT Proline Analyzer 61700-8 Class 85, AMETEK, Pittsburgh, PA) could be used to detect changes in EtAr in an in-vitro model.

A Drager Apollo™ was used to ventilate a dummy lung (2 L bag) with a minute ventilation of 6L in 100% oxygen. The quadrupole mass-spectrometer (sampling at 0.0004 atm-cc/sec) was attached to the end-tidal inlet of the machine. Air (1mL to 60mL) was injected into the dummy lung to simulate VAE.

Pre-VAE baseline baseline measurements revealed an unexpectedly high ion-current (1.2 x10−12 amps) for argon. As a result of this baseline “noise” we were unable to detect simulated VAE events of injected air.

The result of this study would have been different if medical grade oxygen was 100% oxygen. Argon represents approximately 0.93% of room air, or about 9300 parts per million (ppm). We detected about 2000 ppm argon in medical-grade oxygen (or 0.2%), limiting our ability to detect changes in EtAr. This is a USP-accepted contaminant. As a result, this technology is insensitive for early, rapid detection of VAE.
To TAP or not to TAP, An Opioid Sparing Approach to Transcatheter Aortic Valve Replacement

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Vivek Chellappa 1, Dr. Matthew Lopez 1, Dr. Kim Howard-Quijano 1, Dr. Prince Neelankavil 1, Dr. Komal Patel 2, Dr. Matthew Fischer 2, Dr. Parissa Partownavid 1, Dr. Siamak Rahman 3, Dr. William Suh 1, Ms. Claudia Bueno 1, Mrs. Jennifer Scovotti 1, Dr. Jonathan Ho 2

1. UCLA Department of Anesthesiology and Perioperative Medicine, 2. UCLA Anesthesiology & Perioperative Medicine, 3. UCLA Anesthesiology and Perioperative Medicine

Introduction:
Transcatheter aortic valve replacement (TAVR) has become the treatment of choice for patients with severe AS and high perioperative risk. Both general anesthesia and sedation have been used for TAVR with similar outcomes and mortality.1,2,3 Selection for either depends on patient and procedural characteristics with an increasing proportion of these procedures performed under sedation. Sedation for TAVR involves the use of an intravenous hypnotic in addition to opioids. Although opioids are effective in providing analgesia, they have undesired adverse effects. There is recent public effort to reduce overuse postoperatively to improve morbidity and mortality.4 Applying a regional anesthetic may have utility in providing analgesia for both the intraoperative and postoperative period. The transverse abdominal plane (TAP) block targets the ilioinguinal nerve (L1) to minimize the pain of femoral sheath insertion. The goal of this study is to identify if a regional anesthetic could eliminate the need for narcotics in patients with sedation for TAVR.

Methods:
With institutional review board approval, a prospective cohort study of patients receiving TAP blocks with monitored anesthetic care (MAC) compared to historical controls receiving MAC alone was performed on consecutive high-risk patients undergoing TAVR since July 2017. All TAP blocks were performed under ultrasound with a weight based amount of 0.25% bupivacaine. The primary outcomes are intraoperative and 12-hour postoperative narcotic use. The secondary endpoints included postoperative anti-emetic use and length of stay. Intraoperative pain and sedation scores (0-5), 12-hour postoperative pain scores (0-10), propofol requirements (mcg/kg/min), proceduralist and patient satisfaction scores were also compared. Historical controls were matched for surgeon, anesthesiologist, and sheath size. Patient demographics, narcotic use in morphine equivalents, and other points of interest were extracted from the electronic medical record. Student’s T-test was used as appropriate (p < 0.05).

Results: From July 2017 to time of submission, 44 transfemoral TAVR were performed in this institution. 6 were excluded from the review (5 planned general anesthetics, 1 patient expired intraoperatively). 16 patients received TAP blocks and were compared to 21 historical and 9 enrolled controls. The intraoperative narcotic use in morphine equivalents within the regional anesthetic group was reduced compared to the control group (1.61 mg vs. 9.33 mg, p = 0.01) as well as 12 hour postoperative narcotics (0 mg vs 6.02 mg, p = 0.03). 12-hour pain scores were reduced in the experimental group (1.07 vs 3.21, p = 0.04). There was no difference in propofol (47.9 vs 54.1 mcg/kg/min, p=0.31) or antiemetic administration. To date, patient satisfaction survey scores have been rated 5/5 (n=12). No identifiable complications from regional anesthesia were identified.

Conclusions: Preliminary findings suggest that regional anesthesia may reduce or eliminate opioid use in TAVR with MAC. This technique provides adequate analgesia throughout the TAVR procedure and up to 12 hours postoperatively. Continued enrollment is required to increase sample size and power as well as collection of patient and proceduralist satisfaction surveys. This pilot study lays the foundation for a larger randomized control trial.
Total spinal after a failed epidural in a patient having an urgent caesarean section

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Shonte McKenzie 1, Dr. Saul Wiesel 1

1. University of New Mexico

Background: Epidural analgesia is commonly used for management of pain during childbirth. The need for an urgent or emergent cesarean section e.g. because of signs of fetal distress or lack of progress is however not an uncommon event. In women having an established epidural; general anesthesia, top-up of the epidural or putting a spinal are all possible options. Dosing of the spinal anesthesia in women having epidural is a matter of discussion.

Case description: We present a case of total spinal anesthesia following a failed labor epidural in a 25 year old G1 woman at 41 weeks and 4 days gestation. The otherwise healthy patient presented to the labor and delivery unit for a planned induction of labor for post-term pregnancy and a labor epidural was placed. On the evening of hospital day two, the patient reported that she was no longer receiving adequate analgesia from her epidural. The epidural was bloused twice, over a four hour period, with 0.25% Bupivacaine (10 ml) for a total of 20 ml. The patient reported no improvement of her labor pain. Shortly after the last bolus was administered, the decision was made by the obstetrics team to proceed with an urgent cesarean section secondary to arrest of stage II labor due to maternal fatigue. Due to the poorly functioning epidural, we discontinued the epidural and administered a L4/5 spinal anesthetic of hyperbaric 0.75% Bupivacaine (12mg), Fentanyl (15mcg), and Morphine (0.1mg) in the sitting position. Shortly thereafter, the patient developed upper extremity weakness, respiratory depression, and decreased phonation. We then converted to a general anesthetic and performed a modified rapid sequence induction with low dose Propofol and Succinylcholine. A successful cesarean was performed and the patient was extubated at the end of the procedure.

Discussion: A too extensive cephalic spread was the most plausible explanation to the event. Whether or not reducing the dose for a spinal anesthesia in woman having an established labor epidural analgesia is a matter of discussion. It is of course of importance to achieve a rapid and effective surgical anesthesia but also avoiding overdosing with the risk for a too high cephalic spread. To perform spinal anesthesia for urgent cesarean in patients having an epidural for labor pain is a feasible option and should be considered in category 2–3 section. The dose for a convert spinal block should be assessed on an individual basis and reasonably reduced.
Background:
Mitral regurgitation is one of the most prevalent heart diseases in the United States. Moderate to severe MR has an estimated prevalence of 2 to 2.5 million and the prevalence is expected to rise to 5 million by 2030 (1). The gold standard of treatment for MR is surgical intervention but as life expectancy increases, patient complexity increases with age and associated co-morbidities. In patients age 80-89, morbidity and mortality are reportedly 17.0% and 35.5% respectively following definitive MR surgery (2). Due to the increased risk, patients are often not referred for MV surgery with studies showing patients age >80 were treated surgically only 15% of the time compared to 60% in patients <70 (3,4). As patients with increased risk of surgical intervention become more prevalent, the need for less invasive techniques, such as trans-catheter mitral valve repairs or replacements is greater.

Case Description:
The patient is an 81 year old male with past medical history of ischemic cardiomyopathy s/p CABG 2002, complete heart block s/p pacemaker and ICD placement, non-insulin dependent DM II, hyperlipidemia, and HTN. He was admitted for CHF exacerbation with TEE showing severe MR, severely dilated LV, with EF 33%, moderate diastolic dysfunction, and severe pulmonary hypertension with mean PAP 63. The patient also had a myocardial perfusion study approximately 1 month prior to surgery which showed a 37% fixed perfusion abnormality in the anterior and apical wall. Left and right heart catheterization prior to surgery showed severe native CAD with patent bypass grafts. The patient was deemed to be too high risk for definitive MVR surgery. The MR jet was wide and extended into the medial commissure, making Mitraclip placement difficult. The patient elected to participate in a phase 1 safety and feasibility study of the Sapien M3 valve for trans-catheter mitral valve replacement.

Discussion:
The Sapien M3 valve uses an anchoring device that corrals the native mitral leaflets to anchor and seal the valve in place. This patient is 1 of 10 cases done to date using this technology. The first 10 cases showed no mortality at 30 days and 8/10 patients were left with no or trace MR with 1 having mild MR and one with severe MR. 1/10 patients had stroke POD #1 and this same patient also had chordal rupture during dock deployment which required closure of a large paravalvular leak with 2 AVLII 12mm plugs. This patient also had the longest surgery time of 7.3 hours compared to the shortened surgery time of 1.3 hours in patient 10. So far deployment of the trans-catheter mitral valve has not required conversion to open surgery, device embolization, device migration, or implantation of more than one valve; all cases were marked by successful access, delivery, and deployment. Early data suggests that the Sapien M3 valve is feasible for treating patients with severe MR that are not candidates for open surgical intervention (5).
Carotid artery stenosis is a critical risk factor for ischemic stroke either by way of limited blood flow to the brain or emboli from carotid atherosclerotic plaque(s). Studies have reported an annual stroke risk of 2-5% for patients with severe asymptomatic carotid stenosis. Carotid endarterectomy (CEA) is currently established as a revascularization intervention for patients with carotid artery stenosis. CEAs are generally recommended for symptomatic patients with greater than 70% stenosis. One of the feared complications of CEAs is perioperative stroke. The Carotid Revascularization Endarterectomy versus Stenting Trial (CREST) confirmed rates of perioperative stroke in symptomatic patients as low as 2.3%. More recently, a new revascularization technique was introduced to minimize the risk of stroke associated with carotid surgery.

Our patient is a 71-year-old male with left carotid stenosis, found to be 72% occluded at the bifurcation of the common carotid artery. Brain oximetry monitors were applied upon entry into the OR. ASA monitors were applied and patient was induced and intubated easily. An arterial line was placed shortly after intubation for beat-to-beat monitoring. A small incision was made cephalad to the medial aspect of the clavicle and venous access was obtained in the contralateral femoral vein. The patient received 100 units/kg heparin IV prior to carotid artery intervention. The surgeon then passed a wire and catheter into the carotid artery and reversed the blood flow temporarily to divert debris away from the brain. Prior to deploying the balloon and stenting, atropine 0.5mg was given for possible bradycardia. A stent was then implanted in the carotid artery to clear the plaque buildup to reduce the risk for stroke. The patient maintained his baseline brain oximetry readings and the systolic blood pressure was maintained at 130-140 mmHg throughout the case. The patient was extubated awake and was able to follow commands and move all extremities at the end of the case.

Transcarotid artery revascularization (TCAR) is a novel intervention which utilizes high-rate flow reversal during carotid artery stenting for cerebral embolic protection. A recent trial showed an overall stroke rate of 1.4%. A recent study showed that this reversal of flow technique did not elicit any change in brain electrical activity. In terms of anesthetic management, brain oximetry was used to monitor hypoperfusion to the ipsilateral side during flow reversal. Interestingly, while the brain oximetry readings drop in CEAs during clamping and shunting, there was no change during flow reversal in our case. Regardless of the different technique for carotid revascularization, the anesthetic management remains similar to that of a CEA. It would be advisable to have an arterial line for beat-to-beat blood pressure monitoring and brain oximetry to monitor cerebral perfusion. Reperfusion syndrome is still a risk with these procedures so it’s important to avoid overt hypertension after the stent is deployed and in the immediate postoperative period. While this case was done under general anesthesia while the surgeons acclimate to this technique, our institution’s goal is to do these procedures under monitored anesthesia care with regional anesthesia.
Treatment of Acute Venous Air Embolus

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Jayson Fitter 1, Dr. Paul Frank 1

1 Cedars Sinai Medical Center

Introduction: Entrainment of air into the venous system can cause rapid hemodynamic collapse. The risk of venous air embolism (VAE) is most significant when a breached vein is above the level of the heart, as is the case in sitting craniotomy. The entrained air may accumulate in the right ventricle, where it creates a non-compressible “air lock,” thereby restricting volume available for diastolic filling. This acute drop in preload can precipitate cardiovascular collapse unless it is quickly identified and corrective measures are undertaken.

Case Description: A 65-year-old female with a history of morbid obesity and hypertension was scheduled for frontal craniotomy in the supine position for a 6x4x3 cm meningioma close to the superior sagittal sinus. General endotracheal anesthesia was induced with Propofol 200mg, fentanyl 100mcg, and rocuronium 80mg. A right radial arterial line and right internal jugular quad lumen central line were placed. Her head was placed in a Mayfield and elevated slightly. The bed was placed in moderate reverse Trendelenburg position. Anesthesia was maintained with Propofol infusion 100mcg/kg/min and inhaled desflurane.

Shortly after the dura was opened, end tidal CO2 tracing abruptly dropped from 35 to 20, and arterial blood pressure dropped from 125/67 to 27/19. There was significant bleeding in the surgical field. The surgeon was notified of the drop in blood pressure and end tidal CO2. He informed anesthesia that the sinus had torn and may be entraining air. The field was flooded, and epinephrine 10 mcg was administered. The bed was changed to the Trendelenburg position with the right side up. Rapid transfusion was initiated. Blood pressure quickly returned to the normal range. By the time hemostasis was achieved, the patient had received 10 RBC, 5 FFP, 2 platelets, and 1 cryoprecipitate via rapid transfusion. The operation then proceeded as planned, and the meningioma was resected. Postoperatively, the patient was neurologically intact and was taken to the ICU for close monitoring.

Discussion: Patients undergoing surgical procedures where the surgical field is above the level of the heart are at elevated risk of VAE. Surgeons and anesthesiologists embarking upon these types of cases must be vigilant for signs of VAE—such as abrupt drops in end tidal CO2 and arterial blood pressure—and be prepared to take appropriate action—flooding the surgical field, positioning the patient Trendelenburg, right side up, and aggressive hemodynamic resuscitation—in order to minimize morbidity and mortality from VAE.
**Triple threat: An invaded airway, a compressed PA, and a blocked SVC**

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

**Dr. Jai Madhok¹, Dr. Francesca Betti¹, Dr. Eric Sun²**

¹Stanford University School of Medicine, ²Stanford Hospital

**Background:** Mediastinal masses can compress vital structures like the tracheobronchial tree, great vessels and the myocardial chambers resulting in precipitous and profound hemodynamic compromise. Rapid institution of cardiopulmonary bypass (CPB) under such circumstances can rescue instability when it ensues. Here we discuss the management of a patient with a large mediastinal mass resulting in acute respiratory compromise where rescue-CPB was not a potential exit-strategy.

**Case presentation:** A 67-year-old female with refractory diffuse large B-cell lymphoma (DLBCL) undergoing lymphodepletion chemotherapy in preparation for CAR-T immunotherapy presented to the emergency room with worsening dyspnea and hypoxia (saturating 88% on room air). On exam, she was tachycardic, stridulous, diffusely ronchorous, and using her accessory muscles. She had altered sensorium, bulging neck veins, and marked facial plethora that was worse when lying supine. A CT of the showed a 8.2 x 5.5 x 8.2 cm mediastinal mass resulting in prominent narrowing of the superior vena cava (SVC), right main pulmonary artery (PA), trachea, and bilateral mainstem bronchi in addition to progressive metastatic disease. Given concern for critical airway compromise, it was decided to urgently establish airway patency. Anesthesia was induced in the patient's rescue position via a femoral central line with propofol and remifentanil without paralytic. She was mask ventilated without difficulty and subsequently paralyzed with succinylcholine to enable insertion of rigid bronchoscope. The right mainstem and bronchus intermedius were almost entirely occluded by tumor and deemed unsalvageable. However, the left main bronchus and trachea were able to be stented after tumor debulking. Finally, intubation was performed using bronchoscopic guidance to place the endotracheal tube safely around the tracheal stent. Hemodynamically, the patient required an epinephrine infusion and volume resuscitation to maintain a MAP greater than 70 to ensure adequate cerebral perfusion given concurrent SVC syndrome. She underwent SVC stenting within the next 12 hours and was started on emergent radiation therapy given superior mediastinal syndrome and severe PA compression. Unfortunately, despite these measures her neurologic status continued to be poor and she was found to have leptomeningeal involvement of her lymphoma. She was no longer a candidate for CAR-T therapy and her care was ultimately focused on comfort measures.

**Discussion:** With newer targeted oncologic therapies the frequency of high-risk anesthetics in patients with metastatic malignancy is increasing. A detailed understanding of the complex interaction between tumor location and cardiovascular-respiratory anatomy is critical when managing mediastinal masses. In this case, understanding the interplay of SVC syndrome and PA compression helped guide intraoperative fluid and inotropic management. Jet ventilation served to provide oxygenation in a respiratory tree invaded by tumor. With such high-risk situations, multi-disciplinary discussion between anesthesiologists, intensivists, oncologists, and surgeons is vital towards minimizing perioperative morbidity. A pre-outlined step-wise algorithm with contingency plans at each step of the procedure is helpful and it is imperative to have detailed peri-procedural risk/benefit discussions with patients and families. Unfortunately, extracorporeal support is not always an appropriate rescue option in patients with advanced malignancy but with these newer therapies should ECMO be offered as a bridge?
Trouble in Trendelenburg, a Case Report of Bilateral Otorrhagia during Anesthesia

Dr. Sean McGee¹, Dr. Frank Jaime¹, Dr. Neal Gerstein¹
1. University of New Mexico Anesthesiology

Background
Otorrhagia is an uncommon adverse event during anesthesia, usually discovered at procedure termination when drapes are removed, however, there have been case reports of intraoperative discovery, leading to case abortion after an hour in Trendelenburg (3). Case reports of spontaneous bilateral otorrhagia usually involve hypertensive episodes, abdominal insufflation and Trendelenburg position (1-3), however, there have also been reports of otorrhagia after nitrous use (4).

Case Presentation
A 77 year-old female with history of acute myeloblastic leukemia, hypertension, coronary artery disease, and recently treated pneumonia 2 months prior, still requiring oxygen by nasal cannula, presented for laparoscopic bilateral salpingo-oophorectomy after discovery of a 6cm complex left adnexal mass. She denied history of hearing problems and had an unremarkable airway examination.

Induction of anesthesia was uneventful. An oral-gastric tube and radial arterial line were placed. Patient was lowered into steep Trendelenburg and underwent laparoscopic insufflation with intra-abdominal pressures kept below 20 mmHg for approximately 2 hours. Surgical course was significant for one hypertensive episode to systolic pressures in the 170s. The case proceeded uneventfully and at the end of the procedure patient was found to have bloody otorrhea oozing from bilateral atraumatic appearing ears. She was otherwise stable and had no discharge from other orifices, however, endorsed difficulty hearing in PACU. ENT was consulted.

On ENT examination of oral and nasal cavities were unremarkable, however, bilateral external auditory canals contained dry blood with tympanic membranes unable to be visualized. Rinne test showed air greater than bone conduction and Weber test showed no lateralization. Patient was seen by ENT again 19 days later and she endorsed bilateral pain to her ears, right worse than left, hearing loss, tinnitus and aural fullness. Bloody otorrhea had resolved and her tympanic membranes were now visible and clear bilaterally. She had tenderness in the pterygoid musculature on palpation and with manipulation of her temporomandibular joints and was treated for presumed TMJ dysfunction. Over subsequent months she continued to endorse ear pain and was treated with steroid ear drops with subjective relief, which ENT was unable to explain, as her ear examination demonstrated no inflammation. Audiograms several months post-op were consistent with sensorineural hearing loss.

Discussion
Several similarities in the current case reports and our case presentation included age >60, female sex, Trendelenburg position, abdominal insufflation, lithotomy position, and intraoperative hypertensive episode. A case report in 2017 of bilateral otorrhagia in a 79 year-old female after robotically assisted gynecologic surgery utilized reduced Trendelenburg position and low-pressure pneumoperitoneum, suggesting “steep” Trendelenburg and intra-abdominal pressures > or = 20mmHg are not necessarily required to develop this complication (2). It is known Trendelenburg position and intra-abdominal insufflation cause significant hemodynamic changes (5,6), and we hypothesized that the combination of these factors lead to elevated intracranial pressure, arteriovenous congestion, and increased risk of superficial capillary bed hemorrhage within the external ear canal. As this event seems to be exceedingly rare and unpredictable, there is not enough current research available to confirm these suspicions,
however, providers should be aware this complication exists.
Turning the CO2 absorber “green”: waste management systems and practical improvements

Dr. Pandora Chua¹, Dr. John Brock-Utne², Dr. Mark Burbridge², Dr. Ronald Pearl¹, Ms. Diane Alejandro-harper¹, Ms. Erika Kimball³, Mr. Chris Gilsenan⁴

¹. Stanford University, ². Stanford University School of Medicine, ³. Stanford Hospital, ⁴. Draeger

Background:
Operating room waste products may be broadly divided into non-contaminated solid waste (SW) and regulated medical waste (RMW). RMW must be treated before it is sent to landfill, at increased economic and environmental cost. We followed one item in detail to examine operating room waste processes at our institution. We use disposable pre-filled soda lime carbon dioxide (CO2) absorbers, which when exhausted were being discarded intact as RMW. We therefore conducted this investigation with the aim of developing a waste management solution for CO2 absorbers with less environmental and economic impact.

Methods:
We collaborated with Dräeger product representatives, anesthesia and perioperative staff, and waste management personnel to identify opportunities and barriers for recycling and waste reduction. We collected qualitative and quantitative data and performed economic and environmental cost analyses.

Results:
Stakeholder input. We first considered separating and recycling the absorber canisters which are made of recyclable polypropylene. However, the canisters cannot be separated by design, in order to maximize easy handling and minimize soda lime dust, which can be an occupational hazard and irritate the skin, eyes, and airway. Anesthesia staff was discarding exhausted absorbers as RMW due to concern they were contaminated, and lacked the knowledge that absorbers are non-contaminated and may be safely discarded as regular SW.

Cost considerations. In calendar year 2017, our hospital generated 5,200 tons of waste at a net cost of $2.87 million dollars. Approximately 12.8% (667 tons) of this was general infectious RMW, with an additional processing cost of $70,000. General infectious RMW is steam sterilized via autoclave, costing $0.05/lb including maintenance, steam, labor, and electricity. Based on a CO2 absorber weight of 2.38 lbs and current use of approximately 200 canisters each month, we calculated that we could save about $280 per year by discarding absorbers as SW instead of RMW.

Environmental considerations. Incineration of polypropylene at high temperatures (980-1200°C) does directly generate toxic byproducts, but heating polypropylene in the autoclave (138°C) does not cause degradation and therefore does not generate pollutants directly. However, we found many indirect environmental impacts. Autoclaves consume resources and generate greenhouse gases. Manufacturing of disposable canisters increases our carbon footprint and the bulk waste contributes to landfills and landfill-associated negative impacts (6). Ideally, the canister could simply be recycled or reused if the product was designed such that the canister could be separated easily. This may not be economically profitable for the hospital or manufacturer, but it could be ecologically beneficial.

Conclusions:
We agreed and implemented a program to discard CO2 absorbers as SW instead of RMW – a strategy which is practical, less expensive and more environmentally appropriate. This study represents a framework for analyzing RMW or SW from the operating room. Although the savings for the CO2 absorbers represent a small fraction of overall hospital costs, similar savings for other items may be large, and the issue of RMW management is not trivial. Anesthesiologists have a responsibility to be environmentally conscious. A proactive multidisciplinary examination
of these issues can lead to pragmatic improvements.
Unexpected Finding of Left Ventricular Clots by Transesophageal Echocardiography during Cardiac Massage after Resuscitative Thoracotomy on a Trauma Patient

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Jason Lang¹, Dr. Tzann Fang², Dr. Julin Tang¹

¹. University of California San Francisco, ². Virginia Commonwealth University

Background
A resuscitative thoracotomy is an emergent procedure to compress the heart and restore circulation in hypotensive trauma patients who are refractory to damage control, fluid resuscitation, and vasoactive medications. We present the case of a severely injured trauma patient in whom transesophageal echocardiography (TEE) was used for cardiac evaluation and hemodynamic monitoring during emergent surgery. The TEE unexpectedly revealed blood clots originating from the left ventricle after open-chest cardiac massage and intracardiac injections of epinephrine and vasopressin.

Case Description
A 35-year-old male presented to the Emergency Department after an unwitnessed pedestrian versus automobile injury. Upon arrival, he had GCS of 3 with systolic blood pressure in the 70’s. A standard FAST exam was positive for intraperitoneal blood, and the patient was emergently transferred to the operating room for damage control. An exploratory laparotomy was performed and revealed a large liver crush injury. Intraoperative TEE showed that his heart was progressively failing, so a left anterolateral thoracotomy was performed and rhythmic cardiac massage was initiated along with ongoing volume resuscitation. Epinephrine and vasopressin were also injected directly to the left ventricle. Additionally, he received three defibrillating shocks of 15 joules each directly to the heart due to ventricular fibrillation. Arterial blood gas showed pH 7.09, PCO₂ 46 mmHg, PO₂ 153 mmHg, HCO₃ 14 mEq/L, ionized calcium 1.02 mmol/L. Coagulation labs showed platelet count 169,000 per μL, PT 21.8 s, INR 1.9, PTT 60 s, fibrinogen 94 mg/dL. During the resuscitation, the TEE unexpectedly began to reveal blood clots forming in the left ventricle and atrium despite his INR and fibrinogen. The patient had ongoing profound hypotension and acidosis, became asystolic, and was ultimately pronounced dead.

Discussion
We present a case with unexpected intraoperative TEE findings and speculate the potential harm of direct cardiac massage with multiple intracardiac injections of vasoactive medications during cardiac arrest. Virchow’s triad describes contributing factors to thrombosis: hypercoaguability, stasis of blood flow, and endothelial injury. Clot formation was particularly surprising in this case because it occurred in the setting of apparent coagulopathy with INR 1.9 and fibrinogen 94 mg/dL. The patient also did not have stasis of blood flow in his heart since he was receiving direct cardiac massage. Thus, we suspect that the patient’s intracardiac clots are most likely related to endothelial injury, which could be attributed to direct cardiac massage, intracardiac injections of epinephrine and vasopressin, and direct cardiac defibrillation.

Vigorous direct cardiac massage and intracardiac injections may cause direct damage to endothelial / subendothelial cells and fibroblasts of the myocardium. These damaged cells in our patient might have triggered the release of tissue factor from which the observed clot formation ensued. Furthermore, intracardiac injections of epinephrine, a known platelet aggregation agonist, may have created a local hypercoaguable environment in which the clots formed. The time course of clot formation in this case supports the idea that direct cardiac massage and...
intracardiac injections were inciting events to intracardiac clot formation, since TEE did not reveal intracardiac clots until after these resuscitative measures were initiated.
Unique Anesthetic Challenges of Bilateral Lung Transplant in Situs Inversus

Dr. Dylan Masters, Dr. Wilson Cui, Dr. Victor Ng
1. UCSF

Background:
Defects in ciliary motility can cause chronic sinusitis, bronchiectasis, recurrent pulmonary infections, and in severe cases, lead to the need for lung transplantation. Primary ciliary dyskinesia is an autosomal recessive genetic condition, and when associated with situs inversus, is called Kartagener syndrome. We present the case of a patient with Kartagener syndrome undergoing bilateral lung transplantation, and the implications of this rare disorder on the anesthetic management.

Case Description:
A 66-year-old man with Kartagener syndrome complicated by pulmonary hypertension and chronic progressive hypercarbic respiratory failure presented for bilateral lung transplant. In the operating room, standard ASA monitors were used along with right-sided electrocardiogram leads, and a right radial arterial line. He was induced with titrated doses of propofol and fentanyl, with norepinephrine for hemodynamic support. He was initially intubated with a left-sided double lumen endobronchial tube (DLT) by direct laryngoscopy. A bronchoscope was inserted, and confirmed that the bronchial tip of the DLT had entered the morphological right main bronchus (to the left of his carina). Under fiberoptic view, the bronchial tip of the DLT was pulled back into the trachea, rotated 180°, redirected and advanced into the morphological left main bronchus. The anesthesia team and transplant surgeons discussed the likelihood of needing veno-venous extracorporeal membrane oxygenation (VV ECMO) for post-transplant support, which was low, and agreed that the left internal jugular (IJ) vein was appropriate for central venous access. Findings on the intraoperative transesophageal echocardiography (TEE) were normal biventricular function and no hemodynamically significant valvular disease, unremarkable except for the mirror-imaged heart in the right chest. The transplantation was performed on central veno-arterial (VA) ECMO support. The surgeons performed a right pneumonectomy in the recipient left chest followed by the implantation of the donor left lung, and similarly for the opposite side. The postoperative course was uneventful, and the patient was doing well at home four months after a successful bilateral lung transplant.

Discussion:
Anesthesia for lung transplantation involves advanced techniques in lung isolation, vascular access, and invasive cardiovascular monitoring. General anesthesia for patients with situs inversus creates unique challenges related to the alterations in their cardiopulmonary anatomy. At our institution, routine lung transplantation involves a left-sided DLT for lung isolation and selective ventilation, right IJ venous access, continuous TEE monitoring, and frequently, intraoperative VA ECMO support. In cases where there is a significant risk of post-transplant VV ECMO support, the surgeons may request an avoidance of the right IJ as to preserve the site for a bicaval double lumen VV ECMO cannula. Here we review the essential changes, and their rationale, made to adapt our typical techniques to a patient with situs inversus, and discuss potential alternatives. This case also demonstrates how preoperative review of all available images can inform the anesthetic planning. Finally, when previously simple terms such as “right” and “left” suddenly became sources of confusion, it highlights the need for close communication between the surgical and anesthetic teams and of a unified nomenclature.
Valve-Sparing Aortic Root Replacement in Patient with Marfan and Type I Muscular Dystrophy

N.S. is a 54F with history of Marfan syndrome and type I muscular dystrophy who presented with worsening aortic root aneurysm. Secondary to the aneurysm patient also had severe aortic insufficiency. Due to her high risk of death related to her aortic pathology, it was recommended that she undergo surgical intervention by the cardiothoracic surgery team. Conversations were had with patient regarding her high-risk status given her muscular dystrophy in conjunction with her Marfan syndrome.

Patient was seen and evaluated in the anesthesia pre-op clinic. During the pre-operative assessment, she was determined to be high-risk (42.1%) for pulmonary complications based on CANET (Pulmonary Risk) scores with risk factors of: age, intrathoracic surgery, and surgery duration of greater than three hours. Patient had a previous hysterectomy under general anesthesia a decade prior with no complications, and right tibial surgery in 2017, which was performed awake with spinal anesthesia, without complications. Given patient’s increased risk for aspiration, she was placed on a two day clear liquid diet prior to surgery. There were also significant discussions including the risk for pulmonary complications post-surgery and the effect of median sternotomy on pulmonary function. The recommendation was also made for a pulmonary consultation for the patient’s post-operative respiratory care.

On the day of surgery, patient was consented for bilateral pecto-intercostal fascia block to optimize post-operative analgesia. Intra-operatively, pre-induction arterial line was placed. Patient then underwent a rapid-sequent intubation with cricoid pressure and HOB elevated to about 45’ to help minimized the risk of aspiration. Given patient positioning video-mac was used. Given contra-indication of succinylcholine, rocuronium at 1.2 mg/kg was used as induction paralytic. One gram of IV Tylenol was also administered prior to incision in an effort to minimize post-operative opiate requirements. Case was completed without complication, and patient was moved to the ICU intubated and sedated.

Patient was extubated roughly eight hours after surgery without complication. Pain was primarily controlled with the bilateral pectointercostal blocks, around the clock Tylenol, and toradol. One dose of 0.2mg IVP Dilaudid was required on POD 1, and patient was quickly transitioned to Norco 5-325 which she had tolerated after her orthopedic surgery. Patient had uncomplicated recovery and was discharged home on POD 9.
Double-lumen endotracheal tubes (DLT) are commonly used for intrathoracic procedures requiring single lung ventilation. Tracheobronchial rupture is a rare, but life-threatening complication associated with DLT placement. We report a medically complex patient with bronchial rupture due to DLT placement during contralateral pneumonectomy. Venoarterial extracorporeal membrane oxygenation (VA-ECMO) support was instituted to aid in the airway repair. Early diagnosis and intraoperative ECMO support failed to prevent a fatal outcome.
Venovenous ECMO for Repair of Tracheal Laceration from DLT Placement

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Colby Tanner 1, Ms. Cecilia Canales 1, Dr. Karen Chow 1, Dr. Sumit Singh 1
1. UCLA Anesthesiology & Perioperative Medicine

Patient Background:
54-year-old female presenting for surgical repair of a lung hernia. The patient's past medical history consisted of COPD, obstructive sleep apnea, and morbid obesity.

Hospital Course:
Initial airway management was complicated by difficult double lumen tube placement with laryngoscopy performed 3 times prior to successful endotracheal intubation. Its location within the left mainstem bronchus was confirmed intraoperatively via bronchoscope. No blood or evidence of tracheal damage was noted and the procedure proceeded uneventfully.

Postoperatively the patient developed progressive crepitus of the chest and face. Bedside bronchoscopy diagnosed a 4-5 cm long tracheal laceration along the posterior wall. The patient was subsequently re-intubated and returned to the OR for surgical repair.

During reparative surgery, multiple attempts at single lung ventilation were made. Each attempt was associated with drops in O2 saturation to the 50s-60s. The case was cancelled and the patient transferred to a nearby facility for higher level of care.

Prior to a second attempt at surgical repair, the patient was placed on venovenous ECMO with bifemoral cannulation. Heparin was used for anticoagulation with an ACT goal of 140-160. Intraoperatively a combination of ECMO and single lung ventilation was utilized. Due to concern for strain on the surgical site, low pressure ventilation was continued postoperatively with continued ECMO to supplement CO2 clearance and oxygenation. On post-op day 3, ECMO was decannulated and 24 hours later the patient was extubated. She was discharged home on post-op day 10 after successful weaning to room air.

Discussion:
Airway injury presents a unique set of challenges for perioperative anesthetic and airway management. Few cases have been presented describing ECMO as a means of sustaining a patient during airway surgery. Antonacci et al 1 describe the use of venovenous ECMO in combination with small tidal volume ventilation as a means to improved visualization of the surgical site as well as increased room for surgical repair. Additionally, Son et al 2 have reported venovenous ECMO in conservative management of airway injury with prolonged ventilatory rest.

Our case provides perspective in the utilization of ECMO as a salvage maneuver for failed intraoperative ventilation.

Initial decision making was confounded by the fact that the patient was maintaining oxygen saturations on room air prior to intubation as well as was able to tolerate two lung positive pressure ventilation preoperatively. Thus her inability to tolerate one lung ventilation was difficult to predict. Likely exacerbating factors in her case included body habitus, underlying lung pathology as well as airway plugging.

Additionally, continuation of ECMO postoperatively allowed for low pressure ventilation that would otherwise not be adequate for CO2 clearance or oxygenation. This provided time for healing at the site of the laceration and a slow transition to full reliance on ventilation.

As ECMO becomes increasingly common in patient management, additional research can shed light on appropriate patient selection for planned cases or as a possible salvage maneuver. It may also guide decisions on length of use.
postoperatively and provide appropriate goals for transition back to standard ventilation.
Ventilation Management during Cardiac Tamponade.

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Ashley Balentine 1, Dr. Casper Hu 1, Dr. Jay Roby 1
1. University of Southern California

Cardiac tamponade is a life threatening condition when the pericardial sac fluid expands and compresses the heart chambers and increasingly impairs their ability to fill. Common causes include chest trauma, cardiac surgery, malignancy, and myocardial wall rupture. Maintaining perfusion pressures is one of the greatest challenges in the anesthetic management prior to surgical release. Positive pressure ventilation can worsen an already precarious preload due to increased intrathoracic pressure and lead to cardiac arrest. Some practitioners argue intubation with small positive pressure tidal volumes is clinically advantageous in certain scenarios. Case reports have reported severe tamponade with pericardiocentesis with removal of up to 1.1 L of blood.

A 46-year-old male with heart failure with reduced ejection fraction, atrial fibrillation, and severe mitral valve stenosis was taken to the operating room for mitral valve replacement and left atrial appendage ligation. Initially, the patient did well postoperatively, but on postoperative day 8 the patient was found to have an acutely downtrending hemoglobin that was unresponsive to transfusions and worsening hemodynamics. The bedside transthoracic echocardiogram performed by the ICU team showed a large pericardial effusion, and the patient was emergently taken back to the operating room.

In the operating room, the patient was breathing spontaneously with significant pulse pressure variations. During inspiration, a waveform was present, during expiration, nearly no waveform. The patient was prepped and draped with the surgical team ready to make incision upon induction. 2mg of midazolam, 100mg of ketamine and 50mg of rocuronium were given for rapid sequence intubation. When the patient stopped breathing spontaneously, the arterial tracing became flat. The patient was intubated just as the surgical incision was made simultaneously, releasing 1.5 liters of blood. The remainder of the case was largely unremarkable and the surgical site of bleeding was found. At the end of the case, the patient was hemodynamically stable on a nitroglycerin drip, and at no time were vasopressors used.

In symptomatic cardiac tamponade, the standard of care is to preserve spontaneous respirations to minimize intrathoracic pressure and maximize filling of the heart. The right and left sides of the heart compete for limited space. During inspiration there is an increase in systemic venous return and as the right heart fills, this causes the interventricular septum to bow into the left ventricle. The opposite occurs during expiration.

In our practicing history, we have intubated with tidal volumes less than 150 ml and higher respiratory rates in the short time before surgical treatment without further compromise in hemodynamics. This facilitates the transition to an optimal operating setting such as one requiring a sternotomy with the surgeon requesting respirations to be held or done with small tidal volumes. In this scenario of massive cardiac tamponade, we saw that the patient's preload was completely dependent on negative intrathoracic pressure from spontaneous respirations. During spontaneous expiration, the arterial line was significantly dampened, and with the loss of spontaneous respirations, the arterial line tracing was flat. With immediate release of the pericardial effusion, the pressure normalized.
Ventricular fibrillation refractory to cutaneous electrical defibrillation in a morbidly obese pediatric patient with hypertrophic cardiomyopathy

Ms. Maryte Gylys 1, Dr. Govind Rajan 1
1. University of California Irvine

Background
Anesthesia providers should anticipate and prepare for critical events. Some situations may necessitate deviation from established algorithms. This case describes the failure of both subcutaneous-ICD (S-ICD) and cutaneous defibrillation in a morbidly obese pediatric patient with hypertrophic cardiomyopathy (HCM) who required open thoracotomy and direct cardiac defibrillation.

Case Description
A 14-year-old male with morbid obesity (BMI 44.6) and HCM presented for scheduled S-ICD placement. Past medical history was also notable for insulin dependent diabetes and hypertension. Medications included disopyramide and propranolol.

On the day of scheduled S-ICD placement, he underwent uneventful induction of general anesthesia. The S-ICD was placed. Upon defibrillator testing, the ICD failed to defibrillate and the patient remained pulseless in ventricular fibrillation. The ICD failed to defibrillate despite attempts with increased voltage. Cutaneous defibrillation was attempted and also failed. Chest compressions were initiated with 1 mg epinephrine every 3 minutes. Continued attempts were made at defibrillation with increasing voltage.

Given the patient’s body habitus, pressure was placed on the cutaneous pads to decrease distance to the heart, but this also failed. A second defibrillator with additional pads was placed, and the devices were synchronized and fired together, also failing to defibrillate.

Trauma surgery was called, and an open thoracotomy was performed. Cardiac defibrillator pads were used to defibrillate with 50 joules, with return of spontaneous circulation after the second attempt. The incision was closed and the patient was transferred to the ICU.

He was extubated on POD1, required re-intubation on POD 2 due to fluid overload and was again successfully extubated on POD 3. On POD 7, SICD placement was performed, without DFT testing. The patient recovered well and was discharged on POD 11.

Discussion
S-ICDs are a promising option to prevent sudden cardiac death in younger patients with HCM because they avoid the complications associated with long-term lead placement of transvenous ICDs. Pooled data from the EFFORTLESS and IDE trials concluded that S-ICDs are safe and effective for patients with HCM, although the average BMI was 28.4 ± 6.21. However, failure of defibrillator testing with S-ICD placement in patients who are obese was noted on several occasions2,3. Anesthesia providers should be prepared for possible failure of DFT testing, particularly in obese patients.

Anesthesia providers are highly experienced with the advanced cardiac life support algorithm. However, it is important to recognize when the algorithm is not appropriate and other treatments may be necessary. In this case, the patient’s body habitus was the likely reason for cutaneous defibrillation failure. In order for the current to bypass the adipose tissue surrounding the heart, open thoracotomy and direct cardiac defibrillation was required.
Citations

What’s shaking? Multifocal myoclonus after general anesthesia: A double case report

Dr. Revati Nafday1, Dr. Kerstin Kolodzie1, Dr. Matthias Braehler1
1. University of California, San Francisco

Background

Although relatively uncommon, neuroexcitatory symptoms such as dystonia, myoclonus, and seizures or seizure-like activity after general anesthesia have been described in multiple case reports. Various anesthetic and adjunct medications have been identified as potential culprits, including propofol, opioids, volatile anesthetics, nitrous oxide, and antiemetic agents. Here we present the case of a patient who developed rhythmic involuntary movements after two of her four general anesthetics.

Case Description

A 26-year-old female presented for outpatient ACL reconstruction. She had been anesthetized at our institution on three prior occasions for similar procedures, each time undergoing a preoperative nerve block followed by general anesthesia. During the first anesthetic, no adverse events were documented.

After her second surgery, she had several episodes of forceful rhythmic shaking involving her shoulders and head. She did not appear post-ictal in between spells. She was empirically treated with lorazepam, intralipid, and meperidine without complete resolution, and then transferred to the ED for evaluation by a neurologist. Based on the history and video footage, a seizure was ruled out and the diagnosis of a drug-related paradoxical movement disorder was made. Her family recalled a similar, less severe reaction after a colonoscopy for which she had received propofol alone; thus, in spite of other possible triggers, propofol was deemed the most likely offender on this occasion.

Four years later, she had a propofol-free anesthetic for another knee surgery without any reported issues. However, when she presented for her most recent surgery, she again developed similar symptoms despite a propofol- and opioid-free anesthetic.

Discussion

Involuntary movements have been described during induction, maintenance, emergence, and the delayed postoperative period.

Sevoflurane has been linked to myoclonus and seizure-like activity during induction and emergence, potentially due to the precipitous change in anesthetic concentration during these periods. To our knowledge, apart from one report of prolonged postoperative myoclonus in a patient with cerebral palsy, volatile anesthetics have not been associated with delayed-onset movements.

Propofol has been associated with neuroexcitatory phenomena during all anesthetic stages, including delayed myoclonus, seizure-like activity, opisthotonus, dystonia, and tremors. Patient level of consciousness varies among reports, from unaware, to aware and communicative, to aware but unable to communicate, as in our patient’s case.

Our patient’s episodes of multifocal myoclonus are most similar to delayed-onset propofol reactions, but occurred with sevoflurane alone, as well as with propofol/desflurane. She received other medications on both occasions but had previously gotten these without documented issues.
This case adds to the literature on postoperative neuroexcitatory reactions and highlights the difficulty of isolating a causative agent. Potentially, as with malignant hyperthermia, one exposure without adverse reaction may not acquit a medication of blame. Alternatively, susceptible patients may be “unmasked” by general anesthesia regardless of agent, provided that the mechanism converges at some point.

References
What’s taking so long? Improving anesthesia start to ready time in the cardiac ORs. A Quality Improvement Project

Saturday, 5th May - 15:15 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Monica Miller 1, Dr. Vien Nguyen 1, Dr. Michael Doan 1, Dr. Marisa Hernandez-morgan 1, Dr. Alex Fu 1, Dr. Matthew Lopez 1, Dr. Emily Methangkool 1

1. UCLA

Background
Given that operating room (OR) costs are a sizeable portion of hospital expenditures, there is a continued need for efficient OR utilization. OR delays may have important financial consequences for hospital expenditure and revenue, as well as for patient and staff satisfaction. All patients undergoing open heart surgery require multiple invasive lines prior to surgical incision. These include intubation, TEE insertion, and the placement of invasive lines. The average time to complete these procedures at our institution is 54-56 minutes. We hypothesize that targeted efforts to decrease setup time and implementing standardized time limits for residents to place invasive lines will reduce anesthesia time in the cardiac ORs. Our primary aim is to reduce anesthesia time from 56 minutes to 45 minutes.

Methods
An 8-week QI initiative was initiated at our institution on January 18, 2018 for adult patients presenting for first start cases undergoing routine cardiac surgery requiring cardiopulmonary bypass (CPB). We excluded patients less than 18 years old, patients undergoing emergent or transplant surgery, cases requiring femoral arterial access, and the presence of invasive lines prior to OR arrival. Time-saving interventions implemented include: 1) Arterial line kits were prepared with all necessary supplies prior to anesthesia start, 2) Central line setup was performed by the cardiac fellow or attending while arterial access was gained by a resident 3) Surgical hand scrub for central line placement was performed prior to patient arrival to the OR so that sterilizing hand gel use occurred at the time of line placement, and 4) Residents were limited to 2 attempts for invasive lines before the task was completed by a cardiac fellow or attending. Statistical analyses were completed using unpaired t test and chi-square test. Statistically significant differences were defined as p <0.05.

Results
From November 1, 2018 to March 19, 2018 a total of 125 patients (69% male, mean age 58, ASA status 3.5 +/-0.5) underwent routine cardiac surgery requiring CPB as the first case of the day, n=69 in the pre-intervention cohort and n=56 in the post-intervention cohort. The first PA measurement was used as a surrogate marker for anesthesia ready time. After quality measures were implemented, there was a slight reduction in anesthesia times, however not statistically significant (53.83 +/-18.48 to 52.9 +/-13.5 minutes (p=0.86). Despite nominal decreases in anesthesia time, there was a disproportionate reduction in time to incision in the post-intervention group (100.28 +/-26.76 to 94.2 +/-18.5 (p=0.13). There was a decrease in overall time variability between cases in the post-intervention group. Lastly, the number of invasive lines placed by a fellow or attending remained unchanged (pre-intervention 13%, post-intervention 12.5%).

Conclusion
Implementation of four time saving interventions in the cardiac ORs resulted in a nominal decrease in anesthesia times. These interventions did result in a noteworthy reduction in time to incision and overall time variability between cases. These trends could result in improved predictability of OR utilization and decreased operating room time.
“OPEN REPAIR OF ABDOMINAL AORTIC ANEURYSM ON A PATIENT WITH LEFT VENTRICLE ASSIST DEVICE”

Saturday, 5th May - 14:00 - Marina Ballroom D/E and Marina Ballroom Foyer - Poster

Dr. Jeremy Alvord¹, Dr. Ryan Craner¹
¹Mayo Clinic Arizona

Introduction: Left ventricular assist devices (LVAD) are mechanical support devices for management of end stage heart failure. Destination therapy for patients who are ineligible for heart transplantation is a means to maximize medical therapy and improve quality of life, functional status, and overall survival. Screening for peripheral vascular disease is common prior to patients undergoing LVAD placement. There have been few cases of LVAD patients on destination therapy who after the LVAD was place developed a symptomatic abdominal aortic aneurysm (AAA). There are reports of endovascular repair after LVAD placement and concomitant open abdominal aortic aneurysm repair and biventricular VAD (biVAD) implantation. We were unable to find a case report of an open abdominal aortic aneurysm after LVAD placement.

Case Description: A 74-year-old gentleman with a past medical history of ischemic cardiomyopathy, status post HeartMate II LVAD as destination therapy, recurrent GI bleed, hypertension, dyslipidemia, prolonged tobacco history, who recently started having increasing abdominal pain associated with an abdominal aortic aneurysm >5cm. Six months prior to presenting to our hospital had a gradual increasing abdominal pain and a CTA of the abdomen found an AAA measuring 5.6x 5.2 cm and had increased in size that involved the left renal artery in 2013 prior to LVAD placement the AAA measured 4.3x3.9 cm. The patient had a history of recurrent GI bleeds secondary to anticoagulation for his device and his INR goal was 1.5-2.0 and he was not placed on a heparin drip prior to his surgery. The patient stopped Warfarin three day prior to his surgery date. Preop echo showed an EF of <10% and moderate right ventricular dysfunction. Our anesthetic plan involved placement of PAC and intra operative TEE with inhaled nitric oxide (iNO), and milrinone to aid right heart function in this case where we would expect large fluid shifts and release of crossclamp that could impede the function of the right heart during the case. Induction with etomidate and fentanyl and endotracheal tube was placed without difficulty, the patient was started on iNO as well as milrinone. The patient remained stable after incision and the vascular surgery team found a nonruptured pararenal abdominal aortic aneurysm. They then placed a distal lower extremity clamps bilateral and a suprarenal clamp for approximately 42 mins. Norepinephrine and vasopressin infusions were started to maintain LVAD flows. After the operation the patient was transferrd to the ICU and was later extubated and never required renal replacement therapy. Discussion: This was a unique case of open AAA after LVAD placement in a symptomatic patient on destination therapy. We learned that the progression of an aneurysm after LVAD placement, does not exclude a patient from an open repair. Moreover that understanding keys factors of this case include maintaining right heart function. In this case we opted to start iNO after induction for pulmonary afterload reduction and milrinone to maintain contractility of the right ventricle.
## Authors Index

<table>
<thead>
<tr>
<th>Author</th>
<th>Page(s)</th>
<th>Page(s)</th>
<th>Page(s)</th>
<th>Page(s)</th>
<th>Page(s)</th>
<th>Page(s)</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abraaham, B.</td>
<td>156</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abramson, W.</td>
<td>73</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acevedo, F.</td>
<td>207</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afshar, S.</td>
<td>67</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alejandro-harper, D.</td>
<td>262</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alesi, P.</td>
<td>182</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ali, S.</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alschuler, M.</td>
<td>10, 12, 97, 104, 105, 122</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alsouqi, S.</td>
<td>97</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alvarez, E.</td>
<td>223</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alvord, J.</td>
<td>9, 35, 205, 277</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amaya, R.</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anderson, A.</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anderson, C.</td>
<td>179</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Andonian, N.</td>
<td>203</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angiulo, T.</td>
<td>213</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angst, M.</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ani, F.</td>
<td>167</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antognini, J.</td>
<td>54</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applegate, R.</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arif, M.</td>
<td>153</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asnake, B.</td>
<td>101, 140</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Athreya, K.</td>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austin, B.</td>
<td>97</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baca, Q.</td>
<td>230</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bach, D.</td>
<td>225</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Badakhsh, O.</td>
<td>152, 187</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bailey, C.</td>
<td>191</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baja, D.</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balentine, A.</td>
<td>271</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baqai, Z.</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barney, K.</td>
<td>268</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barnier, J.</td>
<td>43</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bartlett, J.</td>
<td>208</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basarb-Tung, J.</td>
<td>72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bellerose, R.</td>
<td>187</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benggon, M.</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benish, B.</td>
<td>193</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berger, J.</td>
<td></td>
<td>247</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bergsten, M.</td>
<td></td>
<td>166</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bernadette, A.</td>
<td></td>
<td>199</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bernardo, M.</td>
<td></td>
<td>149, 171</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bernstein, M.</td>
<td></td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Betti, F.</td>
<td></td>
<td>82, 259</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bettini, A.</td>
<td></td>
<td>214</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bhagwanjee, S.</td>
<td></td>
<td>108</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bhakta, H.</td>
<td></td>
<td>93</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bingham, M.</td>
<td></td>
<td>256</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biskupiak, J.</td>
<td></td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blaine, K.</td>
<td></td>
<td>133</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blake, C.</td>
<td></td>
<td>145</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blanter, M.</td>
<td></td>
<td>148</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bojalian, M.</td>
<td></td>
<td>203</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bokoch, M.</td>
<td></td>
<td>42, 46, 137</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bordegaray, N.</td>
<td></td>
<td>245</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borg, L.</td>
<td></td>
<td>219</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borgmeier, E.</td>
<td></td>
<td>190</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borna, R.</td>
<td></td>
<td>52, 244</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boucher, D.</td>
<td></td>
<td>161</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowdle, T.</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowling, A.</td>
<td></td>
<td>93</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Braehler, M.</td>
<td></td>
<td>32, 197, 220, 274</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brandal, D.</td>
<td></td>
<td>102, 173</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Braunfeld, M.</td>
<td></td>
<td>203</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brock-Utne, J.</td>
<td></td>
<td>2, 82, 227, 228, 253, 262</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broussard, A.</td>
<td></td>
<td>87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown, M.</td>
<td></td>
<td>140</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brun, C.</td>
<td></td>
<td>76, 251</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bueno, C.</td>
<td></td>
<td>254</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bui, E.</td>
<td></td>
<td>237, 245</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buras, M.</td>
<td></td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burbridge, M.</td>
<td></td>
<td>227, 253, 262</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burns, T.</td>
<td></td>
<td>172</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bussey, A.</td>
<td></td>
<td>119</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bussey, L.</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cai, Z.</td>
<td></td>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Page</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Campbell, L.</td>
<td>112</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canales, C.</td>
<td>269</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cannesson, M.</td>
<td>59, 208</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cao, N.</td>
<td>23, 149</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcamo-cavazos, V.</td>
<td>154</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carey, J.</td>
<td>144</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carvajal, T.</td>
<td>226</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casamalhaupa, C.</td>
<td>185</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Castle, S.</td>
<td>203</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caswell, R.</td>
<td>132</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cecil, J.</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chambliss, A.</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chan, J.</td>
<td>179</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chandegara, D.</td>
<td>225</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chandler, C.</td>
<td>218, 232</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chang, A.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>chang, i.</td>
<td>115</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chang, J.</td>
<td>46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chao, A.</td>
<td>97</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chawla, G.</td>
<td>177, 235</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chellappa, V.</td>
<td>254</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chen, A.</td>
<td>129</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chia, P.</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chiamvimonvat, N.</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinn, G.</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chiu, C.</td>
<td>46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chiu, M.</td>
<td>36, 66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cho, D.</td>
<td>235</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choi, H.</td>
<td>158</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chow, B.</td>
<td>14, 141</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chow, K.</td>
<td>269</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chua, P.</td>
<td>262</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chung, B.</td>
<td>10, 105</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>chyatte, d.</td>
<td>207</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clark, A.</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clark, D.</td>
<td>241</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coelho, C.</td>
<td>82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conover, Z.</td>
<td>252</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conrad, K.</td>
<td>160</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Craner, R.</td>
<td>252, 277</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creed, W.</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cui, W.</td>
<td>266</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curry, M.</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curtis, J.</td>
<td>92</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daniels, J.</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Davies, R.</td>
<td>161</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Davis, J.</td>
<td>229</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>De la Cruz, C.</td>
<td>164</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denney, D.</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Der, C.</td>
<td>177</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Derly, L.</td>
<td>78, 166, 243</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dixit, A.</td>
<td>195</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dijavaherian, D.</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doan, M.</td>
<td>276</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dobroskay, D.</td>
<td>122</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donoho, D.</td>
<td>133</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dorotta, I.</td>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dorsey, D.</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doshi, S.</td>
<td>204</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSOUZA, S.</td>
<td>239</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dudley, M.</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duling, L.</td>
<td>181</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durra, O.</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duval, V.</td>
<td>208</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dziuba, A.</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eghbali, M.</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eloustaz, M.</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elvir-lazo, O.</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ershoff, B.</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Escarza, B.</td>
<td>3, 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Essiet, M.</td>
<td>172</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evers, J.</td>
<td>268</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Falcon, R.</td>
<td>117, 125, 169, 216</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fang, T.</td>
<td>264</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fejleh, A.</td>
<td>113</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fergerson, B.</td>
<td>202</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferschl, M.</td>
<td>189, 233</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Figura, M.</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fischer, M.</td>
<td>254</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fischer, S.</td>
<td>140</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fitter, J.</td>
<td>258</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flannery, K.</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleming, N.</td>
<td>101, 140</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forghany, R.</td>
<td>54</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forman, N.</td>
<td>68</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forman, T.</td>
<td>241</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fowler, C.  
Fowler, I.  136, 227 
Frank, P.  258 
Frantz, S.  192 
Fretwell, D.  210 
Fu, A.  276 
Fu, J.  250 
Fukazawa, K.  37 
Furukawa, K.  119 

Gabel, E.  208 
Gabriel, R.  24 
Garner, C.  3, 104 
Gatling, J.  10, 12, 105 
Gautier, P.  123 
Gerstein, N.  78, 260 
Gilsenan, C.  262 
Gimenez, K.  93, 178 
Gitman, R.  19 
Golfeiz, H.  38 
Goodly, H.  122 
Goodwin, B.  91 
Gorlin, A.  9, 191 
Grogan, T.  175, 249 
Gruver, C.  114, 124 
Gruyer, L.  21 
Gulvezan, T.  193 
Gylys, M.  272 

Hagn, E.  30, 61 
Haight, E.  2, 241 
Halverson, B.  3 
Hamilton, J.  73 
Han, M.  164 
Hansen, D.  132 
Hartnett, J.  189 
Hassanian, M.  12 
Haughton, R.  152 
Head, B.  18 
Henke, V.  157 
Hennigan, A.  139 
Henry, J.  55 
Hernandez-morgan, M.  276 
Hicks, J.  229 
Ho, J.  254 

Hofer, I.  7 
Hoffner, L.  146 
Hoffman, N.  6 
Holly, T.  249 
Honkanen, A.  131 
Horn, J.  65, 123, 160, 219 
House II, L.  99 
Howard-Quijano, K.  25, 254 
Hruschka, J.  118 
Hsiung, R.  56 
Hsu, S.  53 
Htun, H.  234 
Hu, A.  178 
Hu, C.  271 
Hu, H.  134 
Hu, L.  245 
Huddleston, L.  145 
Hulvershorn, J.  5 
Hur, S.  217 
Huynh, P.  235 
Ibarra, A.  67 
Iwata, K.  145 

Jaffe, R.  82, 227, 228, 253 
Jaime, F.  260 
Javaherian, A.  138, 222 
Jelacic, S.  5 
Jenabi, I.  175 
Jeng, J.  32 
Jeong Kim, H.  27 
Jha, S.  40, 102, 236 
Ji, A.  76 
Jinkins, L.  243 
Joseph, M.  80 
Jung, M.  182 
Junkins, S.  161 
Kahl, N.  93 
Kakazu, C.  27 
Kan, C.  256 
Khalpey, Z.  144 
Khoche, S.  24, 66, 210 
Kim, D.  87 
Kim, E.  207
<table>
<thead>
<tr>
<th>Name</th>
<th>Page Numbers</th>
<th>Name</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kim, J.</td>
<td>56</td>
<td>Lieu, M.</td>
<td>52, 244</td>
</tr>
<tr>
<td>Kim, M.</td>
<td>133</td>
<td>Lim, S.</td>
<td>68, 182</td>
</tr>
<tr>
<td>Kim, R.</td>
<td>230</td>
<td>Lin, B.</td>
<td>223, 232</td>
</tr>
<tr>
<td>Kim, S.</td>
<td>128</td>
<td>Liu, J.</td>
<td>126</td>
</tr>
<tr>
<td>Kim, T.</td>
<td>51</td>
<td>Liu, L.</td>
<td>32, 145</td>
</tr>
<tr>
<td>Kimball, E.</td>
<td>262</td>
<td>Lopez, M.</td>
<td>254, 276</td>
</tr>
<tr>
<td>King, N.</td>
<td>185</td>
<td>Lorenzo, J.</td>
<td>55</td>
</tr>
<tr>
<td>King, R.</td>
<td>246</td>
<td>Lough, M.</td>
<td>55</td>
</tr>
<tr>
<td>Knepler, J.</td>
<td>67</td>
<td>Love, J.</td>
<td>78</td>
</tr>
<tr>
<td>Kolodzie, K.</td>
<td>274</td>
<td>Low, D.</td>
<td>181</td>
</tr>
<tr>
<td>Kou, A.</td>
<td>246</td>
<td>Luna, D.</td>
<td>58</td>
</tr>
<tr>
<td>Kough, K.</td>
<td>132</td>
<td>Lund, E.</td>
<td>240</td>
</tr>
<tr>
<td>Kratzert, W.</td>
<td>75</td>
<td>Lupu, S.</td>
<td>104</td>
</tr>
<tr>
<td>Krause, M.</td>
<td>39</td>
<td>Ma, C.</td>
<td>89</td>
</tr>
<tr>
<td>Kulkarni, V.</td>
<td>95</td>
<td>Ma, W.</td>
<td>219</td>
</tr>
<tr>
<td>Kung, E.</td>
<td>64</td>
<td>Maass, B.</td>
<td>136</td>
</tr>
<tr>
<td>Kuo, A.</td>
<td>107</td>
<td>Macario, A.</td>
<td>2</td>
</tr>
<tr>
<td>Kuo, W.</td>
<td>80</td>
<td>Machi, R.</td>
<td>48</td>
</tr>
<tr>
<td>Lam, A.</td>
<td>44</td>
<td>Mackensen, B.</td>
<td>21</td>
</tr>
<tr>
<td>Lam, P.</td>
<td>107, 148</td>
<td>Macres, S.</td>
<td>28</td>
</tr>
<tr>
<td>Lammers, C.</td>
<td>223</td>
<td>Madhok, J.</td>
<td>259</td>
</tr>
<tr>
<td>Lane, R.</td>
<td>220</td>
<td>Maglunog Jr, A.</td>
<td>50, 225</td>
</tr>
<tr>
<td>Laney, J.</td>
<td>247</td>
<td>Mahajan, A.</td>
<td>23</td>
</tr>
<tr>
<td>Lang, J.</td>
<td>264</td>
<td>Mai, A.</td>
<td>167</td>
</tr>
<tr>
<td>Larsen, S.</td>
<td>168</td>
<td>Majidian, S.</td>
<td>173</td>
</tr>
<tr>
<td>Laufer, D.</td>
<td>112</td>
<td>Makar, M.</td>
<td>256</td>
</tr>
<tr>
<td>Le, J.</td>
<td>116, 249</td>
<td>Maler, S.</td>
<td>74</td>
</tr>
<tr>
<td>Le, T.</td>
<td>23</td>
<td>Malkin, M.</td>
<td>86</td>
</tr>
<tr>
<td>Lee, A.</td>
<td>26</td>
<td>Mansour, E.</td>
<td>43</td>
</tr>
<tr>
<td>Lee, C.</td>
<td>203, 208</td>
<td>Manuel, S.</td>
<td>106</td>
</tr>
<tr>
<td>Lee, E.</td>
<td>141</td>
<td>Mariano, E.</td>
<td>230</td>
</tr>
<tr>
<td>Lee, J.</td>
<td>50, 97, 225</td>
<td>Markley, J.</td>
<td>154, 182, 195</td>
</tr>
<tr>
<td>Lee, L.</td>
<td>171</td>
<td>Marquez, H.</td>
<td>1</td>
</tr>
<tr>
<td>Lee, P.</td>
<td>257</td>
<td>Marsh, B.</td>
<td>157</td>
</tr>
<tr>
<td>Lee, S.</td>
<td>32</td>
<td>Martin, R.</td>
<td>3</td>
</tr>
<tr>
<td>Leung, k.</td>
<td>78, 245</td>
<td>Martirosyan, H.</td>
<td>8</td>
</tr>
<tr>
<td>Lewin, M.</td>
<td>99</td>
<td>Mascetti, C.</td>
<td>51</td>
</tr>
<tr>
<td>Li, D.</td>
<td>69</td>
<td>Masters, D.</td>
<td>266</td>
</tr>
<tr>
<td>Li, F.</td>
<td>21</td>
<td>Matika, R.</td>
<td>213</td>
</tr>
<tr>
<td>Liaghat, J.</td>
<td>218</td>
<td>Maus, T.</td>
<td>151, 159, 202</td>
</tr>
<tr>
<td>Libaw, J.</td>
<td>32</td>
<td>McAvoy, J.</td>
<td>253</td>
</tr>
<tr>
<td>Lichtenenthal, P.</td>
<td>49, 213</td>
<td>McGee, S.</td>
<td>260</td>
</tr>
<tr>
<td>Lieberman, J.</td>
<td>85, 157</td>
<td>McKenzie, S.</td>
<td>255</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
<td>Author</td>
<td>Pages</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>McNamara, E.</td>
<td>103, 225</td>
<td>No, C.</td>
<td>143</td>
</tr>
<tr>
<td>Meeks, J.</td>
<td>186</td>
<td>No, D.</td>
<td>143</td>
</tr>
<tr>
<td>Mehmood, T.</td>
<td>127</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meier, R.</td>
<td>92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Merriman, K.</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methangkool, E.</td>
<td>48, 276</td>
<td>Ochieng, S.</td>
<td>213</td>
</tr>
<tr>
<td>Michaelsen, K.</td>
<td>5</td>
<td>Ogle, E.</td>
<td>3</td>
</tr>
<tr>
<td>Milam, A.</td>
<td>107, 148</td>
<td>Ohebsion, M.</td>
<td>80</td>
</tr>
<tr>
<td>Miller, K.</td>
<td>208</td>
<td>Oldroyd, D.</td>
<td>63</td>
</tr>
<tr>
<td>Miller, M.</td>
<td>276</td>
<td>Omran, K.</td>
<td>8</td>
</tr>
<tr>
<td>Minasyan, H.</td>
<td>208</td>
<td>Onyia, T.</td>
<td>151</td>
</tr>
<tr>
<td>Ming, J.</td>
<td>117, 169</td>
<td>Overstreet, K.</td>
<td>191</td>
</tr>
<tr>
<td>Mitarai, T.</td>
<td>127</td>
<td>Ozery, E.</td>
<td>251</td>
</tr>
<tr>
<td>Mixon, L.</td>
<td>177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moallempour, M.</td>
<td>114</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moazeni, S.</td>
<td>149</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Molloy, M.</td>
<td>205</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morgan, N.</td>
<td>168</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moriarty, J.</td>
<td>175</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morrissey, C.</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morrissey, T.</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motamed, A.</td>
<td>141, 204</td>
<td>Paidy, S.</td>
<td>144</td>
</tr>
<tr>
<td>Moy, D.</td>
<td>123</td>
<td>Pang, J.</td>
<td>6</td>
</tr>
<tr>
<td>Mudumbai, S.</td>
<td>230</td>
<td>Panigrahi, A.</td>
<td>120</td>
</tr>
<tr>
<td>Mueller, J.</td>
<td>205</td>
<td>Panikkath, P.</td>
<td>156</td>
</tr>
<tr>
<td>Murray, A.</td>
<td>226</td>
<td>Paparisto, E.</td>
<td>133</td>
</tr>
<tr>
<td>Myo-Bui, C.</td>
<td>89</td>
<td>Paredes, K.</td>
<td>93</td>
</tr>
<tr>
<td>Nafday, R.</td>
<td>274</td>
<td>Park, A.</td>
<td>85</td>
</tr>
<tr>
<td>Naghshbandi, M.</td>
<td>97</td>
<td>Partownavid, P.</td>
<td>254</td>
</tr>
<tr>
<td>Naidu, R.</td>
<td>99</td>
<td>Pasca, I.</td>
<td>97</td>
</tr>
<tr>
<td>Nair, B.</td>
<td>5</td>
<td>Patel, K.</td>
<td>175, 254</td>
</tr>
<tr>
<td>Naowamondhol, K.</td>
<td>163</td>
<td>Patel, N.</td>
<td>173</td>
</tr>
<tr>
<td>Neelankavil, P.</td>
<td>254</td>
<td>Patel, P.</td>
<td>18</td>
</tr>
<tr>
<td>Nercisian, A.</td>
<td>50</td>
<td>Patel, R.</td>
<td>16</td>
</tr>
<tr>
<td>Ng, V.</td>
<td>150, 266</td>
<td>Pearl, R.</td>
<td>262</td>
</tr>
<tr>
<td>Ngo, J.</td>
<td>77</td>
<td>Penn, C.</td>
<td>84</td>
</tr>
<tr>
<td>Nguyen, A.</td>
<td>24</td>
<td>Perez, F.</td>
<td>131</td>
</tr>
<tr>
<td>Nguyen, C.</td>
<td>171</td>
<td>Pessegueiro, A.</td>
<td>208</td>
</tr>
<tr>
<td>Nguyen, M.</td>
<td>89</td>
<td>Petersen, T.</td>
<td>78, 117, 118, 125, 169, 216, 243</td>
</tr>
<tr>
<td>Nguyen, V.</td>
<td>276</td>
<td>Petrie, M.</td>
<td>199</td>
</tr>
<tr>
<td>Nguyen-Buckley, C.</td>
<td>89</td>
<td>Petrou, P.</td>
<td>72</td>
</tr>
<tr>
<td>Nguyen-Lee, J.</td>
<td>89</td>
<td>Pham, V.</td>
<td>137</td>
</tr>
<tr>
<td>Nielsen, V.</td>
<td>207</td>
<td>Pia, J.</td>
<td>52</td>
</tr>
<tr>
<td>Qi, J.</td>
<td></td>
<td>Piacenza, E.</td>
<td>162</td>
</tr>
<tr>
<td>Quach, J.</td>
<td></td>
<td>Pingili, R.</td>
<td>94</td>
</tr>
<tr>
<td>Quadri, S.</td>
<td></td>
<td>Pong, R.</td>
<td>240</td>
</tr>
<tr>
<td>Poon, A.</td>
<td></td>
<td>Pooresattar, S.</td>
<td>59, 110</td>
</tr>
<tr>
<td>Prasad, R.</td>
<td></td>
<td>Prasad, R.</td>
<td>224</td>
</tr>
<tr>
<td>Pugh, J.</td>
<td></td>
<td>Pugh, J.</td>
<td>10, 12, 97, 104, 105, 122</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------</td>
<td>-------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Rafizadeh, S.</td>
<td>27</td>
<td>Sarkisian, C.</td>
<td>208</td>
</tr>
<tr>
<td>Rahman, S.</td>
<td>116, 149, 249, 254</td>
<td>Schertz, T.</td>
<td>253</td>
</tr>
<tr>
<td>Rajan, G.</td>
<td>81, 128, 211, 272</td>
<td>Schmidt, U.</td>
<td>24</td>
</tr>
<tr>
<td>Ramsingh, D.</td>
<td>3, 10, 12, 51, 97, 100, 104, 105, 122</td>
<td>Schober, A.</td>
<td>129</td>
</tr>
<tr>
<td>Raphael, D.</td>
<td>26</td>
<td>Schultz, D.</td>
<td>200</td>
</tr>
<tr>
<td>Raval, R.</td>
<td>3</td>
<td>Schwan, J.</td>
<td>246</td>
</tr>
<tr>
<td>Ravula, N.</td>
<td>64, 74, 94</td>
<td>Schwarzenberger, J.</td>
<td>175</td>
</tr>
<tr>
<td>Reddy, S.</td>
<td>186</td>
<td>Schwebler, K.</td>
<td>108</td>
</tr>
<tr>
<td>Regev, A.</td>
<td>208</td>
<td>Scovotti, J.</td>
<td>254</td>
</tr>
<tr>
<td>Reisman, M.</td>
<td>21</td>
<td>Sedra, A.</td>
<td>204</td>
</tr>
<tr>
<td>Rever, L.</td>
<td>14</td>
<td>Seiler, A.</td>
<td>45</td>
</tr>
<tr>
<td>Reyes, K.</td>
<td>91</td>
<td>Seligman, K.</td>
<td>245</td>
</tr>
<tr>
<td>Rice, C.</td>
<td>110</td>
<td>Seo, S.</td>
<td>118</td>
</tr>
<tr>
<td>Richman, S.</td>
<td>53</td>
<td>Shah, S.</td>
<td>244</td>
</tr>
<tr>
<td>Rinehart, J.</td>
<td>26</td>
<td>Shamloo, B.</td>
<td>8</td>
</tr>
<tr>
<td>Ringer, M.</td>
<td>97</td>
<td>Shaw, R.</td>
<td>171</td>
</tr>
<tr>
<td>Rishel, C.</td>
<td>4</td>
<td>Shih, G.</td>
<td>3, 100</td>
</tr>
<tr>
<td>Ritz, M.</td>
<td>191</td>
<td>Shyong, J.</td>
<td>97</td>
</tr>
<tr>
<td>Rivera, F.</td>
<td>20</td>
<td>Sigmon, C.</td>
<td>1</td>
</tr>
<tr>
<td>Roby, J.</td>
<td>271</td>
<td>Silva, A.</td>
<td>128</td>
</tr>
<tr>
<td>Rocha, J.</td>
<td>117, 169</td>
<td>Silverton, N.</td>
<td>16, 190</td>
</tr>
<tr>
<td>Rodriguez, J.</td>
<td>159</td>
<td>Sing, D.</td>
<td>185</td>
</tr>
<tr>
<td>Roffey, P.</td>
<td>124, 225</td>
<td>Singh, H.</td>
<td>231</td>
</tr>
<tr>
<td>Rollins, M.</td>
<td>63</td>
<td>Sing, S.</td>
<td>103, 203, 269</td>
</tr>
<tr>
<td>Roper, B.</td>
<td>199</td>
<td>Skanchy, J.</td>
<td>136</td>
</tr>
<tr>
<td>Rosario, L.</td>
<td>211</td>
<td>Slingwine, C.</td>
<td>113</td>
</tr>
<tr>
<td>Rosner, H.</td>
<td>8</td>
<td>Slupski, V.</td>
<td>225</td>
</tr>
<tr>
<td>Ross, J.</td>
<td>153</td>
<td>Smith, M.</td>
<td>91</td>
</tr>
<tr>
<td>Ross, M.</td>
<td>151</td>
<td>smith, s.</td>
<td>228</td>
</tr>
<tr>
<td>Ruan, A.</td>
<td>127</td>
<td>Snyder, H.</td>
<td>181</td>
</tr>
<tr>
<td>Rubio, G.</td>
<td>246</td>
<td>Sobel, E.</td>
<td>102</td>
</tr>
<tr>
<td>Rumbaugh, C.</td>
<td>117</td>
<td>Somal, J.</td>
<td>60</td>
</tr>
<tr>
<td>Runyon, A.</td>
<td>12, 104, 105</td>
<td>Soneru, C.</td>
<td>117, 118, 125, 169, 216</td>
</tr>
<tr>
<td>Russel, M.</td>
<td>203</td>
<td>Soo, J.</td>
<td>3</td>
</tr>
<tr>
<td>Russino, H.</td>
<td>15</td>
<td>Spilka, J.</td>
<td>199</td>
</tr>
<tr>
<td>Rutkowski, M.</td>
<td>137</td>
<td>Stalls, C.</td>
<td>125, 169, 216</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Starr, B.</td>
</tr>
<tr>
<td>Sadeghipour, H.</td>
<td>8</td>
<td>Steadman, R.</td>
<td>110</td>
</tr>
<tr>
<td>Sag, L.</td>
<td>234</td>
<td>Steely, C.</td>
<td>10, 100</td>
</tr>
<tr>
<td>Sall, J.</td>
<td>31</td>
<td>Steffel, L.</td>
<td>164</td>
</tr>
<tr>
<td>Salvatierra, N.</td>
<td>81</td>
<td>Steinhardt, D.</td>
<td>106</td>
</tr>
<tr>
<td>Sandoval, A.</td>
<td>169</td>
<td>Stewart, J.</td>
<td>1</td>
</tr>
<tr>
<td>Santos, J.</td>
<td>78, 237</td>
<td>Stier, G.</td>
<td>3, 10, 12, 122</td>
</tr>
<tr>
<td>Sarah, G.</td>
<td>233</td>
<td>Stoker, A.</td>
<td>9</td>
</tr>
</tbody>
</table>
Suh, W. 254  Walters, T. 246
Sun, E. 4, 246, 259  Walther, C. 86
Sun, L. 197  Wang, C. 69
Szabo, E. 91  Wang, R. 219
Taborek, A. 105, 134  Wang, S. 18
Takemura, Y. 241  Wang, T. 32
Tan, M. 80  Ward, T. 213
Tanaka, P. 2, 214  Weinstein, L. 36, 73, 186, 224
Tang, J. 195, 264  Weis, R. 35
Tanner, C. 269  Wiesel, S. 255
Tawfik, V. 2, 241  Wijesinghe, I. 122
Tay, C. 257  Wilson, J. 1
Teng, J. 233  Wingfield, P. 202
Thangathurai, D. 41, 50, 124, 138, 141, 222, 225  Wolfson, J. 218
Thorup, B. 61  Wong, J. 95
Thurston, Jr. MD, J. 183  Wong, s. 75
Timmermann, T. 8  Woodfin, M. 97
Togashi, K. 21  Wu, A. 6
Tong, J. 53  Wu, H. 67
Tontoh, H. 92  Xu, L. 32
Torgeson, E. 237  Yamoah, E. 27
Tran, M. 24  Yang, J. 12
Tran, Q. 20  Yao, A. 101
Tran, T. 236  Yen, T. 146
Tausch, D. 108  Yim, M. 94, 126
Umar, S. 15, 23, 149, 203  Yin, N. 25
Uthlaut, E. 37  Ying, C. 122
Vaillancourt, M. 23, 149  Younan, L. 158
Valdez, A. 197  Young, M. 55
Valencia, F. 49  Yu, T. 46
Valencia, O. 49  Yumul, R. 8, 107, 113
Valladares, J. 212  Zakaroff, M. 90
Vogelsong, M. 55  Zarrabi, D. 267
Vu, K. 41, 138, 222  Zhang, Z. 27
Vu, T. 220  Zhou, J. 28
Wachi, C. 14, 141  Zhou, Y. 18
Wailes, D. 12, 104  Zimmerman, J. 16, 190
Table of Contents

A CURATIVE TREATMENT FOR SEVERE RECALCITRANT UNILATERAL LOWER LIMB COMPLEX REGIONAL PAIN SYNDROME (CRPS) TYPE I & TYPE II BY IMPLEMENTING A MULTI-DISCIPLINARY TEAM APPROACH WITH LIMB AMPUTATION: A CASE SERIES
Dr. Jessica Wilson, Dr. Ian Fowler, Dr. Carter Sigmon, Ms. Julianne Stewart, Ms. Hanna Marquez

A STRUCTURED RESEARCH PROGRAM DURING RESIDENCY INCREASES ACADEMIC PRODUCTIVITY OF GRADUATES: THE STANFORD EXPERIENCE
Ms. Elena Haight, Dr. Pedro Tanaka, Dr. John Brock-Utne, Dr. Alex Macario, Dr. Vivianne Tawfik

ANESTHESIOLOGISTS AS PERIOPERATIVE HOSPITALISTS AND OUTCOMES IN PATIENTS UNDERGOING MAJOR UROLOGIC SURGERY: A HISTORICAL-PROSPECTIVE, COMPARATIVE EFFECTIVENESS STUDY
Dr. Brett Escarza, Dr. Gary Stier, Dr. Ronak Raval, Dr. Gary Shih, Dr. Joseph Soo, Dr. Eric Ogle, Dr. Bryan Halverson, Dr. Colin Garner, Dr. Davinder Ramsingh, Dr. Robert Martin

ASSOCIATION BETWEEN PREOPERATIVE OPIOID WEANING AND POSTOPERATIVE OUTCOMES AMONG CHRONIC OPIOID USERS: A RETROSPECTIVE ANALYSIS
Dr. Chris Rishel, Dr. Martin Angst, Dr. Eric Sun

DEVELOPMENT AND CLINICAL TESTING OF A COMPACT, VERSATILE AND LOW COST MECHANOMYOGRAPHY DEVICE FOR QUANTITATIVE TRAIN OF FOUR ASSESSMENT
Dr. Kelly Michaelsen, Dr. Bala Nair, Dr. Srdjan Jelacic, Mr. Logan Bussey, Dr. Justin Hulvershorn, Dr. T. Andrew Bowdle

DEVELOPMENT OF A UNIVERSAL DESIGN DUAL LUMEN ENDOBRONCHIAL TUBE (DLT)
Dr. Andrew Wu, Dr. Jonathan Pang, Dr. Nir Hofman

DYNAMIC GFR AS A PREDICTOR OF PERI-OPERATIVE MORTALITY COMPARED TO KDIGO AKI CLASSIFICATION
Dr. Myroslav Figura, Dr. Ira Hofer

EVALUATION OF COLD PAIN RESPONSE IN CHRONIC PAIN PATIENTS ON OPIOID
Dr. Hamed Sadeghipour, Dr. Roya Yumul, Dr. Hripsime Martirosyan, Dr. Bahman Shamloo, Dr. Katayoon Omrani, Dr. Ofelia Elvir-lazo, Dr. Tia Nicole Timmermann, Dr. Howard Rosner

EVALUATION OF PATIENT CHARACTERISTICS AND PHARMACEUTICAL FACTORS ASSOCIATED WITH ADVERSE DRUG EVENTS OF LOW-DOSE KETAMINE INFUSIONS USED FOR PERIOPERATIVE ANALGESIA AT MAYO CLINIC ARIZONA.
Dr. Alexander Stoker, Dr. Jeremy Alvord, Mr. Matthew Buras, Dr. Andrew Gorlin
FEASIBILITY AND PRELIMINARY RESULTS FROM THE USE OF A NON-INVASIVE WRISTBAND DEVICE TO CAPTURE HEART RATE VARIABILITY METRICS AMONG ANESTHESIOLOGY RESIDENT PHYSICIANS DURING AND AFTER IN-HOUSE CALL SHIFTS
Dr. Alexandra Chang, Dr. Davinder Ramsingh, Dr. Brian Chung, Mr. Matthew Alschuler, Mr. Justin Pugh, Dr. Christianna Steely, Dr. Brett Escarza, Dr. Gary Stier, Dr. Jason Gatling

IMPACT ASSESSMENT OF A PERIOPERATIVE POINT OF CARE ULTRASOUND SERVICE: A QUALITY IMPROVEMENT INITIATIVE
Dr. Alec Runyon, Dr. Davinder Ramsingh, Dr. Dustin Wailes, Dr. Mohammed Hassanian, Mr. Jaron Yang, Mr. Justin Pugh, Mr. Matthew Alschuler, Dr. Michael Benggon, Dr. Jason Gatling, Dr. Gary Stier

IMPACT ON SURGICAL SITE INFECTION USING PREOPERATIVE CHLOROHEXIDINE BODY WASH PRIOR TO ELECTIVE COLORECTAL SURGERY
Dr. Bryan Chow, Dr. Mohamed Eloustaz, Dr. Carly Wachi, Dr. Linda Rever

INTRALIPID IMPROVES LEFT VENTRICULAR FUNCTION IN RATS WITH LPS-INDUCED CARDIAC DYSFUNCTION
Dr. Hanzi Russino, Dr. Soban Umar

INTRAOPERATIVE TRANSESOPHAGEAL ECHOCARDIOGRAPHY TO PREDICT RIGHT VENTRICULAR FAILURE AFTER LVAD IMPLANTATION
Mr. Ravi Patel, Dr. Natalie Silverton, Dr. Candice Morrissey, Dr. Joshua Zimmerman

NEURON-TARGETED CAVEOLIN-1 PROMOTES NEURONAL PLASTICITY IN A MOUSE MODEL OF ALZHEIMER’S DISEASE (AD)
Dr. YingQiu Zhou, Dr. Shanshan Wang, Dr. Piyush Patel, Dr. Brian Head

NOVEL USE OF VA ECMO IN THE TREATMENT OF AMNIOTIC FLUID EMBOLISM
Dr. Robert Gitman

PATIENT SATISFACTION FOLLOWING VIDEO EDUCATION ON EPIDURAL ANESTHESIA
Dr. Franchesca Rivera, Dr. Quy Tran

PERCUTANEOUS LEFT ATRIAL APPENDAGE OCCLUSION: COMPARISON OF 2 DIMENSIONAL VERSUS 3 DIMENSIONAL ECHOCARDIOGRAPHIC QUANTITATIVE ASSESSMENT
Dr. Flora Li, Dr. Kei Togashi, Ms. Lara Gruye, Dr. Mark Reisman, Dr. Burkhard Mackensen

PULMONARY HYPERTENSION IS ASSOCIATED WITH NEUROINFLAMMATION IN RATS
Dr. Pamela Chia, Ms. Mylene Vaillancourt, Ms. Nancy Cao, Ms. Trixie Le, Dr. Mansoureh Eghbali, Dr. Aman Mahajan, Dr. Soban Umar

SKIPPING OUT ON SCIP MEASURE -10 MAY BE A SKIP, HOP AND JUMP IN THE RIGHT DIRECTION.
Dr. Minh Tran, Dr. Swapnil Khoche, Dr. Rodney Gabriel, Dr. Ulrich Schmidt, Dr. Albert Nguyen

SPINAL CORD STIMULATION THERAPY ATTENUATES ACTIVATION OF DORSAL HORN AND INTERMEDIOLATERAL NUCLEUS NEURONS DURING ACUTE MYOCARDIAL ISCHEMIA
Dr. Nicole Yin, Dr. Kim Howard-Quijano
SUGAMMADEX DECREASES COST ASSOCIATED WITH POST-OPERATIVE REINTUBATIONS
Dr. Angela Lee, Dr. Darren Raphael, Dr. Joseph Rinehart

TARGETING CALCIUM-ACTIVATED POTASSIUM CHANNELS AS A NOVEL APPROACH TO TREATING ATRIAL FIBRILLATION
Dr. Sassan Rafizadeh, Dr. Zheng Zhang, Dr. Hyo Jeong Kim, Dr. Clinton Kakazu, Dr. Nipavan Chiamvimonvat, Dr. Ebenezer Yamoah

TRANSVERSUS ABDOMINUS PLANE BLOCK CATHETERS VS LIPOSOMAL BUPIVACAINE FOR PAIN CONTROL AFTER COLORECTAL SURGERY: A PROSPECTIVE RANDOMIZED CONTROL TRIAL
Dr. Diosdado Baja, Dr. Zar Baqai, Dr. Jon Zhou, Dr. Stephen Macres, Dr. Richard Applegate

USAGE PATTERNS OF KETAMINE AT THE UNIVERSITY OF UTAH
Dr. Whitney Creed, Dr. Emily Hagn, Dr. Joseph Biskupiak

VOLUNTARY EXERCISE RESCUES A SPATIAL MEMORY DEFICIT AFTER EARLY-LIFE ANESTHESIA EXPOSURE
Dr. Gregory Chinn, Dr. Jeffrey Sall

“REVERSE TO AVOID THE ADVERSE”: IMPROVING COMPLIANCE TO EVIDENCE-BASED REVERSAL OF NON-DEPOLARIZING NEUROMUSCULAR BLOCKADE
Dr. Lei Xu, Dr. Jack Jeng, Dr. Jacob Cecil, Dr. Shona Lee, Dr. Tom Wang, Dr. Justin Libaw, Dr. Alexandra Anderson, Dr. Linda Liu, Dr. Matthias Braehler

Posters

“LOEYS-DIETZ SYNDROME AND OXYGENATION FAILURE DURING CARDIOPULMONARY BYPASS FOR COMPLEX CARDIAC SURGERY”
Dr. Jeremy Alvord, Dr. Ricardo Weis, Mr. Derek Denney

A CASE OF PITUITARY APOPLEXY: AN UNUSUAL CASE OF POSTPARTUM HEADACHE AFTER NEURAXIAL ANESTHESIA
Dr. Margaret Chiu, Dr. Larry Weinstein

A CASE OF RAPID GROWTH OF TUMOR THROMBUS INTO RIGHT VENTRICLE DETECTED BY TRANSESOPHAGEAL ECHOCARDIOGRAPHY DURING SURGICAL RESECTION OF RENAL CELL CARCINOMA WITH IVC EXTENSION
Dr. Elise Uthlaut, Dr. Kyota Fukazawa

A CASE OF SEVERE ARDS AND REFRACTORY HYPOXEMIA DESPITE VV-ECMO AFTER SCROTAL AND PENILE SILICONE INJECTIONS
Dr. Hooman Golfeiz

A CASE OF SPURIOUS HYPOXEMIA ON BLOOD GAS ANALYSIS DURING HYPERLEUKOCYTOSIS SECONDARY TO CHRONIC MYELOGENOUS LEUKEMIA
Dr. Tyler Morrissey, Dr. Martin Krause

A CASE OF UNDIAGNOSED SUBGLOTTIC STENOSIS MANAGED DURING INTUBATION
Dr. Derek Djavaherian, Dr. Sachin Jha
A MULTIMODAL APPROACH TO THE PERI-OPERATIVE MANAGEMENT OF MAST CELL ACTIVATION SYNDROME
Dr. Kevin Vu, Dr. Duraiyah Thangathurai

A RARE CASE OF CLINICALLY SIGNIFICANT SUBCUTANEOUS EMPHYSEMA AND PNEUMOMEDIASTINUM FOLLOWING LAPAROSCOPIC ABDOMINAL SURGERY
Dr. Syed Ali, Dr. Michael P. Bokoch

A RETROSPECTIVE REVIEW OF PERIOPERATIVE OPIOID USE FOLLOWING RENAL TRANSPLANT SURGERY IN PATIENTS THAT RECEIVED SINGLE SHOT TAP (TRANSVERSUS ABDOMINUS PLANE) BLOCKS COMPARED TO THOSE THAT RECEIVED TAP CATHETERS WITH CONTINUOUS INFUSIONS.
Dr. Jonathan Barnier, Dr. Eugene Mansour

A SAFE AND PRACTICAL METHOD FOR TEACHING BEDSIDE PERCUTANEOUS TRACHEOSTOMY
Dr. Anthony Clark, Dr. Arthur Lam

A UNIQUE MANAGEMENT OF A KNOWN DIFFICULT AIRWAY
Dr. Arran Seiler, Dr. David Dorsey

ACUTE HYPOXEMIA DURING THE NEOHEPATIC STAGE OF LIVER TRANSPLANTATION IN A PATIENT WITH A PATENT FORAMEN OVALE
Dr. Catherine Chiu, Dr. Tina Yu, Dr. Joyce Chang, Dr. Michael P. Bokoch

ACUTE INTRAOPERATIVE HEPATIC FAILURE DURING CARDIAC SURGERY: A COMPLEX CASE
Dr. Raymond Machi, Dr. Emily Methangkool

ADEQUATE PAIN CONTROL IN PEDIATRICS: MAKING A SURGICAL PROCEDURE A PERSONAL AND COST EFFECTIVE SUCCESS
Ms. Olivia Valencia, Dr. Peter Lichtenthal, Dr. Francisco Valencia

AGGRESSIVE AND EARLY EXTUBATION IN SUPER OBESITY
Dr. Alexander Maglunog Jr, Dr. Aren Nercisian, Dr. Jessica Lee, Dr. Duraiyah Thangathurai

AIRWAY FIRE IN CARDIAC SURGERY: CASE REPORT
Dr. Tiffany Kim, Dr. Carin Mascetti, Dr. Davinder Ramsingh

AIRWAY MANAGEMENT IN A PATIENT WITH TRAUMATIC HARD PALATE PERFORATION
Dr. Michelle Lieu, Dr. Jason Pia, Dr. Reza Borna

AIRWAY MANAGEMENT IN PATIENT WITH LARGE OBSTRUCTING THYROID GOITER
Dr. Sherif Richman, Dr. Shao Pu Hsu, Dr. Justin Tong

AN ANALYSIS OF THE ROLE OF ANESTHESIOLOGY PROVIDERS IN HOSPITAL DEFICIENCIES PUBLISHED BY CMS
Dr. Reihaneh Forghany, Dr. Joseph Antognini
AN AWAKENING, BREATHING, DELIRIUM SCREENING, AND MOBILITY PROGRAM FOR MECHANICALLY VENTILATED PATIENTS CHANGES DAILY ICU PRACTICES BUT NOT PATIENT OUTCOMES
Dr. Melissa Vogelsong, Ms. Jill Henry, Ms. Mary Lough, Ms. Kristen Merriman, Ms. Merriam Young, Dr. Javier Lorenzo

ANESTHESIA FOR VEGANS
Dr. Jimmy Kim, Dr. Robert Hsiung

ANESTHESIA IN POSTPOLIO SYNDROME: A CASE REPORT
Dr. Donald Luna, Dr. Brian Starr

ANESTHESIA MANAGEMENT IN A PARTURIENT WITH SINGLE VENTRICLE PHYSIOLOGY AND FONTAN PALLIATION: A CASE REPORT
Dr. Sophia Poorsattar, Dr. Maxime Cannesson

ANESTHESIOLOGISTS AS PERIOPERATIVE PHYSICIANS FOR IMPROVED CLINICAL OUTCOME AND RESOURCE MANAGEMENT FOR THE HIGH-RISK NEUROSURGICAL PATIENT
Dr. Megan Bernstein, Dr. Jaspreet Somal

ANESTHETIC CONSIDERATIONS IN A PATIENT WITH MARFAN’S SYNDROME AND KNOWN THORACOABDOMINAL AORTIC ANEURYSM UNDERGOING LAPAROSCOPIC APPENDECTOMY – A CASE REPORT
Dr. Brock Thorup, Dr. Emily Hagn

ANESTHETIC IMPLICATIONS OF CARNITINE PALMITOYLTRANSFERASE II DEFICIENCY IN THE PARTURIENT: A CASE REPORT.
Dr. Daniel Oldroyd, Dr. Mark Rollins

ANESTHETIC MANAGEMENT OF A SPINAL MUSCULAR ATROPHY PATIENT
Dr. Evan Kung, Dr. Niroop Ravula

ANESTHETIC MANAGEMENT OF AN OBSTETRIC PATIENT WITH EVANS SYNDROME
Dr. Adam Dziuba, Dr. Jeffrey Horn

ANESTHETIC MANAGEMENT OF CONGENITAL HEART DISEASE WITH COR TRIATRIMUM SINISTER AND ANOMALOUS PULMONARY VENOUS DRAINAGE IN AN ADULT
Dr. Margaret Chiu, Dr. Swapnil Khoche

ANESTHETIC MANAGEMENT OF LOWER TRACHEAL/CARINAL AIRWAY STENOSIS FROM TUMOR ENCROACHMENT
Dr. Henry Wu, Dr. Alejandro Ibarra, Dr. James Knepler, Dr. Sam Afshar

ANESTHETIC MANAGEMENT OF MIDGUT VOLVULUS IN THE OBSTETRIC PATIENT REQUIRING EMERGENT ABDOMINAL SURGERY.
Dr. Nell Forman, Dr. Stephanie Lim

ANESTHETIC MANAGEMENT OF PATIENT WITH RIGHT ATRIAL ANGIOSARCOMA
Dr. Cecilia Wang, Dr. David Li
ANESTHETIC MANAGEMENT OF PATIENTS WITH MITOCHONDRIAL DISEASE
Dr. Syeda Quadri

ANESTHETIC MANAGEMENT OF SEVERE PULMONARY HYPERTENSION UNDERGOING MAJOR NON-CARDIAC SURGERY
Dr. Philip Petrou, Dr. Jennifer Basarb-Tung

ANTEPARTUM UTERINE RUPTURE WITH PLACENTAL ABRUPTION AT 29 WEEKS OF GESTATION
Dr. Jeffrey Hamilton, Dr. Larry Weinstein, Dr. Wendy Abramson

APPROACH TO AIRWAY MANAGEMENT IN AN INFANT WITH OSTEOGENESIS IMPERFECTA
Dr. Steven Maler, Dr. Niroop Ravula

ARTERIAL EMBOLISM IN MITRAL CLIP PROCEDURE
Dr. sefum (steven) wong, Dr. Wolf Benjamin Kratzert

ASPIRE TO PREVENT ASPIRATION: GASTRIC SONOGRAPHY IN PERIOPERATIVE MANAGEMENT
Dr. Angela Ji, Dr. Carlos Brun

ASSOCIATION BETWEEN ACUTE POST-CESAREAN SECTION PAIN AND POSTPARTUM INFECTION: A RETROSPECTIVE COHORT STUDY
Dr. John Ngo

ATRIAL SEPTOSTOMY PALLIATION DURING V-V ECMO WITH SEVERE PULMONARY HYPERTENSION AND CARDIOGENIC FAILURE.
Dr. kar wei leung, Dr. Neal Gerstein, Dr. Josh Santos, Dr. Timothy Petersen, Dr. Lev Deriy, Dr. John Love

BLOOD LACTATE LEVELS IN ADULT CANCER AND NON-CANCER PATIENTS UNDERGOING ELECTIVE NON-CARDIAC SURGERY
Mr. William Kuo, Mr. Zhongjie Cai, Mr. Michael Ohebsion, Mr. Michael Tan, Dr. Allison Chambliss, Dr. Rodolfo Amaya, Dr. Mary Joseph

BONE CEMENT EMBOLISM WITH TEE VISUALIZATION DURING HIP HEMIARTHROPLASTY
Mr. Nicolas Salvatierra, Dr. Govind Rajan

CAN PERIPHERAL TEMPERATURE MEASUREMENT REFLECT CORE TEMPERATURE IN PATIENTS UNDERGOING HYPOTHERMIC SURGERY? A COMPARISON OF 3M SPOTON TEMPERATURE STICKERS TO ESOPHAGEAL TEMPERATURE.
Dr. Francesca Betti, Dr. Carla Coelho, Dr. Richard Jaffe, Dr. John Brock-Utne

CARDIOEMBOLIC STROKE SECONDARY TO AORTIC VALVE PAPILLARY FIBROELASTOMA
Dr. Caleb Penn

CASE PRESENTATION: MALIGNANT HYPERTERMIA
Dr. Anne Park, Dr. Jeremy Lieberman

CASE REPORT: EMERGENT ANESTHETIC MANAGEMENT OF INCARCERATED UMBILICAL HERNIA IN A PATIENT WITH DIFFUSE ANEURYSMAL DISEASE
Dr. Curtis Walther, Dr. Matthew Malkin
CASE REPORT: MANAGEMENT OF ELEVATED PEAK AIRWAY PRESSURE AND UNANTICIPATED TRACHEOMALACIA DURING PRONE SPINAL SURGERY
Dr. Daniel Kim, Dr. Ashley Broussard

CASE SERIES OF INTRAOPERATIVE CONTINUOUS REPLACEMENT RENAL THERAPY THROUGH THE VENOVENOUS BYPASS CIRCUIT DURING ORTHOTOPIC LIVER TRANSPLANT, A NOVEL APPROACH
Dr. Jennifer Nguyen-Lee, Dr. Christine Nguyen-Buckley, Ms. Christina Ma, Dr. Brent Ershoff, Dr. Minhtri Nguyen, Dr. Christine Myo-Bui

CESAREAN DELIVERY 40 DAYS AFTER STEMI WITH PCI AND DRUG ELUTING STENT PLACEMENT
Dr. Michael Zakaroff

CESAREAN SECTION FOR MORBIDLY OBESE (SUPER OBESE) PATIENT
Dr. Morgan Smith, Dr. Boyd Goodwin, Dr. Kathleen Reyes, Dr. Eva Szabo

CHALLENGES AND SUCCESSES IN ESTABLISHING A NOVEL ANESTHESIA COLLABORATION IN CAPE COAST, GHANA—A COLLABORATION AT FIVE YEARS
Dr. Jonathan Curtis, Dr. Ryan Meier, Mr. Harry Tontoh

CHALLENGING INTUBATION AND MONITORING DURING PERIOPERATIVE MANAGEMENT IN OSTEOGENESIS IMPERFECTA
Dr. Harshal Bhakta, Mr. Nicolas Kahl, Dr. Anna Bowling, Dr. Kyle Paredes, Dr. Kimberly Gimenez

CHARACTERISTICS OF NON-OPERATING ROOM PEDIATRIC CASE CANCELLATIONS AT UC DAVIS MEDICAL CENTER IN 2016-2017
Dr. Michael Yim, Mr. Risheek Pingili, Dr. Niroop Ravula

COMBINED MEDIASTINOSCOPY, MEDIAN STERNOTOMY AND LEFT THORACOTOMY FOR CARINAL LEFT PNEUMONECTOMY (SLEEVE PNEUMONECTOMY) IN A PATIENT WITH PRIOR LEFT LOWER LOBE SEGMENTAL RESECTION AND RADIATION FOR METASTATIC COLON CANCER.
Dr. Jocelyn Wong, Dr. Vivekanand Kulkarni

COMPARISON OF POSTOPERATIVE OPIOID USE AND PAIN SCORES IN PRIMARY VERSUS SECONDARY CESAREAN SECTIONS IN OPIOID NAÏVE PATIENTS: A RETROSPECTIVE COHORT STUDY
Dr. Amanda Chao, Dr. Ioana Pasca, Dr. Michelle Woodfin, Mr. Matthew Alschuler, Mr. Justin Pugh, Dr. Jay Lee, Ms. Sara Alsouqi, Mr. Mostafa Naghshbandi, Ms. Briahnna Austin, Ms. Jennifer Shyong, Mr. Mark Ringer, Dr. Davinder Ramsingh

COMPLEX REGIONAL PAIN SYNDROME FOLLOWING SOUTHERN PACIFIC RATTLESNAKE ENVENOMATION
Dr. L. McLean House II, Dr. Matthew Lewin, Dr. Ramana Naidu

CORRELATION OF PERCENT CHANGE IN SERUM FREE HEMOGLOBIN VALUES TO PERCENT CHANGE IN TRANSCRANIAL DOPPLER VELOCITY IN ANEURYSMAL SUBARACHNOID HEMORRHAGE PATIENTS
Dr. Gary Shih, Dr. Christianna Steely, Dr. Justin Daniels, Dr. Davinder Ramsingh

CPVT, A RARE BUT DEADLY CONDITION THAT COULD PRESENT TO YOUR OPERATING ROOM
Dr. Betelhem Asnake, Dr. Aubrey Yao, Dr. Neal Fleming
CRITICAL BONE CEMENT IMPLANTATION SYNDROME, A RARE PHENOMENON WHICH MAY INCREASE IN FREQUENCY
Dr. Evan Sobel, Dr. Delara Brandal, Dr. Sunny Jha

CRYOAMPUTATION AS PERIOPERATIVE OPTIMIZATION IN PATIENT WITH ACUTE LIMB ISCHEMIA AND SEPTIC SHOCK
Dr. Erin McNamara, Dr. Siddharth Singh

CURRENT ANESTHESIA AND POST-PROCEDURE MANAGEMENT TECHNIQUES FOR TRANSFEMORAL AORTIC VALVE REPLACEMENT (TAVR) IN THE UNITED STATES: A SURVEY OF TAVR CENTERS
Dr. Simona Lupu, Dr. Alec Runyon, Dr. Dustin Wailes, Dr. Colin Garner, Mr. Justin Pugh, Mr. Matthew Alschuler, Dr. Davinder Ramsingh

CURRENT PRACTICE STRATEGIES IN THE ACUTE CARE SETTING AND THE UTILIZATION OF POINT OF CARE ULTRASOUND: A SURVEY STUDY ACROSS ALL ACUTE CARE SPECIALTIES
Dr. Alex Taborek, Dr. Davinder Ramsingh, Dr. Alec Runyon, Dr. Ihab Dorotta, Dr. Brian Chung, Mr. Justin Pugh, Mr. Matthew Alschuler, Mr. Kishore Athreya, Dr. Jason Gatling

DEEP BRAIN STIMULATION FOR REFRACTORY PHANTOM LIMB PAIN
Dr. David Steinhardt, Dr. Solmaz Manuel

DELAYED EMERGENCE FOLLOWING A BILATERAL THYROIDECTOMY
Dr. Adam J Milam, Dr. Andrew Kuo, Dr. Patrick Lam, Dr. Roya Yumul

DELAYED ONSET MALIGNANT HYPERTHERMIA DURING COMPLEX PAROTID RESECTION WITH FREE FLAP
Dr. David Trauscht, Dr. Kristopher Schwebler, Dr. Satish Bhagwanjee

DEVELOPING A SERIOUS GAME FOR TEAMWORK SKILLS TRAINING AND ASSESSMENT: YEAR 1 OF A 2-YEAR DEPARTMENT OF DEFENSE GRANT
Dr. Sophia Poorsattar, Dr. Cameron Rice, Dr. Randolph Steadman

DIAGNOSIS AND SURGICAL REPAIR OF DOUBLE AORTIC ARCH IN 30-YEAR-OLD MALE PRESENTING WITH PNEUMONIA
Dr. Danielle Laufer, Dr. Lundy Campbell

DIFFICULT AWAKE FIBEROPTIC INTUBATION OF A PATIENT WITH KLIPPLE-FEIL SYNDROME AND MORBID OBESITY PRESENTING TO OR FOR REVISION OF SPINAL FUSION
Dr. Ashley Fejleh, Dr. Christy Slingwine, Dr. Roya Yumul

DISSEMINATED INTRAVASCULAR COAGULATION IN A PARTURIENT WITH RETAINED STILLBIRTH
Dr. Charles Gruver, Dr. Mojgan Moallempour

DRUG-INDUCED HYPERTHERMIA IN A PEDIATRIC PATIENT
Dr. inhwanchang

EPIDURAL MANAGEMENT IN A PATIENT WITH AN ACUTE MYOCARDIAL INFARCTION SECONDARY TO CORONARY ARTERY SEPTIC EMBOLI
Dr. Andrea Poon, Dr. John Le, Dr. Siamak Rahman
ERECTOR SPINAE PLANE BLOCK FOR POSTOPERATIVE PAIN CONTROL IN A PEDIATRIC ORCHIOPEXY AND INGUINAL HERNIORSRHAPHY PATIENT
Dr. Craig Rumbaugh, Dr. Codruta Soneru, Dr. Jorge Rocha, Dr. Jessica Ming, Dr. Timothy Petersen, Dr. Ricardo Falcon

ERECTOR SPINAE PLANE BLOCK FOR POSTOPERATIVE PAIN CONTROL IN AN 18-MONTH-OLD PYELOPLASTY PATIENT
Dr. Seong Wook Seo, Dr. James Hruschka, Dr. Timothy Petersen, Dr. Codruta Soneru

ERECTOR SPINAE PLANE BLOCK FOR TREATMENT OF PAIN ASSOCIATED WITH MULTIPLE UNILATERAL RIB FRACTURES
Dr. Andrew Bussey, Dr. Kenneth Furukawa

ESOPHAGEAL PERFORATION, A CASE REPORT
Dr. Kaitlin Flannery, Dr. Anil Panigrahi

EVALUATION OF PRE-OPERATIVE NON-INVASIVE HEMODYNAMIC MONITORING FOR PATIENTS UNDERGOING MODERATE TO HIGH RISK SURGERY
Dr. Carl Ying, Dr. Gary Stier, Dr. Daniel Dobroskay, Dr. Isuru Wijesinghe, Dr. Heather Goodly, Mr. Justin Pugh, Mr. Matthew Alschuler, Dr. Davinder Ransingh

EVALUATION OF SPREAD FOR THE QUADRATUS LUMBORUM BLOCKS 1, 2, AND TRANSMUSCULAR BY COMPUTED-TOMOGRAPHY STUDY
Dr. Dan Moy, Dr. Jean-Louis Horn, Dr. Philippe Gautier

FLUID OVERLOAD AND RESPIRATORY DECOMPENSATION IN A MORBIDLY OBESE PATIENT WITH ABDOMINAL COMPARTMENT SYNDROME AND PROLONGED MECHANICAL VENTILATION
Dr. Charles Gruver, Dr. Duraiyah Thangathurai, Dr. Peter Roffey

GASTRIC ULTRASOUND REVEALING PRESENCE OF INGESTED ROCKS IN THE STOMACH
Dr. Caleb Stalls, Dr. Timothy Petersen, Dr. Ricardo Falcon, Dr. Codruta Soneru

GRADE IV ANAPHYLAXIS RESISTANT TO EPINEPHRINE IN A HEALTHY CHILD PRESENTING FOR ELECTIVE SCALP LESION REMOVAL UNDER GENERAL ANESTHESIA
Dr. Michael Yim, Dr. John Liu

HALF DOSE ALTEPLASE FOR THE TREATMENT OF ACUTE RESPIRATORY FAILURE SECONDARY TO RECURRENT SUBMASSIVE PULMONARY EMBOLISM WITH UNDERLYING HEMORRHAGIC PANCREATITIS: A CASE REPORT
Dr. Alexandra Ruan, Dr. Talha Mehmood, Dr. Tsuyoshi Mitarai

HEMODYNAMIC INSTABILITY FOLLOWING PERITONEAL INSUFFLATION AND LIVER PARENCHYMAL INJURY WITH THE VERESS NEEDLE
Dr. Govind Rajan, Ms. Aline Silva, Dr. Simon Kim

HIGH-DOSE KETAMINE ANESTHESIA TO OVERCOME DIFFICULT NEUROMONITORING IN A MYELOPATHIC PATIENT
Dr. Amy Chen, Dr. Andrew Schober
HOME PREMEDICATION WITH DIPHENHYDRAMINE TO AVOID MAST CELL DEGRANULATION IN AN INFANT WITH URTICARIA PIGMENTOSA
Dr. Felipe D. Perez, Dr. Anita Honkanen

HUMANITIES IN MEDICINE – A TOOL FOR RESIDENT WELLNESS
Dr. Daniel Hansen, Ms. Katherine Kough, Dr. Renee Caswell

HYPERACUTE CATHETER-ASSOCIATED PULMONARY EMBOLUS IN THE IMMEDIATE POSTOPERATIVE PERIOD FOLLOWING SPINAL SURGERY
Dr. Ergit Paparisto, Dr. Daniel Donoho, Mr. Michael Kim, Dr. Kevin Blaine

HYPERPERFUSION SYNDROME CAUSING ENCEPHALOPATHY IN ORTHOTOPIC HEART TRANSPLANT PATIENT: A CASE REPORT
Dr. Alex Taborek, Dr. Huayong Hu

HYPERTENSIVE EMERGENCY IN A PEDIATRIC MOYAMOYA EC-IC BYPASS
Dr. Jeffrey Skanchy, Dr. Birgit Maass, Dr. Cedar Fowler

HYPOXIA IN THE RECOVERY UNIT FROM UNILATERAL DIAPHRAGMATIC PARALYSIS
Dr. Vivian Pham, Dr. Martin Rutkowski, Dr. Michael P. Bokoch, Dr. Matthew Dudley

HYPOXIC RESPIRATORY FAILURE AND ABDOMINAL COMPARTMENT SYNDROME IN A MORBIDLY OBESE PATIENT WITH OVARIAN MUCINOUS CYSTADENOMA
Dr. Kevin Vu, Dr. Duraiyah Thangathurai, Dr. Anoosh Javaherian

IATROGENIC RUPTURE OF SUPERIOR VENA CAVA DURING ROUTINE CANNULATION OF THE RIGHT INTERNAL JUGULAR VEIN AS A RESULT OF “JUVENILE” XANTHOGRANULOMA IN AN ADULT
Dr. Andrew Hennigan

IMPACT OF THE INTRODUCTION OF SUGAMMADEX ON PROVIDER PRACTICE
Ms. Melissa Brown, Mr. Seth Fischer, Dr. Betelehem Asnake, Dr. Neal Fleming

IMPROVING PATIENT OUTCOME THROUGH THE USE OF CEREBRAL OXIMETRY DURING HIGH RISK LIVER TRANSPLANT SURGERY
Dr. Eunice Lee, Dr. Bryan Chow, Dr. Carly Wachi, Dr. Duraiyah Thangathurai, Dr. Arash Motamed

INCIDENTAL FINDING OF VOCAL CORD SWELLING: REINKE’S EDEMA
Dr. David No, Dr. Christine No

INTERCOSTAL NERVE CRYOABLATION AND POST-THORACOTOMY PAIN WITH LEFT VENTRICULAR ASSIST DEVICE PLACEMENT - A CASE SERIES
Dr. John Carey, Dr. Samata Paidy, Dr. Zain Khalpey

INTRANASAL DEXMEDETOMIDINE FOR POSTICTAL AGITATION IN ELECTROCONVULSIVE THERAPY
Dr. Kathryn Iwata, Dr. Lindsey Huddleston, Dr. Linda Liu, Dr. Charlene Blake

INTRAOPERATIVE PNEUMOTHORAX - A RARE COMPLICATION DURING PERCUTANEOUS NEPHROLITHOTOMY: A CASE REPORT
Dr. Lia Hoffner, Dr. Tony Yen
INTRAOPERATIVE PULMONARY EMBOLISM DIAGNOSED BY TEE IN A MORBIDLY OBSESE PATIENT UNDERGOING ORTHOPEDIC SURGERY FOLLOWING MOTOR VEHICLE CRASH
Dr. Patrick Lam, Dr. Maximillian Blanter, Dr. Adam Milam, Prof. Omar Durra

INVESTIGATING THE CARDIOTOXICITY OF LIPOSOMAL BUPIVACAINE (EXPAREL) IN RATS: THE ROLE OF INTRALIPID RESCUE
Dr. Marsha Kristel Bernardo, Mr. Shayan Moazeni, Ms. Nancy Cao, Ms. Mylene Vaillancourt, Dr. Siamak Rahman, Dr. Soban Umar

LEFT ATRIAL APPENDAGE LACERATION DURING LARIAT PROCEDURE REQUIRING EMERGENCY STERNOTOMY AND CARDIOPULMONARY BYPASS
Dr. Michelle Curry, Dr. Victor Ng

LEFT ATRIAL MASS NOTED ON TEE PRIOR TO SEPARATION FROM CPB FOLLOWING BILATERAL ATRIAL AND PULMONARY THROMBECTOMY AND PTE. WHAT IS THE DIAGNOSIS AND HOW SHOULD IT BE MANAGED?
Dr. Thomas Onyia, Dr. Michael Ross, Dr. Timothy Maus

LEFT ATRIAL OBSTRUCTION CAUSING POST INDUCTION HYPOTENSION: A TEE CASE REPORT
Dr. Robert Haughton, Dr. Orode Badakhsh

LIVER TRANSPLANTATION IN A PATIENT (MELD 40) WITH INFRAHEPATIC INTERRUPTION OF THE INFERIOR VENA CAVA WITH AZYGOS CONTINUATION
Dr. Murad Arif, Dr. Jennifer Ross

LOCAL ANESTHETIC SYSTEMIC TOXICITY AT THE CONCLUSION OF AN AXILLARY BRACHIAL PLEXUS NERVE BLOCK
Dr. Valeria Carcamo-cavazos, Dr. John Markley

LOSS OF AIRWAY DURING AN AWAKE CRANIOTOMY IN AN OBESE PATIENT
Dr. Bessie Abraaham, Dr. Pramod Panikkath

MANAGEMENT OF A PATIENT WITH HISTORY OF INTRAOPERATIVE ANAPHYLACTIC SHOCK OF UNCLEAR ETIOLOGY
Dr. Benjamin Marsh, Dr. Vanessa Henke, Dr. Jeremy Lieberman

MANAGEMENT OF A PATIENT WITH UNEXPECTED PLACENTA PERCRETA
Dr. Lawrence Younan, Dr. Taizoon Dhoon, Dr. Ho Choi

MANAGEMENT OF INTRA-OPERATIVE MASSIVE CO2 EMBOLISM IN THE SETTING OF MAIN PULMONARY ARTERY TEAR
Dr. Jessica Rodriguez, Dr. Timothy Maus

METASTATIC EPIDURAL PHEOCHROMOCYTOMA
Dr. Kevin Conrad, Dr. Jeffrey Horn

MINDFULNESS & MEDITATION: IMPROVING RESIDENT BURNOUT
Dr. Dulce Boucher, Dr. Scott Junkins, Dr. Rob Davies
MITRAL VALVE REPLACEMENT COMPLICATED BY COLD AGGLUTININ DISEASE
Dr. Eric Piacenza

MUSCLE RIGIDITY FOLLOWING SUGAMMADEX REVERSAL
Dr. Kris Naowamondhol

NEUROPATHY FOLLOWING AXILLARY BLOCK FOR ARTERIOVENOUS FISTULA CREATION: WHAT WAS THE CAUSE?
Dr. Carla De la Cruz, Dr. Lauren Steffel, Dr. Michelle Han

NOVEL AIRWAY MANAGEMENT IN A PATIENT WITH PENETRATING TRAUMA TO THE NECK
Dr. Matthew Bergsten, Dr. Lev Deriy

OBSTETRIC ANESTHESIA CONSIDERATION AND MANAGEMENT OF A PARTURIENT PATIENT WITH NEUROFI-BROMATOSIS
Dr. Andrew Mai, Dr. Taizoon Dhoon, Dr. Fiyinfoluwa Ani

OCCLUSION OF A ABERRANT RIGHT SUBCLAVIAN ARTERY FROM INSERTION OF A TRANSESOPHAGEAL ECHOCARDIOGRAPHIC PROBE AND IMPLICATIONS DURING CARDIAC SURGERY
Dr. Steven Larsen, Dr. Ned Morgan

OPIOID FREE MANAGEMENT OF A PEDIATRIC PATIENT UNDERGOING OPEN INGUINAL HERNIA REPAIR WITH AN ERECTOR SPINAE PLANE BLOCK
Dr. Caleb Stalls, Dr. Jorge Rocha, Dr. Andrea Sandoval, Dr. Timothy Petersen, Dr. Jessica Ming, Dr. Ricardo Falcon, Dr. Codruta Soneru

OPTIMIZATION OF COLDS SCORING SYSTEM: A PRE-ANESTHETIC RISK ASSESSMENT TOOL
Dr. Robert Shaw, Dr. Catherine Nguyen, Dr. Marsha Kristel Bernardo, Dr. Lisa Lee

PALATOPHARYNGEAL INJURY DURING GLIDESCOPE USE FOR OROTRACHEAL INTUBATION
Dr. Mfonobong Essiet, Dr. Tracy Burns, Dr. Taizoon Dhoon

PARAVERTEBRAL CATHETER PLACEMENT FOR POST-MASTECTOMY PAIN MANAGEMENT
Dr. Delara Brandal, Dr. Neesa Patel, Dr. Shabnam Majidian

PATIENT OUTCOMES OF ANGIOVAC PROCEDURES AND ANESTHETIC MANAGEMENT
Dr. Isaac Jenabi, Dr. Komal Patel, Dr. John Moriarty, Mr. Tristan Grogan, Dr. Johanna Schwarzenberger

PECS BLOCK FOR RADICAL MASTECTOMY IN HIGH RISK PREGNANCY
Dr. Lance Mixon, Dr. Christopher Der, Dr. Gulraj Chawla

PECTORALIS NERVE BLOCK AS PRIMARY ANESTHESIA FOR SIMPLE MASTECTOMY: A CASE REPORT.
Dr. Amanda Hu, Dr. Kimberly Gimenez

PEDIATRIC ABDOMINAL NEUROBLASTOMA CAUSING SEVERE RESTRICTIVE LUNG DISEASE AND HYPERTENSION: PERIOPERATIVE MANAGEMENT
Dr. Jeffrey Chan, Dr. Corrie Anderson
PEDIATRIC MYRINGOTOMY TUBE PLACEMENT IN AN AMBULATORY SURGERY CENTER: LEVERAGING REAL WORLD (EMR) DATA AND SPC CHARTS TO OPTIMISE QUALITY IMPROVEMENT CYCLES
Dr. Holly Snyder, Dr. Laura Duling, Dr. Daniel Low

PENTALOGY OF CANTRELL: CASE REPORT AND REVIEW OF MATERNAL AND FETAL ANESTHETIC MANAGEMENT
Dr. Michael Jung, Dr. Stephanie Lim, Dr. John Markley, Dr. Pedram Aleshi

PERICARDIECTOMY FOR SEVERE CONstrictive Pericarditis of Uncertain Etiology
Dr. John Thurston, Jr. MD

PERIOPERATIVE ANAPHYLACTOID RESPONSE
Dr. Derek Sing, Dr. Carlos Casamalhaupa, Dr. Nicole King

PERIOPERATIVE DIAGNOSIS AND MANAGEMENT OF A PATIENT WITH MIRROR SYNDROME
Dr. Sanhita Reddy, Dr. Larry Weinstein, Dr. Jason Meeks

PERIOPERATIVE MANAGEMENT OF A PATIENT WITH ISCHEMIC CARDIOMYOPATHY AND METASTATIC PHEOCHROMOCYTOMA FOR OPEN ADRENALECTOMY
Dr. Robert Bellerose, Dr. Orode Badakhsh

PERIOPERATIVE MANAGEMENT OF AN INFANT WITH HYPERTROPHIC PYLORIC STENOSIS AND CHRONIC RESPIRATORY ACIDOSIS
Dr. Jessica Hartnett, Dr. Marla Ferschl

PERIOPERATIVE METHAMPHETAMINE USE: A CASE REPORT AND LITERATURE REVIEW
Dr. Emilee Borgmeier, Dr. Joshua Zimmerman, Dr. Natalie Silverton

PERSISTENT HICCUPS FOLLOWING CERVICAL EPIDURAL STEROID INJECTION WITH BETAMETHASONE
Dr. Matthew Ritz, Dr. Christopher Bailey, Mrs. Katherine Overstreet, Dr. Andrew Gorlin

PLACEMENT OF ALterra PREStent AND TRANSCATHETER PULMONIC VALVE FOR SEVERE PULMONARY VALVE INSUFFICIENCY
Dr. Stephen Frantz

PLATELET COUNT OF ZERO: ANESTHETIC IMPLICATIONS OF SPLENECTOMY FOR SEVERE ITP
Dr. Thomas Gulvezan, Dr. Bethany Benish

POINT-OF-CARE ULTRASOUND DIAGNOSIS OF DECOMPENSATED CARDIOMYOPATHY IN PREGNANCY
Dr. Anjali Dixit, Dr. John Markley, Dr. Julin Tang

POST-SURGICAL INFLAMMATORY NEUROPATHY AFTER ACL REPAIR- A CASE REPORT
Dr. Ana Valdez, Dr. Lisa Sun, Dr. Matthias Braehler

POSTOPERATIVE AIRWAY EMERGENCY IN A PATIENT WITH AN UNKNOWN TRACHEAL CARTILAGINOUS SLEEVE
Dr. Aaron Bernadette, Dr. Michelle Petrie, Dr. Jared Spilka, Dr. Benjamin Roper

POSTPARTUM COAGULOPATHY IN SETTING OF SUSPECTED VITAMIN K DEFICIENCY
Dr. Darcey Schultz
PRACTICAL UTILITY OF POCKET ULTRASOUND DEVICES IN ANESTHESIA CARE
Dr. Peter Wingfield, Dr. Timothy Maus, Dr. Byron Fergerson

PREHABILITATION TO IMPROVE POST-OPERATIVE OUTCOMES IN THE FRAIL POPULATION
Dr. Nicole Andonian, Dr. Sumit Singh, Dr. Soban Umar, Dr. Cathy Lee, Dr. Michelle Braunfeld, Dr. Marcia Russel, Dr. Marineh Bojalian, Dr. Steven Castle

PREOPERATIVE OPTIMIZATION FOR A TRANSFUSION FREE, RECIPIENT LIVING-RELATED TRANSPLANT
Dr. Sona Doshi, Dr. Arash Motamed, Dr. Ashraf Sedra

PSEUDOCHOLINESTERASE DEFICIENCY FOLLOWING EXPLORATORY LAPAROTOMY
Dr. Michael Molloy, Dr. Jeremy Alvord, Dr. Jeff Mueller

RARE CAUSE OF DELIRIUM AND HYPOXEMIA AFTER CORONARY BYPASS SURGERY: TRANSDERMAL LIDOCAINE PATCH-ASSOCIATED METHEMOGLOBINEMIA
Dr. Fidel Acevedo, Dr. Esther Kim, Dr. david chyatte, Dr. Vance Nielsen

REJECTING LOW VALUE CARE IN THE PREOPERATIVE ASSESSMENT AND PREPARATION FOR CATARACT SURGERY.
Dr. Hayk Minasyan, Dr. Eilon Gabel, Dr. Aviva Regev, Dr. Maxime Cannesson, Dr. John Bartlett, Dr. Kevin Miller, Dr. Catherine Sarkisian, Mr. Johnny Quach, Mrs. Carol Lee, Dr. Ji Qi, Dr. Antonio Pessequeiro, Dr. Victor Duval

REMOVAL OF A GIANT LEFT VENTRICULAR THROMBUS AFTER PULMONARY THROMBOENDARTERECTOMY IN A PATIENT WITH PROTEIN C DEFICIENCY
Dr. Debbie Fretwell, Dr. Swapnil Khoche

REPEATED SUBDURAL HEMATOMA AFTER LUMBAR DRAIN DISCONTINUATION
Ms. Lauren Rosario, Dr. Govind Rajan

REPORT OF TWO CASES OF PULSE OXIMETER DESATURATION ARTIFACT SECONDARY TO AN INFILTRATED INTRAVENOUS LINE
Dr. Jason Valladares

RESIDENCY DECISION MAKING: DOES MEDIA INFLUENCE WHERE APPLICANTS RANK RESIDENCY PROGRAMS?
Dr. Timothy Ward, Dr. Ryan Matika, Mrs. Trish Angiulo, Mr. Samwel Ochieng, Dr. Peter Lichtenthal

RESIDENT-BASED ASSESSMENT OF INTRAOPERATIVE TEACHING IN ANESTHESIOLOGY
Dr. Anna Bettini, Dr. Pedro Tanaka

RESIDUAL ESOPHAGEAL CONTENTS DESPITE APPROPRIATE NPO TIME IN CONTEXT OF FOREIGN BODY INGESTION
Dr. Caleb Stalls, Dr. Ricardo Falcon, Dr. Timothy Petersen, Dr. Codruta Soneru

RIGHT VENTRICULAR FAILURE AFTER LVAD
Dr. Steven Hur
SACRAL RADICULITIS FOLLOWING A REPEAT EPIDURAL BLOOD PATCH: A CASE REPORT AND REVIEW OF THE LITERATURE
Dr. Jeremy Wolfson, Dr. John Liaghat, Dr. Cristina Chandler

SAPHENOUS NEUROPATHY AFTER ADDUCTOR CANAL BLOCK IN A PATIENT UNDERGOING UNICOMPARTMENTAL KNEE ARTHROPLASTY TREATED SUCCESSFULLY WITH A PERINEURAL DEXAMETHASONE/ROPIVICAINE INJECTION
Dr. Wendy Ma, Dr. Lindsay Borg, Dr. Rachel Wang, Dr. Jean-Louis Horn

SEEING THROUGH A SAFE INDUCTION: ANESTHETIC MANAGEMENT OF A PATIENT WITH ORBIT-TO-AIRWAY COMMUNICATION
Dr. Thanh-Giang Vu, Dr. Matthias Braehler, Dr. Rondall Lane

SEVERE COMPLEX REGIONAL PAIN SYNDROME (CRPS), MAST CELL ACTIVATION SYNDROME, AND CENTRAL SENSITIZATION TREATED WITH MONTHLY KETAMINE INFUSION
Dr. Anoosh Javaherian, Dr. Kevin Vu, Dr. Duraiyah Thangathurai

SEVERE HYPOGLYCEMIA IN FASTING PEDIATRIC CANCER PATIENT UNDERGOING INTRATHECAL CHEMOTHERAPY TREATMENT
Dr. Brian Lin, Dr. Elysia M. Alvarez, Dr. Cathy R. Lammers

SEVERE HYponatremia AND Preeclampsia IN PREGNANCY
Dr. Rupa Prasad, Dr. Larry Weinstein

SEVERE HYPOXEMIA IN THE SETTING OF ARDS, PULMONARY EMBOLISM, AND FLUID OVERLOAD
Dr. Alexander Maglunog Jr, Dr. Dianne Bach, Dr. Jessica Lee, Dr. Deep Chandegara, Dr. Erin McNamara, Dr. Victor Slupski, Dr. Peter Roffey, Dr. Duraiyah Thangathurai

SEVERE INTRATHORACIC TRACHEAL COMPRESSION AND AIRWAY MANAGEMENT UTILIZING AWAKE ECMO
Tomas Carvajal, Dr. Andrew Murray

SODASORB™ APPEARS TO OUTPERFORM LITHOLYME™ IN THE OR SETTING
Dr. Cedar Fowler, Dr. Mark Burbridge, Dr. Richard Jaffe, Dr. John Brock-Utne

SPIKING OF INTRAVENOUS BAGS DOES NOT CAUSE TIME DEPENDENT MICROBIAL CONTAMINATION.
Dr. sara smith, Dr. Richard Jaffe, Dr. John Brock-Utne

SUBDURAL SPREAD FOLLOWING RIGHT-SIDED PARAVERTEREBRAL BLOCKS.
Dr. Jarred Hicks, Dr. Jennifer Davis

SUCCESSFUL ERECTOR SPINA PLANES BLOCK FOR AXILLARY SENTINEL LYMPH NODE BIOPSY UNDER DEEP SEDATION IN MORBIDLY OBESE PATIENT
Dr. Richard Kim, Dr. Quentin Baca, Dr. Sesh Mudumbai, Dr. Edward Mariano

SUCCESSFUL MANAGEMENT OF A PRIMIGRAVIDA PATIENT WITH HYPERTROPHIC OBLITERATIVE CARDIOMYOPATHY (HOCM) UNDERGOING CESAREAN SECTION WITH AN EPIDURAL
Dr. Harjot Singh, Dr. Taizoon Dhoon
SUCCESSFUL PRE-EMPTIVE MANAGEMENT OF AMNIOTIC FLUID EMBOLISM (AFE) DEVELOPED DURING CESAREAN SECTION (C-SECTION)  
Dr. Brian Lin, Dr. Cristina Chandler

SUGAMMADEX FOR REVERSAL OF NEUROMUSCULAR BLOCKADE BY ROCURONIUM IN A 10 WEEK-OLD INFANT  
Dr. Justin Teng, Dr. Gabriel Sarah, Dr. Marla Ferschl

SUGAMMADEX USE IN AN 8 MONTH OLD BOY S/P ILEOSTOMY REVISION THAT WAS RE-INTUBATED AND RE-RELAXED 20 MINUTES AFTER INITIAL EXTUBATION  
Dr. Leah Sag, Dr. Hnin Htun

SUPERIOR HYPOGASTRIC PLEXUS BLOCK WITH AN UNINTENDED LUMBAR PLEXUS BLOCK  
Dr. Peter Huynh, Dr. Gulraj Chawla, Dr. David Cho

SUPRAVENTRICULAR TACHYCARDIA CAUSED BY ACUTE METHAMPHETAMINE USAGE PRIOR TO A MONITORED ANESTHESIA CARE CASE  
Dr. Thang Tran, Dr. Sachin Jha

SYNOVIAL SARCOMA PRESENTING AS AN ANTERIOR MEDIASTINAL MASS IN A PARTURIENT  
Dr. Joshua Santos, Dr. Eli Torgeson, Dr. Emily Bui

TEE GUIDANCE FOR TYPE A DISSECTIONS: IDENTIFYING HIGH RISK FEATURES TO INFORM SURGICAL INTERVENTIONS  
Dr. STEPHANIE DSOUZA

TELEMETRY INTERROGATION OF BILATERAL DEEP BRAIN STIMULATOR PULSE GENERATORS AND ELECTROCARDIOGRAM ARTIFACT  
Dr. Elisa Lund, Dr. Ryan Pong

TEMPORAL CONTROL OF MICROGLIAL REACTIVITY REVEALS SEX-INDEPENDENT FUNCTIONAL CONTRIBUTION OF MICROGLIA TO LONG-LASTING PAIN  
Mr. Thomas Forman, Ms. Elena Haight, Dr. Yoshinori Takemura, Dr. David Clark, Dr. Vivianne Tawfik

TEMPORIZATION OF ECMO CIRCUIT RUPTURE FOR THE GENERAL ANESTHESIOLOGIST  
Dr. Lindsay Jinkins, Dr. Lev Deriy, Dr. Timothy Petersen

THE BEZOLD-JARISCH REFLEX AS A LIKELY CAUSE OF ASYSTOLE WITH SPONTANEOUS RETURN TO NORMAL SINUS RHYTHM DURING A KYPHOSCOLIOSIS REPAIR IN A 12 YEAR OLD  
Dr. Shaishav Shah, Dr. Michelle Lieu, Dr. Reza Borna

THE DEVELOPMENT AND IMPLEMENTATION OF A SURGICAL SITE INFECTION BUNDLE FOR CESAREAN DELIVERY  
Dr. kar wei leung, Dr. Katherine Seligman, Dr. Emily Bui, Dr. Nichole Bordegaray, Dr. Lauren Hu

THE EFFECT OF INTRAOPERATIVE SUFENTANIL INFUSION ON POSTOPERATIVE PAIN AFTER COMPLEX SPINAL SURGERY  
Dr. Josi Schwan, Mr. Gabriel Rubio, Dr. Eric Sun, Mr. Alex Kou, Mr. Robert King, Dr. Tessa Walters
THE FORGOTTEN OPIATE: ALFENTANIL INDUCTION IN AN ASA IV CARDIAC PATIENT 247
Dr. Jeremy Laney, Dr. Jack Berger

THE IMPLEMENTATION OF VISUAL TREND LINES TO IMPROVE THE ABILITIES OF PHYSICIANS TO TREAT PAIN 249
Dr. John Le, Dr. Andrea Poon, Dr. Siamak Rahman, Mrs. Tsione Holly, Mr. Tristan Grogan

THE MYSTERIOUS END-TIDAL CO2 WAVEFORM 250
Dr. Jasmine Fu

THE RCA IS NOT OK: A CASE OF PRE-OPERATIVE BEDSIDE ECHOCARDIOGRAPHY CHANGING AN ANESTHETIC PLAN 251
Dr. Elizabeth Ozery, Dr. Carlos Brun

THE USE OF CEREBRAL OXIMETRY MONITORING DURING A CASE OF COMPLEX AORTIC ARCH SURGERY WITH BILATERAL CAROTID ARTERY STENOSIS 252
Dr. Zacherie Conover, Dr. Ryan Craner

THE USE OF END-TIDAL ARGON TO DETECT VENOUS AIR EMBOLISM: FOILED BY “FAKE OXYGEN!” 253
Dr. James McAvoy, Dr. Mark Burbridge, Dr. Richard Jaffe, Dr. Tyler Schertz, Dr. John Brock-Utne

TO TAP OR NOT TO TAP, AN OPIOID SPARING APPROACH TO TRANSCATHETER AORTIC VALVE REPLACEMENT 254
Dr. Vivek Chellappa, Dr. Matthew Lopez, Dr. Kim Howard-Quijano, Dr. Prince Neelankavil, Dr. Komal Patel, Dr. Matthew Fischer, Dr. Parissa Partownavid, Dr. Siamak Rahman, Dr. William Suh, Ms. Claudia Bueno, Mrs. Jennifer Scovotti, Dr. Jonathan Ho

TOTAL SPINAL AFTER A FAILED EPIDURAL IN A PATIENT HAVING AN URGENT CAESAREAN SECTION 255
Dr. Shonte McKenzie, Dr. Saul Wiesel

TRANS-CATHETER MITRAL VALVE REPLACEMENT USING THE M3 SAPIEN VALVE 256
Dr. Michael Bingham, Dr. Caroline Kan, Dr. Moody Makar

TRANS-CAROTID ARTERY REvascularization: how does our management change? 257
Dr. Paul Lee, Dr. Candice Tay

TREATMENT OF ACUTE VENOUS AIR EMBOLUS 258
Dr. Jayson Fitter, Dr. Paul Frank

TRIPLE THREAT: AN INVADED AIRWAY, A COMPRESSED PA, AND A BLOCKED SVC 259
Dr. Jai Madhok, Dr. Francesca Betti, Dr. Eric Sun

TROUBLE IN TRENDELENBURG, A CASE REPORT OF BILATERAL OTORRHAGIA DURING ANESTHESIA 260
Dr. Sean McGee, Dr. Frank Jaime, Dr. Neal Gerstein

TURNING THE CO2 ABSORBER “GREEN”: WASTE MANAGEMENT SYSTEMS AND PRACTICAL IMPROVEMENTS 262
Dr. Pandora Chua, Dr. John Brock-Utne, Dr. Mark Burbridge, Dr. Ronald Pearl, Ms. Diane Alejandro-harper, Ms. Erika Kimball, Mr. Chris Gilsenan
UNEXPECTED FINDING OF LEFT VENTRICULAR CLOTS BY TRANSESOPHAGEAL ECHOCARDIOGRAPHY DURING CARDIAC MASSAGE AFTER RESUSCITATIVE THORACOTOMY ON A TRAUMA PATIENT 264
Dr. Jason Lang, Dr. Tzann Fang, Dr. Julin Tang

UNIQUE ANESTHETIC CHALLENGES OF BILATERAL LUNG TRANSPLANT IN SITUS INVERSUS 266
Dr. Dylan Masters, Dr. Wilson Cui, Dr. Victor Ng

VALVE-SPARING AORTIC ROOT REPLACEMENT IN PATIENT WITH MARFAN AND TYPE I MUSCULAR DYSTROPHY 267
Dr. Darab Zarrabi

VENOARTERIAL EXTRACORPOREAL MEMBRANE OXYGENATION FOR TRACHEOBRONCHIAL RUPTURE AFTER DOUBLE LUMEN TUBE PLACEMENT 268
Dr. Kristin Barney, Dr. Jacob Evers

VENOVENOUS ECMO FOR REPAIR OF TRACHEAL LACERATION FROM DLT PLACEMENT 269
Dr. Colby Tanner, Ms. Cecilia Canales, Dr. Karen Chow, Dr. Sumit Singh

VENTILATION MANAGEMENT DURING CARDIAC TAMPONADE. 271
Dr. Ashley Balentine, Dr. Casper Hu, Dr. Jay Roby

VENTRICULAR FIBRILLATION REFRACTORY TO CUTANEOUS ELECTRICAL DEFIBRILLATION IN A MORBIDLY OBESE PEDIATRIC PATIENT WITH HYPERTROPHIC CARDIOMYOPATHY 272
Ms. Maryte Gylys, Dr. Govind Rajan

WHAT'S SHAKING? MULTIFOCAL MYOCLONUS AFTER GENERAL ANESTHESIA: A DOUBLE CASE REPORT 274
Dr. Revati Nafday, Dr. Kerstin Kolodzie, Dr. Matthias Braehler

WHAT'S TAKING SO LONG? IMPROVING ANESTHESIA START TO READY TIME IN THE CARDIAC ORS. A QUALITY IMPROVEMENT PROJECT 276
Dr. Monica Miller, Dr. Vien Nguyen, Dr. Michael Doan, Dr. Marisa Hernandez-morgan, Dr. Alex Fu, Dr. Matthew Lopez, Dr. Emily Methangkool

“OPEN REPAIR OF ABDOMINAL AORTIC ANEURYSM ON A PATIENT WITH LEFT VENTRICLE ASSIST DEVICE” 277
Dr. Jeremy Alvord, Dr. Ryan Craner