



The American College of
Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS

PRACTICE BULLETIN

CLINICAL MANAGEMENT GUIDELINES FOR OBSTETRICIAN—GYNECOLOGISTS

NUMBER 154, NOVEMBER 2015

(Replaces Practice Bulletin 17, June 2000)

Operative Vaginal Delivery

Despite significant changes in management of labor and delivery over the past few decades, operative vaginal delivery remains an important component of modern labor management, accounting for 3.30% of all deliveries in 2013 (1). Use of obstetric forceps or vacuum extractor requires that an obstetrician and obstetric care provider be familiar with the proper use of the instruments and the risks involved. The purpose of this document is to provide a review of the current evidence regarding the benefits and risks of operative vaginal delivery.

Background

Operative vaginal delivery is used to achieve or expedite safe vaginal delivery for maternal or fetal indications. Examples include maternal exhaustion and an inability to push effectively; medical indications such as maternal cardiac disease and a need to avoid pushing in the second stage of labor; prolonged second stage of labor, arrest of descent, or rotation of the fetal head; and non-reassuring fetal heart rate patterns in the second stage of labor. Operative vaginal delivery is beneficial for women because it avoids cesarean delivery and its associated morbidities. The short-term risks of cesarean delivery include hemorrhage, infection, prolonged healing time, and increased cost. The long-term morbidities associated with cesarean delivery include the high likelihood of repeat cesarean delivery, the complications that can occur with trial of labor after cesarean delivery, and the risks of placental abnormalities such as placenta accreta. For the fetus showing signs of possible compromise, successful operative vaginal delivery can shorten the exposure to additional labor and reduce or prevent the effect of intrapartum insults (2). Often, operative vaginal delivery can be safely accomplished more quickly than cesarean delivery.

The rate of operative vaginal delivery has decreased over the past few decades, accounting for part of the increase in cesarean birth rates in the United States. As the rate of cesarean delivery increased over the past two decades, the rate of operative vaginal delivery decreased from 9.01% of all deliveries in 1992 to 3.30% of all deliveries in 2013. (1) Nonetheless, operative vaginal delivery remains an important part of modern obstetric care and in the appropriate circumstances can be used to safely avoid cesarean delivery. Operative vaginal deliveries are accomplished by applying direct traction on the fetal skull with forceps or applying traction to the fetal scalp by means of a vacuum extractor (3). Various types of forceps and vacuum extractors have been developed for this purpose, and readers should refer to textbooks for review of these instruments (4–6). Whichever instrument is used, the indications for operative vaginal delivery are the same (Box 1).

Operative vaginal deliveries are classified by the station of the fetal head at application and the degree of rotation necessary for delivery (Box 2). In an evaluation of the American College of Obstetricians and Gynecologists' classification, investigators demonstrated that the lower the fetal head and the less rotation required,

Committee on Practice Bulletins—Obstetrics. This Practice Bulletin was developed by the Committee on Practice Bulletins—Obstetrics with the assistance of Alan M. Peaceman, MD. The information is designed to aid practitioners in making decisions about appropriate obstetric and gynecologic care. These guidelines should not be construed as dictating an exclusive course of treatment or procedure. Variations in practice may be warranted based on the needs of the individual patient, resources, and limitations unique to the institution or type of practice.



Box 1. Indications for Operative Vaginal Delivery ↵

- Prolonged second stage of labor
- Suspicion of immediate or potential fetal compromise
- Shortening of the second stage of labor for maternal benefit

the less the risk of injury to the woman and the fetus (7). Before use of either forceps or vacuum extractor, an assessment by the operator of the factors that contribute to success and safety should be performed, including estimated fetal weight, the clinical adequacy of the maternal pelvis, the fetal station and position, and the adequacy of anesthesia. Operative vaginal delivery is contraindicated if the fetal head is not engaged in the maternal pelvis or if the position of the vertex cannot be determined.

Clinical Issues

Choice of Instruments

Forceps and vacuum extractors have low risk of complications and are acceptable for operative vaginal delivery. The choice of whether to use vacuum or forceps and which specific instrument to use are defined by the clinical circumstances and operator preference based on experience and training. Both types of instruments can be effective in delivering the fetus and shortening the time to delivery. Vacuum extraction is believed to be easier to learn and may be used when asynclitism prevents proper forceps placement. Use of forceps provides a more secure application and is appropriate for rotation of the fetal head to occiput anterior or occiput posterior position.

A vaginal birth is more likely to be achieved with forceps than with vacuum extractors; however, forceps are more likely to be associated with third- and fourth-degree perineal tears. In a review of randomized trials comparing forceps deliveries with vacuum deliveries, the authors found that when all deliveries were considered, use of vacuum was more likely to fail as the instrument of delivery compared with forceps (relative risk [RR], 0.65; 95% confidence interval [CI], 0.45–0.94). Forceps were more likely to be associated with third- and fourth-degree perineal tears (RR, 1.89; 95% CI, 1.51–2.37), with no difference in the occurrence of neonatal cephalohematomas (RR, 0.64; 95% CI, 0.37–1.11) (8). In another study that analyzed longer-term outcomes, no difference in urinary incontinence or anal sphincter dysfunction was found after 5 years in women who had deliveries by forceps versus vacuum extractor (9). Vacuum extraction has been discouraged for gestational age less than 34 weeks,

Box 2. Criteria for Types of Forceps Deliveries

Outlet forceps ↵

- Scalp is visible at the introitus without separating the labia
- Fetal skull has reached the pelvic floor
- Fetal head is at or on perineum
- Sagittal suture is in anteroposterior diameter or right or left occiput anterior or posterior position
- Rotation does not exceed 45 degrees

Low forceps

- Leading point of the fetal skull is at station +2 cm or more and not on the pelvic floor
- Without rotation: Rotation is 45 degrees or less (right or left occiput anterior to occiput anterior, or right or left occiput posterior to occiput posterior)
- With rotation: Rotation is greater than 45 degrees

Midforceps

- Station is above +2 cm but head is engaged

although a safe lower limit for gestational age has not been established (10–12).

Technique

Few specific aspects of operative vaginal delivery technique have been studied. Nonetheless, it is reasonable to perform many parts of the procedure based on traditional teaching and longstanding experience. A full list of prerequisites for an operative vaginal delivery is presented in Box 3. In addition, the reason for the procedure, alternatives, and risks involved should be discussed with the patient and agreement obtained.

Before applying traction with either forceps or a vacuum extractor, it is important to confirm appropriate placement. For vacuum extraction, the cup should be placed 2 cm anterior to the posterior fontanelle and centered over the sagittal suture, ensuring that no maternal tissue is included. For forceps, the application should be checked to ensure that the sagittal suture is aligned with the shanks, that the posterior fontanelle is one finger breadth above the shanks, and that the lambdoid sutures are equidistant from the forceps blades. A full description of operative vaginal delivery techniques are detailed elsewhere (4–6).

Episiotomy

Episiotomy should not be performed routinely for all operative vaginal deliveries. Use of episiotomy has significantly decreased among all deliveries; decreasing



Box 3. Prerequisites for Operative Vaginal Delivery ⇐

- Cervix fully dilated and retracted
- Membranes ruptured
- Engagement of the fetal head
- Position of the fetal head has been determined
- Fetal weight estimation performed
- Pelvis thought to be adequate for vaginal delivery
- Adequate anesthesia
- Maternal bladder has been emptied
- Patient has agreed after being informed of the risks and benefits of the procedure
- Willingness to abandon trial of operative vaginal delivery and back-up plan in place in case of failure to deliver

Adapted from Royal Australian and New Zealand College of Obstetricians and Gynaecologists. Instrumental vaginal delivery. College Statement C-Obs 16. East Melbourne, Australia: RANZCOG; 2012. Available at: <https://www.ranzcog.edu.au/doc/instrumental-vaginal-delivery.html>. Retrieved June 9, 2015.

from 60.9% in 1979 to 24.5% in 2004, with a similar decrease in episiotomy rates with operative vaginal delivery (13). In the past, routine mediolateral episiotomy was often recommended with operative vaginal delivery to lessen the chance of marked perineal stretching and damage to the underlying pelvic muscles (5). More recently, a randomized clinical trial compared routine episiotomy with selective episiotomy for operative vaginal delivery (14). Although the study was underpowered and no distinction was made between mediolateral and midline episiotomy, it found no significant differences between the groups with regard to anal sphincter tears, neonatal trauma, or urinary or fecal incontinence.

There are no data to support the use of routine episiotomy with operative vaginal delivery. Routine episiotomy with operative vaginal delivery is not recommended because poor healing and prolonged discomfort has been reported with mediolateral episiotomy (15) and because of the association of midline episiotomies with increased risk of injury to the anal sphincter and extension into the rectum (16). Several retrospective studies have found an association between midline episiotomy and anal sphincter trauma with operative vaginal delivery (17) and a lower risk of anal sphincter injury when mediolateral episiotomy was used instead of midline episiotomy with delivery by forceps or vacuum extraction (18, 19). Thus, when episiotomy is indicated with forceps or vacuum delivery, mediolateral episiotomy may have a lower risk of anal sphincter injury than midline episiotomy, but

it is associated with an increased likelihood of long-term perineal pain and dyspareunia (15).

Maternal Complications of Operative Vaginal Delivery

Research into the complications of operative vaginal delivery has been hampered by a number of confounders and potential biases, including the level of experience of the operators, changes in practice and definitions over time, the small numbers of patients studied under similar circumstances, and the inability to achieve statistical power to answer relevant questions. Outcomes of operative vaginal deliveries should not be compared with those of spontaneous vaginal deliveries, but rather with second stage cesarean delivery because this is the clinical alternative.

Operative vaginal delivery has been recognized as a risk factor for anal sphincter injury, but it is difficult to separate its contribution to these injuries from other clinical factors associated with its use. These include prolonged second stage of labor, fetal size, maternal age and obesity, shoulder dystocia, and episiotomy. In one study that controlled for these other clinical factors, forceps use was still associated with a sixfold increase in the risk of third- and fourth-degree perineal tears and vacuum extractor use was still associated with a twofold increase compared with patients who had a spontaneous delivery (20). However, in another study of 109 primiparous women with second stage arrest who completed symptom questionnaires at 1 year postpartum, the 53 women with successful operative vaginal delivery did not differ in pelvic floor function or sexual function scores from those who had a cesarean delivery (21). In addition, one study reported that many of the morbidities attributed to operative vaginal delivery were present antenatally, to a greater or similar degree. Specifically, among 108 patients with operative vaginal delivery, the reported prevalence of urinary incontinence was not different at 6 weeks and 1 year postpartum compared with the third trimester. Rates of incontinence of flatus and liquids also did not differ from the third trimester through 1 year postpartum. Only anal incontinence of solids was reported to be more prevalent at 6 weeks postpartum than before delivery (5% versus 1%; $P=.02$), but this difference resolved by 1 year postpartum (22). If no anal sphincter laceration occurs with operative vaginal delivery, anal incontinence rates at 5–10 years after delivery are similar to those in women who had a spontaneous vaginal delivery (23). After an anal sphincter tear, the recurrence rate of sphincter tears is low (3.2%) but is significantly increased if operative vaginal delivery is used for subsequent births (24).



Forceps delivery appears to have a higher risk of anal sphincter injury in comparison with vacuum delivery. In a review of 13 randomized trials of forceps delivery versus vacuum delivery, including 3,338 women, forceps use was associated with a higher rate of third- and fourth-degree tears (8). In one randomized trial of vacuum delivery versus forceps delivery, altered fecal continence at 3 months postpartum was reported more frequently after forceps delivery (59% versus 33%; $P=.006$), although most occurrences were occasional flatal incontinence and median continence scores were similar. The two groups did not differ in anal manometry measurements or anal sphincter ultrasonographic findings (25). As previously noted, a randomized trial comparing forceps delivery with vacuum delivery found no difference in either bowel or urinary dysfunction 5 years postpartum. (9)

Newborn Complications of Operative Vaginal Delivery

Although operative vaginal delivery is not without risk, the absolute rate of newborn injury with forceps and vacuum deliveries is low. Estimates from large cohort studies have indicated that intracranial hemorrhage occurs in one of every 650–850 operative vaginal deliveries and neurologic complications occur in one of every 220–385 infants delivered using forceps or vacuum extraction (26, 27). Additionally, there is evidence that some injuries (such as intracranial hemorrhage) attributed to operative delivery actually are associated with the indication for delivery rather than the procedure itself, and that the alternative of cesarean delivery does not lessen the risk. Similarly, given that operative vaginal delivery can be accomplished more quickly than cesarean delivery, it remains uncertain (for example, in the setting of nonreassuring fetal heart rate pattern) whether foregoing an operative vaginal delivery would lead to fewer neurologic injuries overall.

Various neonatal injuries have been reported with operative vaginal deliveries and, to some degree, the type and frequency vary with the instrument used. With vacuum extraction, traction is applied to the fetal scalp, which can result in laceration, cephalohematoma formation, and subgaleal or intracranial hemorrhage. Retinal hemorrhages and increased rates of hyperbilirubinemia also have been reported. With forceps deliveries, reported injuries have included facial lacerations and facial nerve palsy, corneal abrasions and external ocular trauma, skull fracture, and intracranial hemorrhage. The risk of these complications is low, but large database studies are required to establish complication rates. One study evaluated singleton births in California from 1992 to 1994, and found that the rate of neonatal death was

similar for infants delivered spontaneously, by cesarean delivery, and by forceps or vacuum extraction (26). Also, the rates of intracranial hemorrhage were similar for forceps, vacuum, and cesarean deliveries performed during labor. Another study examined data on births to nulliparous women in New York City from 1995 to 2003 (28). Relative to infants delivered by cesarean delivery, those delivered with forceps had higher rates of fracture, facial nerve palsy, and brachial plexus injury, but lower rates of neurologic complications, including seizures, intraventricular hemorrhage, and subdural hemorrhage.

Relative to cesarean delivery, vacuum delivery is associated with higher rates of cephalohematoma or scalp laceration, fracture, and brachial plexus injury, but not central neurologic complications. Researchers studied outcomes from a single obstetric unit from 2000 to 2009 and found that compared with neonates delivered by cesarean delivery in the second stage of labor, those delivered with forceps or vacuum had similar rates of neonatal death and neonatal encephalopathy. Operative vaginal delivery was associated with a rate of neonatal encephalopathy of 4.2 per 1,000 term neonates (compared with 3.9 per 1,000 delivered by cesarean delivery), and a rate of neonatal death from intracranial hemorrhage of 3–4 per 10,000 operative vaginal deliveries (27). In a review of 13 randomized trials comparing forceps with vacuum extraction, no significant differences were found in umbilical pH, severe morbidity, or death (8).

In summary, some differences in rates of various complications may exist between forceps and vacuum, but the use of either instrument is associated with relatively low rates of major morbidity and mortality and complications do not appear to be substantially greater than with cesarean delivery performed in labor. For the fetus that manifests signs of compromise in the second stage of labor, the timely and skilled use of instrumental vaginal delivery has the potential to decrease the exposure to intrauterine insults and could decrease the contribution of intrapartum factors leading to neonatal encephalopathy and hypoxic–ischemic encephalopathy (2). Neonatal care providers should be made aware of the mode of delivery in order to observe for potential complications associated with operative vaginal delivery.

Long-Term Infant Morbidity

There are few current data that assess the long-term consequences of operative vaginal delivery on the infant, but the evidence indicates that long-term outcomes of operative vaginal delivery are equivalent to those of spontaneous vaginal delivery. One study analyzed the effect of forceps delivery on cognitive development in a cohort of 3,413 children at age 5 years (29). No significant differences were seen in the 1,192 children delivered



with forceps compared with the 1,499 children delivered spontaneously. In another study, evaluations were performed at age 10 years in 295 children delivered by vacuum extraction and 302 children in the control group who delivered spontaneously at the same hospital in the same year. No differences were seen between the two groups in terms of scholastic performance, speech, or neurologic abnormality (30).

Operative Vaginal Delivery With Fetal Macrosomia

To evaluate the risk of operative vaginal delivery with fetal macrosomia, one study compared 2,924 infants who had birth weights greater than 4,000 g with those who had birth weights between 3,000 g and 3,999 g. Infants with birth weights greater than 4,000 g had an overall injury rate of 1.6% compared with 0.4% in the lower birth weight group. Forceps delivery in the group with birth weights greater than 4,000 g produced a 7.3-fold increase in the incidence of persistent injury at 6 months (95% CI, 6.5–8.2) compared with the lower birth weight group. However, the risk of persistent injury was not different from the increased risk with spontaneous vaginal delivery and birth weights greater than 4,000 g (RR, 7.7; 95% CI, 7.4–8.1). The authors calculated that as many as 258 elective cesarean deliveries would have to be performed for macrosomia to prevent a single case of persistent injury (31).

There are no studies that evaluate the risk of complications with operative vaginal delivery based on estimated fetal weight. Regardless, judicious use of operative vaginal delivery for infants with suspected macrosomia is not contraindicated. Recognizing the inherent inaccuracy in estimating fetal weight, the additional variables that should be considered include the adequacy of the maternal pelvis and the progress of labor, particularly during the second stage. Caution should be used and preparations made for the increased possibility of encountering a shoulder dystocia.

Clinical Considerations and Recommendations

► **What are contraindications to operative vaginal delivery?**

Under certain circumstances, operative vaginal delivery should be avoided or, at the least, carefully considered in terms of relative maternal and fetal risk. Operative vaginal delivery is contraindicated if the fetal head is unengaged, the position of the fetal head is unknown, or a live fetus is known or strongly suspected to have a bone

demineralization condition (eg, osteogenesis imperfecta) or a bleeding disorder (eg, alloimmune thrombocytopenia, hemophilia, or von Willebrand disease).

Operative vaginal delivery should be performed only by experienced obstetricians and obstetric care providers with privileges for such procedures and the ability to perform emergency cesarean delivery in the event the operative vaginal delivery is unsuccessful. Indeterminate fetal heart rate patterns are not a contraindication to operative vaginal delivery, and an expedited vaginal delivery can potentially benefit the deteriorating fetus if delivery can be accomplished more expeditiously than a cesarean delivery can be performed.

► **Is there a role for a trial of operative vaginal delivery?**

A trial of operative vaginal delivery is an attempt at operative delivery with the intention to abandon the procedure if potentially dangerous resistance or difficulty is met (4). The rate of failed operative vaginal delivery has been reported to be 2.9–6.5% (26, 32). In an analysis of 3,798 operative vaginal deliveries, only increased birth weight and second stage labor duration were significantly associated with failure, after controlling for operator experience (32).

The few studies that address maternal and neonatal outcome after an unsuccessful attempt at operative vaginal delivery show conflicting results. Although the analysis of California births from 1992 to 1994 found similar rates of neonatal death and intracranial hemorrhage for forceps, vacuum, and cesarean deliveries performed during labor, cesarean delivery after a failed attempt at vacuum or forceps delivery was associated with increased rates of subdural or cerebral hemorrhage, mechanical ventilation, and seizures compared with either successful operative vaginal delivery or cesarean delivery (26).

In contrast, a secondary analysis of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development cesarean birth registry data found that neonatal morbidity was more common with cesarean delivery after forceps attempt compared with cesarean without forceps. However, this association was confined to the subgroup of patients with nonreassuring fetal heart rate pattern as an indication for cesarean delivery, and there was no difference between the groups when delivery was for other indications (33). In both reports, the rates of neonatal complications after forceps attempt were low. A trial of operative vaginal delivery is an appropriate option in a situation where the obstetrician or obstetric care provider feels the chances of success are high, but must be prepared to abandon the attempt if



appropriate descent does not occur. Although a number of authors have offered concrete limits for trial of operative vaginal delivery, there are no adequate data to generate an evidence-based guideline for the number of forceps pulls or vacuum detachments that should be allowed before abandoning the procedure. In general, descent should be expected with traction and if there is no descent with the first several pulls, a reappraisal is necessary.

► ***Is there a role for the use of alternative instruments after a failed attempt?***

The California study raised significant concerns regarding the sequential use of forceps and vacuum. Compared with vacuum extraction alone, the combination of forceps and vacuum was associated with significantly higher rates of subdural or cerebral hemorrhage, subarachnoid hemorrhage, facial nerve injury, and brachial plexus injury (26). An increased incidence of intracranial hemorrhage with sequential instrument use compared with either forceps or vacuum alone also was seen in a study of a Washington State multiyear database, as was an increase in the rate of severe perineal lacerations (34). However, in both studies, the rates of complications with sequential use of instruments were compared with spontaneous vaginal delivery and not with the rates for cesarean delivery during labor after a failed operative vaginal delivery attempt.

In a more recent report of 1,360 nulliparous women undergoing operative vaginal delivery, use of sequential instruments was associated with increased anal sphincter tears and low umbilical artery pH compared with patients undergoing single instrument vaginal delivery (35). Sequential use of vacuum extractor and forceps has been associated with increased rates of neonatal complications, and should not routinely be performed. Thus, even though the reported rates of neonatal complications were relatively low, the weight of available evidence appears to be against routine use of sequential instruments at operative vaginal delivery.

► ***What special considerations are involved with the use of a vacuum extractor?***

Modern vacuum extractors differ substantially from the original metal cup and vary by material, cup size and shape, and the method of vacuum application to the fetal scalp. Randomized trials comparing soft vacuum cups with the original metal cup indicate that the pliable cup is associated with decreased fetal scalp trauma but with increased rates of detachment from the fetal head (36–39). However, there are no differences in Apgar scores, cord pH, neurologic complications, retinal hemorrhage,

maternal trauma, or blood loss when comparing rigid cup vacuum deliveries with soft cup vacuum deliveries (39).

Cephalohematoma is more likely to occur as the duration of vacuum application increases. One study found that cephalohematoma was diagnosed clinically in 28% of neonates when the time from application to delivery exceeded 5 minutes (40). It does not appear that reducing the vacuum pressure between contractions reduces the incidence of fetal scalp injury. One trial randomized 164 patients to continuous vacuum application during and between contractions in an effort to prevent fetal loss of station and randomized 158 patients to reduction of vacuum pressure between contractions. Overall, 93.5% had a delivery by the intended method, and the cephalohematoma rate was 11.5%. Time to delivery, method failure, maternal lacerations, episiotomy extension, incidence of cephalohematoma, and neonatal outcome were similar between the two groups (41). As such, release of vacuum pressure between contractions does not appear to be associated with improved outcomes.

Traditional teaching has held that the direction of traction with vacuum delivery should follow the pelvic curvature, and that rocking motions and application of torque to affect rotation should be avoided (4). Only gentle augmentation of the natural rotation that occurs with maternal pushing and fetal descent is recommended. Because of the risk of cephalohematoma and other complications, clinicians caring for the neonate should be notified of the vacuum delivery so that the newborn can be appropriately monitored for the signs and symptoms of instrument-related injuries.

► ***Is there a role for midforceps and rotational forceps deliveries in current practice?***

Midforceps and rotational forceps delivery are appropriate options in select clinical circumstances. Recent studies comparing midforceps deliveries with cesarean deliveries confirmed older data that showed no difference in neonatal outcome. One study of 144 cases in which Kielland forceps were used for rotation, 90% resulted in vaginal delivery, and there were no instances of forceps-related neonatal trauma or hypoxic–ischemic encephalopathy (42). Another study compared outcomes of deliveries with rotational forceps with nonrotational forceps, vacuum, spontaneous vaginal, and emergency cesarean deliveries at any dilation. No difference in the rate of neonatal encephalopathy was found between the groups, and the rate of neonatal intensive care unit admission was highest with emergency cesarean delivery (43). The contemporary report with the largest number of rotational deliveries (n=1,038) compared Kielland forceps delivery to emergency cesarean delivery in the second stage of labor and saw no difference in rates of



neonatal intensive care unit admission or other measures of neonatal morbidity (44).

With regard to occiput posterior position with arrest of descent in the second stage of labor, there may be a benefit from an attempt at rotation to occiput anterior. In a retrospective study of patients with forceps deliveries, 99 patients with manual (n=64) or forceps (n=35) rotation were compared with 57 patients delivered from the occiput posterior position without an attempt at rotation. No difference in neonatal outcomes was seen, but forceps delivery without attempt at rotation was associated with a significantly higher rate of severe perineal laceration (odds ratio, 3.67; 95% CI, 1.42–9.47) (45). Thus, it seems reasonable to attempt forceps delivery with manual or forceps rotation of occiput posterior position in certain circumstances.

Summary of Recommendations and Conclusions

The following recommendations and conclusions are based on good and consistent scientific evidence (Level A):

- ▶ Forceps and vacuum extractors have low risk of complications and are acceptable for operative vaginal delivery.
- ▶ A vaginal birth is more likely to be achieved with forceps than with vacuum extractors; however, forceps are more likely to be associated with third- and fourth-degree perineal tears.
- ▶ Routine episiotomy with operative vaginal delivery is not recommended because poor healing and prolonged discomfort has been reported with mediolateral episiotomy and because of the association of midline episiotomies with increased risk of injury to the anal sphincter and extension into the rectum.

The following recommendations and conclusions are based on limited or inconsistent scientific evidence (Level B):

- ▶ Episiotomy should not be performed routinely for all operative vaginal deliveries.
- ▶ Operative vaginal delivery is contraindicated if the fetal head is unengaged, the position of the fetal head is unknown, or a live fetus is known or strongly suspected to have a bone demineralization condition (eg, osteogenesis imperfecta) or a bleeding disorder (eg, alloimmune thrombocytopenia, hemophilia, or von Willebrand disease).

- ▶ A trial of operative vaginal delivery is an appropriate option in a situation where the obstetrician or obstetric care provider feels the chances of success are high, but must be prepared to abandon the attempt if appropriate descent does not occur.
- ▶ Sequential use of vacuum extractor and forceps has been associated with increased rates of neonatal complications and should not routinely be performed.
- ▶ Cephalohematoma is more likely to occur as the duration of vacuum application increases.
- ▶ Midforceps and rotational forceps delivery are appropriate options in select clinical circumstances.

The following recommendations and conclusions are based primarily on consensus and expert opinion (Level C):

- ▶ Vacuum extraction has been discouraged for gestational age less than 34 weeks, although a safe lower limit for gestational age has not been established.
- ▶ For the fetus who manifests signs of compromise in the second stage of labor, the timely and skilled use of instrumental vaginal delivery has the potential to decrease the exposure to intrauterine insults and could decrease the contribution of intrapartum factors leading to neonatal encephalopathy and hypoxic–ischemic encephalopathy.
- ▶ Neonatal care providers should be made aware of the mode of delivery in order to observe for potential complications associated with operative vaginal delivery.

Proposed Performance Measure

Documentation of station and position at time of forceps or vacuum extractor application

References

1. Martin JA, Hamilton BE, Osterman MJ, Curtin SC, Matthews TJ. Births: final data for 2013. *Natl Vital Stat Rep* 2015;64:1–65. (Level II-3) [PubMed] ⇐
2. American Academy of Pediatrics, American College of Obstetricians and Gynecologists. Neonatal encephalopathy and neurologic outcome. 2nd ed. Elk Grove Village (IL): Washington, DC:AAP; American College of Obstetricians and Gynecologists; 2014. (Level III) ⇐
3. American Academy of Pediatrics, American College of Obstetricians and Gynecologists. Guidelines for perinatal care. 7th ed. Elk Grove Village (IL): AAP; Washington,



- DC: American College of Obstetricians and Gynecologists; 2012. (Level III) ↵
4. Hale RW, editor. Dennen's forceps deliveries. 4th ed. Washington, DC: American College of Obstetricians and Gynecologists; 2001. (Level III) ↵
 5. Laufe LE. Obstetric forceps. New York (NY): Harper & Row; 1968. (Level III) ↵
 6. Laufe LE, Berkus MD. Assisted vaginal delivery: obstetric forceps and vacuum extraction techniques. New York (NY): McGraw-Hill; 1992. (Level III) ↵
 7. Hagadorn-Freathy AS, Yeomans ER, Hankins GD. Validation of the 1988 ACOG forceps classification system. *Obstet Gynecol* 1991;77:356–60. (Level II-3). [PubMed] [*Obstetrics & Gynecology*] ↵
 8. O'Mahony F, Hofmeyr GJ, Menon V. Choice of instruments for assisted vaginal delivery. *Cochrane Database of Systematic Reviews* 2010, Issue 11. Art. No.: CD005455. DOI: 10.1002/14651858.CD005455.pub2. (Meta-analysis) [PubMed] [Full Text] ↵
 9. Johanson RB, Heycock E, Carter J, Sultan AH, Walklate K, Jones PW. Maternal and child health after assisted vaginal delivery: five-year follow up of a randomised controlled study comparing forceps and ventouse. *Br J Obstet Gynaecol* 1999;106:544–9. (Level I) [PubMed] ↵
 10. Morales R, Adair CD, Sanchez-Ramos L, Gaudier FL. Vacuum extraction of preterm infants with birth weights of 1,500–2,499 grams. *J Reprod Med* 1995;40:127–30. (Level II-2) [PubMed] ↵
 11. Aberg K, Norman M, Ekeus C. Preterm birth by vacuum extraction and neonatal outcome: a population-based cohort study. *BMC Pregnancy Childbirth* 2014; 14:42,2393-14–42. (Level II-2) [PubMed] [Full Text] ↵
 12. Cargill YM, MacKinnon CJ, Arsenault MY, Bartellas E, Daniels S, Gleason T, et al. Guidelines for operative vaginal birth. *Clinical Practice Obstetrics Committee. J Obstet Gynaecol Can* 2004;26:747–61. (Level III) [PubMed] ↵
 13. Frankman EA, Wang L, Bunker CH, Lowder JL. Episiotomy in the United States: has anything changed? *Am J Obstet Gynecol* 2009;200:573.e1–7. (Level II-3) [PubMed] [Full Text] ↵
 14. Murphy DJ, Macleod M, Bahl R, Goyder K, Howarth L, Strachan B. A randomised controlled trial of routine versus restrictive use of episiotomy at operative vaginal delivery: a multicentre pilot study. *BJOG* 2008;115: 1695–702; discussion 1702–3. (Level I) [PubMed] [Full Text] ↵
 15. Sartore A, De Seta F, Maso G, Pregazzi R, Grimaldi E, Guaschino S. The effects of mediolateral episiotomy on pelvic floor function after vaginal delivery. *Obstet Gynecol* 2004;103:669–73. (Level II-2) [PubMed] [*Obstetrics & Gynecology*] ↵
 16. Fitzgerald MP, Weber AM, Howden N, Cundiff GW, Brown MB. Risk factors for anal sphincter tear during vaginal delivery. *Pelvic Floor Disorders Network. Obstet Gynecol* 2007;109:29–34. (Level II-3) [PubMed] [*Obstetrics & Gynecology*] ↵
 17. Kudish B, Blackwell S, Mcneely SG, Bujold E, Kruger M, Hendrix SL, et al. Operative vaginal delivery and midline episiotomy: a bad combination for the perineum. *Am J Obstet Gynecol* 2006;195:749–54. (Level II-3) [PubMed] [Full Text] ↵
 18. de Leeuw JW, de Wit C, Kuijken JP, Bruinse HW. Mediolateral episiotomy reduces the risk for anal sphincter injury during operative vaginal delivery. *BJOG* 2008; 115:104–8. (Level II-3) [PubMed] [Full Text] ↵
 19. de Vogel J, van der Leeuw-van Beek A, Gietelink D, Vujkovic M, de Leeuw JW, van Bavel J, et al. The effect of a mediolateral episiotomy during operative vaginal delivery on the risk of developing obstetrical anal sphincter injuries. *Am J Obstet Gynecol* 2012;206:404.e1–5. (Level II-3) [PubMed] [Full Text] ↵
 20. Gurol-Urganci I, Cromwell DA, Edozien LC, Mahmood TA, Adams EJ, Richmond DH, et al. Third- and fourth-degree perineal tears among primiparous women in England between 2000 and 2012: time trends and risk factors. *BJOG* 2013;120:1516–25. (Level II-3) [PubMed] [Full Text] ↵
 21. Crane AK, Geller EJ, Bane H, Ju R, Myers E, Matthews CA. Evaluation of pelvic floor symptoms and sexual function in primiparous women who underwent operative vaginal delivery versus cesarean delivery for second-stage arrest. *Female Pelvic Med Reconstr Surg* 2013;19:13–6. (Level II-3) [PubMed] [Full Text] ↵
 22. Macleod M, Goyder K, Howarth L, Bahl R, Strachan B, Murphy DJ. Morbidity experienced by women before and after operative vaginal delivery: prospective cohort study nested within a two-centre randomised controlled trial of restrictive versus routine use of episiotomy. *BJOG* 2013;120:1020–6. (Level I) [PubMed] [Full Text] ↵
 23. Evers EC, Blomquist JL, McDermott KC, Handa VL. Obstetrical anal sphincter laceration and anal incontinence 5–10 years after childbirth. *Am J Obstet Gynecol* 2012;207:425.e1–6. (Level II-3) [PubMed] [Full Text] ↵
 24. Basham E, Stock L, Lewicky-Gaupp C, Mitchell C, Gossett DR. Subsequent pregnancy outcomes after obstetric anal sphincter injuries (OASIS). *Female Pelvic Med Reconstr Surg* 2013;19:328–32. (Level II-3) [PubMed] ↵
 25. Fitzpatrick M, Behan M, O'Connell PR, O'Herlihy C. Randomised clinical trial to assess anal sphincter function following forceps or vacuum assisted vaginal delivery. *BJOG* 2003;110:424–9. (Level I) [PubMed] [Full Text] ↵
 26. Towner D, Castro MA, Eby-Wilkens E, Gilbert WM. Effect of mode of delivery in nulliparous women on neonatal intracranial injury. *N Engl J Med* 1999;341: 1709–14. (Level II-3) [PubMed] [Full Text] ↵
 27. Walsh CA, Robson M, McAuliffe FM. Mode of delivery at term and adverse neonatal outcomes. *Obstet Gynecol* 2013;121:122–8. (Level II-3) [PubMed] [*Obstetrics & Gynecology*] ↵
 28. Werner EF, Janevic TM, Illuzzi J, Funai EF, Savitz DA, Lipkind HS. Mode of delivery in nulliparous women and neonatal intracranial injury. *Obstet Gynecol* 2011; 118:1239–46. (Level II-3) [PubMed] [*Obstetrics & Gynecology*] ↵
 29. Wesley BD, van den Berg BJ, Reece EA. The effect of forceps delivery on cognitive development. *Am J Obstet Gynecol* 1993;169:1091–5. (Level II-2) [PubMed] ↵



30. Ngan HY, Miu P, Ko L, Ma HK. Long-term neurological sequelae following vacuum extractor delivery. *Aust N Z J Obstet Gynaecol* 1990;30:111–4. (Level II-2) [PubMed] ⇐
31. Kolderup LB, Laros RK Jr, Musci TJ. Incidence of persistent birth injury in macrosomic infants: association with mode of delivery. *Am J Obstet Gynecol* 1997;177:37–41. (Level II-3) [PubMed] [Full Text] ⇐
32. Aiken CE, Aiken AR, Brockelsby JC, Scott JG. Factors influencing the likelihood of instrumental delivery success. *Obstet Gynecol* 2014;123:796–803. (Level II-3) [PubMed] [*Obstetrics & Gynecology*] ⇐
33. Alexander JM, Leveno KJ, Hauth JC, Landon MB, Gilbert S, Spong CY, et al. Failed operative vaginal delivery. Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. *Obstet Gynecol* 2009;114:1017–22. (Level II-3) [PubMed] [*Obstetrics & Gynecology*] ⇐
34. Gardella C, Taylor M, Benedetti T, Hitti J, Critchlow C. The effect of sequential use of vacuum and forceps for assisted vaginal delivery on neonatal and maternal outcomes. *Am J Obstet Gynecol* 2001;185:896–902. (Level II-3) [PubMed] [Full Text] ⇐
35. Murphy DJ, Macleod M, Bahl R, Strachan B. A cohort study of maternal and neonatal morbidity in relation to use of sequential instruments at operative vaginal delivery. *Eur J Obstet Gynecol Reprod Biol* 2011;156:41–5. (Level II-2) [PubMed] [Full Text] ⇐
36. Chenoy R, Johanson R. A randomized prospective study comparing delivery with metal and silicone rubber vacuum extractor cups. *Br J Obstet Gynaecol* 1992;99:360–3. (Level I) [PubMed] ⇐
37. Cohn M, Barclay C, Fraser R, Zaklama M, Johanson R, Anderson D, et al. A multicentre randomized trial comparing delivery with a silicone rubber cup and rigid metal vacuum extractor cups. *Br J Obstet Gynaecol* 1989;96:545–51. (Level I) [PubMed] ⇐
38. Hofmeyr GJ, Gobetz L, Sonnendecker EW, Turner MJ. New design rigid and soft vacuum extractor cups: a preliminary comparison of traction forces. *Br J Obstet Gynaecol* 1990;97:681–5. (Level I) [PubMed] ⇐
39. Kuit JA, Eppinga HG, Wallenburg HC, Huikeshoven FJ. A randomized comparison of vacuum extraction delivery with a rigid and a pliable cup. *Obstet Gynecol* 1993;82:280–4. (Level I) [PubMed] [*Obstetrics & Gynecology*] ⇐
40. Bofill JA, Rust OA, Devidas M, Roberts WE, Morrison JC, Martin JN Jr. Neonatal cephalohematoma from vacuum extraction. *J Reprod Med* 1997;42:565–9. (Level I) [PubMed] ⇐
41. Bofill JA, Rust OA, Schorr SJ, Brown RC, Roberts WE, Morrison JC. A randomized trial of two vacuum extraction techniques. *Obstet Gynecol* 1997;89:758–62. (Level I) [PubMed] [*Obstetrics & Gynecology*] ⇐
42. Burke N, Field K, Mujahid F, Morrison JJ. Use and safety of Kielland's forceps in current obstetric practice. *Obstet Gynecol* 2012;120:766–70. (Level III) [PubMed] [*Obstetrics & Gynecology*] ⇐
43. Stock SJ, Josephs K, Farquharson S, Love C, Cooper SE, Kissack C, et al. Maternal and neonatal outcomes of successful Kielland's rotational forceps delivery. *Obstet Gynecol* 2013;121:1032–9. (Level II-3) [PubMed] [*Obstetrics & Gynecology*] ⇐
44. Tempest N, Hart A, Walkinshaw S, Hapangama DK. A re-evaluation of the role of rotational forceps: retrospective comparison of maternal and perinatal outcomes following different methods of birth for malposition in the second stage of labour. *BJOG* 2013;120:1277–84. (Level II-3) [PubMed] [Full Text] ⇐
45. Bradley MS, Kaminski RJ, Streitman DC, Dunn SL, Krans EE. Effect of rotation on perineal lacerations in forceps-assisted vaginal deliveries. *Obstet Gynecol* 2013;122:132–7. (Level II-3) [PubMed] [*Obstetrics & Gynecology*] ⇐



The MEDLINE database, the Cochrane Library, and the American College of Obstetricians and Gynecologists' own internal resources and documents were used to conduct a literature search to locate relevant articles published between January 2000–November 2013. The search was restricted to articles published in the English language. Priority was given to articles reporting results of original research, although review articles and commentaries also were consulted. Abstracts of research presented at symposia and scientific conferences were not considered adequate for inclusion in this document. Guidelines published by organizations or institutions such as the National Institutes of Health and the American College of Obstetricians and Gynecologists were reviewed, and additional studies were located by reviewing bibliographies of identified articles. When reliable research was not available, expert opinions from obstetrician–gynecologists were used.

Studies were reviewed and evaluated for quality according to the method outlined by the U.S. Preventive Services Task Force:

- I Evidence obtained from at least one properly designed randomized controlled trial.
- II-1 Evidence obtained from well-designed controlled trials without randomization.
- II-2 Evidence obtained from well-designed cohort or case–control analytic studies, preferably from more than one center or research group.
- II-3 Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments also could be regarded as this type of evidence.
- III Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

Based on the highest level of evidence found in the data, recommendations are provided and graded according to the following categories:

Level A—Recommendations are based on good and consistent scientific evidence.

Level B—Recommendations are based on limited or inconsistent scientific evidence.

Level C—Recommendations are based primarily on consensus and expert opinion.

Copyright November 2015 by the American College of Obstetricians and Gynecologists. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, posted on the Internet, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher.

Requests for authorization to make photocopies should be directed to Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400.

**The American College of Obstetricians and Gynecologists
409 12th Street, SW, PO Box 96920, Washington, DC 20090-6920**

Operative vaginal delivery. Practice Bulletin No. 154. American College of Obstetricians and Gynecologists. *Obstet Gynecol* 2015; 126:e56–65.

