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Prevention and Management of Obstetric Lacerations at Vaginal Delivery

Lacerations are common after vaginal birth. Trauma can occur on the cervix, vagina, and vulva, including the labial, periclitoral, and periurethral regions, and the perineum. Most of these lacerations do not result in adverse functional outcomes. Severe perineal lacerations, extending into or through the anal sphincter complex, although less frequent, are more commonly associated with increased risk of pelvic floor injury, fecal and urinary incontinence, pain, and sexual dysfunction with symptoms that may persist or be present many years after giving birth. The purpose of this document is to provide evidence-based guidelines for the prevention, identification, and repair of obstetric lacerations and for episiotomy.

Background

Perineal Anatomy

The external female genitalia are composed of the mons pubis, labia majora, labia minora, clitoris, vaginal vestibule, and the perineal body, all of which can be damaged during childbirth. The perineal body is the most common site of laceration; it is a mass of dense connective tissue that includes superficial and deep muscles of the perineal membrane, including the transverse perineal muscles and attachments of the bulbocavernosus muscles. Inferior to the perineal body is the anal sphincter complex. This complex includes the internal and external sphincters, which circle the distal anus. The external anal sphincter is composed of skeletal muscle. The external anal sphincter is under voluntary control and provides the squeeze pressure of the anal canal. The distal thickening of the circular smooth muscle layer of the anal wall makes up the internal anal sphincter. The internal anal sphincter is under autonomic control and provides up to 80% of the resting pressure of the anal

canal (1). The external sphincter overlaps with the distal internal sphincter for a distance of 1–2 cm; the entire anal sphincter complex extends up the anal canal for a distance of approximately 4 cm (1, 2). See Figure 1.

Incidence and Definitions

Although laceration rates vary based on patient characteristics, birth settings, and obstetric care provider practices, 53–79% of women will sustain some type of laceration at vaginal delivery (3, 4), with most being first-degree and second-degree lacerations (3, 5). Lacerations to the external genitalia other than the perineum typically do not require intervention unless the laceration is bleeding or distorts anatomy. Severe perineal lacerations are those that extend into or through the anal sphincter complex and are referred to as obstetric anal sphincter injuries (OASIS).

Systems have been developed that classify the severity of OASIS according to the degree of involvement of the external anal sphincter, internal anal sphincter, and anal epithelium. However, there is no consensus regarding a recommended classification approach (6, 7).



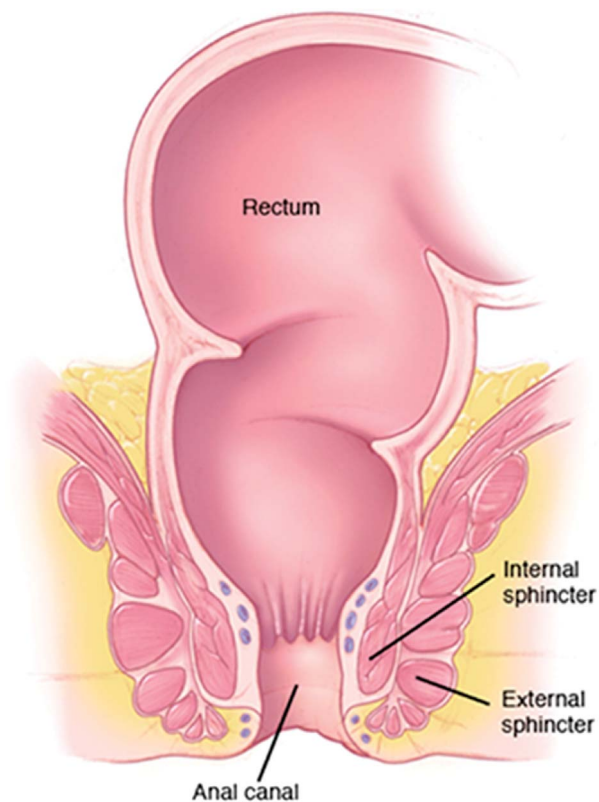


Figure 1. The anal canal. (Reprinted from Mayo Foundation for Medical Education and research. All rights reserved. The anal canal. Available at: <http://www.mayoclinic.org/the-anal-canal/img-20006922>. Retrieved April 20, 2016.)

In 2012, the American College of Obstetricians and Gynecologists convened the reVITALize Obstetric Data Definitions Conference to develop and standardize national obstetric clinical data definitions, including the classification of perineal lacerations (Box 1).

Lack of uniformity in the classification of severe lacerations has hindered accurate estimates of their incidence. The 1998–2010 U.S. Nationwide Inpatient Sample reported a third-degree laceration rate of 3.3% and fourth-degree laceration rate of 1.1% for women who had vaginal deliveries (8); whereas a systematic review noted wide variation in reported incidence of childbirth-associated sphincter injury, estimating a true incidence of approximately 11% in women who gave birth vaginally (9).

Episiotomy

Episiotomy is a surgical enlargement of the posterior aspect of the vagina by an incision to the perineum during the last part of the second stage of labor (10). National episiotomy rates have decreased steadily since 2006. Approximately 12% of vaginal births include an episiotomy, based on 2012 U.S. hospital discharge data (11). Precise anatomic definitions for the type of episiotomy

Box 1. Classification of Perineal Lacerations

First degree: Injury to Perineal skin only.

Second degree: Injury to perineum involving perineal muscles but not involving anal sphincter.

Third degree: Injury to perineum involving anal sphincter complex.

3a: Less than 50% of external anal sphincter thickness torn.

3b: More than 50% external anal sphincter thickness torn.

3c: Both external anal sphincter and internal sphincter torn.

Fourth degree: Injury to perineum involving anal sphincter complex (external anal sphincter and internal anal sphincter) and anal epithelium.

Modified from American College of Obstetricians and Gynecologists. Obstetric data definitions (version 1.0). Washington, DC: American College of Obstetricians and Gynecologists; 2014. Available at <https://www.acog.org/-/media/Departments/Patient-Safety-and-Quality-Improvement/2014reVITALizeObstetricDataDefinitionsV10.pdf>. Retrieved April 29, 2016.

have been proposed based on the angle and direction of the incision (12). The more common type of episiotomy performed in the United States is midline (also known as median), which starts within 3 mm of the midline in the posterior fourchette and extends downwards between 0 degrees and 25 degrees of the sagittal plane. In Europe, a mediolateral episiotomy is more frequently performed; this starts within 3 mm of the midline in the posterior fourchette and is directed laterally at an angle of at least 60 degrees from the midline towards the ischial tuberosity (12). Although other types of episiotomy have been described, they are used less often. Current data and clinical opinion suggest that there are insufficient objective evidence-based criteria to recommend episiotomy, especially routine use of episiotomy, and that clinical judgment remains the best guide for use of this procedure (13).

Effect of Episiotomy and Perineal Trauma on Pelvic Floor Function

Separating the unique contributions of vaginal birth, operative vaginal delivery, episiotomy, and OASIS to pelvic floor function is a challenge. Women may experience more than one risk factor at delivery and many exposures



are interrelated. A systematic review of 26 articles found that a routine episiotomy offered no immediate or long-term maternal benefit in perineal laceration severity, pelvic floor dysfunction (including urinary or fecal incontinence), or pelvic organ prolapse over a restrictive use of episiotomy (13). In other reviews, however, episiotomy has been associated with increased risk of postpartum anal incontinence. In a meta-analysis including eight studies, episiotomy was associated with an increased risk of anal incontinence (pooled odds ratio [OR], 1.74; 95% confidence interval [CI], 1.28–2.38) compared with no episiotomy, whether or not the perineal laceration extended into the anal sphincter complex. In the same meta-analysis, women with OASIS injuries were more likely to have anal incontinence than women who did not have OASIS injuries (OR, 2.66; 95% CI, 1.77–3.98) (14). However, the strength of these associations is uncertain, as the quality of the articles included in the meta-analysis was low, episiotomy type and degree were not always defined, and extension of the episiotomy incision was not included uniformly. In a study of women 5–10 years after first delivery, vaginal delivery with obstetric anal sphincter injury was associated with increased report of anal incontinence symptoms compared with a cesarean control group without sphincter laceration (OR, 2.32; 95% CI, 1.27–4.26) (15). Women who sustain fourth-degree lacerations are at the highest risk of reporting bowel symptoms 6 months postpartum; women with a history of a fourth-degree laceration at the first delivery reported worse bowel control 10 times more frequently than women with a third-degree laceration (30.8% versus 3.6%, $P < .001$) (16).

Vaginal delivery is associated with increased need for pelvic floor reconstruction later in life, but the contribution of episiotomy and perineal laceration on pelvic organ prolapse and stress urinary incontinence is less clear. In a cohort study of women who had only cesarean deliveries compared with women who had only vaginal deliveries, pelvic organ prolapse surgery was increased after noninstrumented vaginal delivery (hazard ratio [HR], 9.3; 95% CI, 6.9–12.2), vacuum-assisted vaginal delivery (HR, 8.9; 95% CI, 6.4–12.5), and forceps-assisted vaginal delivery (HR 20.9; 95% CI, 5.5–79.9) (17). This study did not assess whether a specific type of pelvic floor laceration at the time of vaginal delivery affected pelvic floor outcomes. In a cohort study of women surveyed and examined 5–10 years after giving birth, episiotomy was not associated with increased risk of pelvic organ prolapse or urinary incontinence, but having multiple deliveries with spontaneous perineal lacerations was associated with the development of prolapse beyond the hymen (OR, 2.34; 95% CI, 1.13–4.86) (18).

In a systematic review, routine episiotomy did not improve self-reported sexual function outcomes. Although

women who underwent routine episiotomy were more likely to have pain with intercourse in the months after pregnancy and were slower to resume intercourse than women for whom episiotomy use was restricted, the summary estimates noted no significant differences (13). In a long-term outcome study that evaluated the mode of delivery effect on pelvic pain 6–11 years after a first delivery, dyspareunia or pelvic pain among women who gave birth vaginally was not associated with perineal laceration or episiotomy (19).

Risk Factors for Obstetric Anal Sphincter Injuries

Based on meta-analysis of data from 22 studies (651,934 women of whom 15,366 [2.4%] had severe lacerations), the strongest risk factors for OASIS included forceps delivery (OR, 5.50; 95% CI, 3.17–9.55), vacuum-assisted delivery (OR, 3.98; 95% CI, 2.60–6.09), midline episiotomy (OR, 3.82; 95% CI, 1.96–7.42), and increased fetal birth weight (mean difference, 192.88 g; 95% CI, 139.80–245.96 g) (20). Midline episiotomy combined with forceps delivery substantially increases the risk of third-degree laceration (OR, 5.65; 95% CI, 5.55–5.75) and fourth-degree laceration (OR, 10.55; 95% CI, 10.29–10.81) (8). The risk of anal sphincter trauma with operative delivery and episiotomy is increased in primigravid women and multigravid women (21).

Based on the same meta-analysis data, other risk factors for OASIS include primiparity (OR, 3.24; 95% CI, 2.20–4.76), Asian ethnicity (OR, 2.74; 95% CI, 1.31–5.72), labor induction (OR, 1.08; 95% CI, 1.02–1.14), labor augmentation (OR, 1.95; 95% CI, 1.56–2.44), epidural anesthesia (OR, 1.95; 95% CI, 1.66–2.32), and persistent occiput posterior position (OR, 3.09; 95% CI, 1.81–5.29). Maternal age, pregnancy duration, body mass index, and duration of the second stage of labor were not significantly different between women who sustained OASIS and women who did not (20).

Familial factors also may predispose women to OASIS. In an analysis of the Medical Birth Registry of Norway, OASIS risk was increased if the woman's mother or sister had OASIS during a delivery (adjusted relative risk [RR], 1.9; 95% CI, 1.6–2.3 and RR, 1.7; 95% CI, 1.6–1.7, respectively) (22).

Management of Obstetric Anal Sphincter Injuries and Opportunities for Instruction Through Simulation

Repairing and caring for perineal lacerations are part of the obstetrician–gynecologist's training and clinical expertise. With a decrease in the use of episiotomy and operative vaginal delivery, obstetric care providers may need to supplement their OASIS repair training with the



use of simulation. Validated models developed to practice and teach OASIS repair skills, such as a beef tongue (23) and sponge models (24), are available.

Role of Third-Degree and Fourth-Degree Lacerations as an Obstetric Care Quality Measure

The Joint Commission included OASIS in its 2002 Pregnancy and Related Conditions Core Measure set. The Agency for Healthcare Research and Quality has proposed third-degree and fourth-degree lacerations as patient safety indicators, and the National Quality Forum adopted OASIS as a quality measure in 2003 (8). Since adoption, however, the low rates of these injuries have not decreased. Unreliable data collection is cited as one of the reasons for the lack of reduction in OASIS because obstetrician–gynecologists and other obstetric care providers may be unlikely to code third-degree lacerations that do not extend through the anal sphincter complex. Additionally, a number of OASIS risk factors are not modifiable, many of which may be due to childbirth itself or actions necessary to facilitate safe childbirth, and are not necessarily reflective of the routine practice of obstetrician–gynecologists and other obstetric care providers. These factors led the National Quality Forum to ultimately withdraw their endorsement of OASIS as a quality indicator because it is not an appropriate measure of value (8). Interventions that may modify the risk of OASIS include operative vaginal delivery and episiotomy, but restriction in the use of episiotomy is already recommended and further reduction in operative vaginal delivery might lead to inadvertent increase in cesarean delivery rates (8). Processes that better reflect quality care may be measuring the rate of episiotomy with unassisted vaginal deliveries; accurately documenting the indication for operative vaginal delivery; and advising the patient of the associated risk of third-degree and fourth-degree lacerations and obtaining consent. However, validation of these quality measurement actions would be required before widespread implementation.

Clinical Considerations and Recommendations

► What are prevention strategies for severe obstetric lacerations?

A number of different perineal management interventions have been used in the antepartum period or at the time of delivery in an effort to reduce perineal trauma, including maternal perineal massage, manual perineal support, warm compresses, different birthing positions, and delayed pushing.

Antepartum or Intrapartum Perineal Massage or Support

Perineal massage (antepartum or during the second stage of labor) is intended to decrease perineal muscular resistance and reduce the likelihood of laceration at delivery. In an analysis of four trials (2,497 women) that compared antenatal perineal massage to no-massage controls, digital perineal massage from 34 weeks of gestation onward was associated with modest reduction in perineal trauma that required repair with suture (RR, 0.91; 95% CI, 0.86–0.96) and decreased episiotomy (RR, 0.84; 95% CI, 0.74–0.95) in women without previous vaginal birth. Only women who previously had a vaginal delivery reported a statistically significant reduction in the incidence of pain at 3 months postpartum (one trial, 376 women, RR, 0.45; 95% CI, 0.24–0.87) (25). Perineal massage during the second stage of labor may help reduce third-degree and fourth-degree lacerations. Meta-analysis of data from two studies (2,147 women) found that perineal massage during the second stage of labor reduced third-degree and fourth-degree tears when compared with “hands off” the perineum (RR, 0.52; 95% CI, 0.29–0.94), but was not associated with significant changes in the rate of birth with an intact perineum (26).

Manual perineal support at delivery is commonly practiced (with health care providers in some parts of the world describing this as a “hands on” method), with several different techniques described globally. Among these are the flexion techniques and the Ritgen maneuver (or a modification of either). In a meta-analysis of trials that evaluated the effect of manual perineal support, three randomized trials (6,647 women) did not demonstrate a protective effect for the risk of OASIS (RR, 1.03; 95% CI, 0.32–3.36), whereas three nonrandomized studies (74,744 women) showed a significant reduction in the risk of OASIS (RR, 0.45; 95% CI, 0.40–0.50). However, the techniques of perineal support were not well described, which makes it difficult to judge the quality of the interventions. Authors of the meta-analysis concluded that current evidence is insufficient to recommend a specific practice (27).

Warm Compresses

A meta-analysis of two studies (1,525 women) that randomized participants to warm compresses on the perineum during the second stage of labor versus no warm compresses found that compress use significantly reduced third-degree and fourth-degree lacerations (RR, 0.48; 95% CI, 0.28–0.84). However warm compresses did not increase the rate of a woman having an intact perineum after delivery (RR, 1.05; 95% CI, 0.86–1.26) (26). Warm compresses also have been shown to be acceptable to women and are, therefore, reasonable to offer. Because application of warm



perineal compresses during pushing reduces the incidence of third-degree and fourth-degree lacerations, obstetrician-gynecologists and other obstetric care providers can apply warm compresses to the perineum during pushing to reduce the risk of perineal trauma.

Birth Position

In a meta-analysis of 22 trials (7,280 women), upright or lateral birth positions compared with supine or lithotomy positions were associated with fewer episiotomies and operative deliveries, but higher rates of second-degree lacerations, and the overall quality of the studies was rated as low (28). Meta-analysis of five randomized controlled trials (879 women) with epidural anesthesia did not show a clear benefit of any upright position compared with a lying down position (29). In a recent randomized trial, lateral birthing position with delayed pushing was compared with lithotomy positions and pushing at complete dilatation in women with epidural anesthesia and found that women in the lateral position with delayed pushing were more likely to deliver with an intact perineum (40% versus 12%, $P < .001$) (30).

Delayed Pushing

A systematic review of randomized trials that compared delayed pushing (between 1 hour and 3 hours) to immediate or early pushing (within 1 hour of full dilation) combined data from nine trials (2,953 women). The study found no differences in rates of perineal laceration (RR, 0.90; 95% CI, 0.7–1.17) or use of episiotomy (RR, 0.97; 95% CI, 0.88–1.06) between groups (31).

► **What are the indications for episiotomy in contemporary obstetric practice?**

Contemporary data indicate that there are insufficient objective evidence-based criteria to define the indications for episiotomy—and specifically routine use of episiotomy—and that restrictive use of episiotomy remains the best practice (13). But historically, in cases for which expediting delivery in the second stage of labor is warranted, such as delivery complicated by shoulder dystocia or with operative vaginal delivery, episiotomy has been thought to be indicated. Although some guidelines have suggested an episiotomy to allow for additional access for maneuvers when shoulder dystocia is encountered (7), a systematic review of the effectiveness of episiotomy in the prevention and management of shoulder dystocia found no evidence that supported the use of episiotomy (32). Although the overall quality of evidence was rated as very low, most studies noted increased risk of advanced perineal tears. A randomized controlled trial of restrictive use of mediolateral episiotomy versus rou-

tine use of mediolateral episiotomy at the time of operative vaginal delivery found no significant differences between groups in rates of OASIS, postpartum hemorrhage, or neonatal trauma. However, this trial had inadequate sample size to rule out a type II error (33). The longitudinal prospective follow up at 1-year postpartum from this same randomized controlled trial found no differences between groups in the rates of urinary morbidities, anal incontinence, or dyspareunia (34). At present, current clinical information is limited on the harm or benefit of episiotomy in the specific clinical situations of shoulder dystocia and operative vaginal delivery. Larger trials are needed to address uncertainties in the existing medical literature and to better define a list of indications for episiotomy. Based on the existing evidence, there are no specific situations in which episiotomy is essential, and the decision to perform an episiotomy should be based on clinical considerations. Restrictive episiotomy use is recommended over routine episiotomy.

► **How does episiotomy affect the rate and severity of perineal lacerations?**

The effect of episiotomy on obstetric lacerations, including OASIS, is unclear because the data from studies of midline and mediolateral episiotomy are often combined. Further, outcome measures may be biased because indications for performing the intervention may themselves be confounding factors. Although midline episiotomy increases the occurrence and severity of perineal lacerations, data are less clear for mediolateral episiotomy. Indeed, midline episiotomy is a strong independent risk factor for third-degree or fourth-degree lacerations (20).

In a prospective, nonrandomized, observational study, episiotomy was found to increase the length of perineal lacerations by an average of 3 cm when compared with women who did not undergo episiotomy; 89% of the episiotomies performed in that study were midline, so the authors were not able to compare midline and mediolateral approaches (35). Comparing restrictive episiotomy practices to routine performance, a meta-analysis of eight randomized trials (5,541 women) found that restrictive practices (28% episiotomy rate) were associated with a lower risk of severe perineal trauma (RR, 0.67; 95% CI, 0.49–0.91), posterior perineal trauma (RR, 0.88; 95% CI, 0.84–0.92), need for suture repair of perineal trauma (RR, 0.71; 95% CI, 0.61–0.81), and healing complications at 7 days (RR, 0.69; 95% CI, 0.56–0.85) compared with patients in the routine episiotomy study arm (75% episiotomy rate). Only anterior perineal trauma increased with the restrictive use of episiotomy (RR, 1.84; 95% CI, 1.61–2.10). This review also was not able to distinguish the contributions of mediolateral versus midline episiotomy (10).



Anal sphincter injuries may be reduced with mediolateral episiotomy. The Collaborative Perinatal Project described the association of episiotomy type and OASIS in 24,114 women. Adjusted odds ratios for OASIS increased with midline episiotomy among primiparous women (adjusted OR, 4.2; 95% CI, 1.8–10.0) and multiparous women (adjusted OR, 12.8; 95% CI, 5.4–30.3), whereas mediolateral episiotomy was associated with a reduced risk of OASIS in primiparous women (adjusted OR, 0.4; 95% CI, 0.2–0.9) but had no effect on OASIS in multiparous women (36).

Retrospective cohort data found mediolateral episiotomy protective from fecal incontinence after anal sphincter complex injury in primiparous women compared with women who did not have a mediolateral episiotomy (adjusted OR, 0.17; 95% CI, 0.05–0.61) (37). When comparing routine use of mediolateral episiotomy (72% received episiotomy) versus restrictive use (27% of women received episiotomy), the incidence of OASIS increased from 0.2% to 1% with restrictive use of mediolateral episiotomy in primiparous women (38). In a prospective trial of 407 primigravida women who were randomized to either routine midline versus mediolateral episiotomies, significantly more women resumed sexual intercourse at 1 month postpartum (18% versus 6% in the midline versus mediolateral groups, respectively, $P < .01$). However, no differences in the proportion of women resuming sexual intercourse were noted between the groups by 3 months after episiotomy (39). In another prospective cohort trial in 519 women, routine mediolateral episiotomy when compared to no episiotomy was associated with significantly higher rates of perineal pain (OR, 3.1; 95% CI, 1.2–8.0) and dyspareunia (OR, 2.4; 95% CI, 1.1–5.5) at 3 months postpartum (40). Because mediolateral episiotomy has been associated with decreased OASIS in retrospective studies, proponents have argued that routine performance will protect the pelvic floor. Although observational data support a possible reduction in third-degree and fourth-degree lacerations, data are insufficient to support long-term improvement in pelvic floor function with routine mediolateral episiotomy. If there is need for episiotomy, mediolateral episiotomy may be preferred over midline episiotomy because of the association of midline episiotomy with increased risk of injury to the anal sphincter complex (36); however, limited data suggest mediolateral episiotomy may be associated with an increased likelihood of perineal pain and dyspareunia (40).

► *Which obstetric lacerations should be repaired?*

Diagnosis of obstetric lacerations in the setting of perineal trauma requires adequate lighting, exposure,

and analgesia. If a deep perineal laceration is noted, a digital rectal examination can improve the diagnosis of OASIS (41). For repair, the laceration apex must be identified for adequate closure and hemostasis. When complex lacerations exist or if there is excessive bleeding, better positioning, visualization, suitable lighting, and assistance may be necessary to perform the repair.

Periclitoral, Periurethral, and Labial Lacerations

Small tears of the anterior vaginal wall and labia are relatively common, are often superficial with no bleeding, and can be left unrepaired (6, 42). One randomized, controlled trial (80 women) noted no differences in healing of minor lacerations of the labia whether the lacerations were sutured or left to heal spontaneously (43). Expert opinion is to repair periclitoral, periurethral, and labial lacerations that are bleeding or distort anatomy (6, 42).

Spontaneous First-Degree and Second-Degree Lacerations

Although most perineal lacerations are sutured, insufficient evidence exists to recommend surgical or nonsurgical repair of first-degree or second-degree perineal tears sustained during childbirth. A systematic review of the limited evidence available from two randomized controlled trials (154 women) found no difference between groups (surgical versus nonsurgical repair) with regard to short-term clinical outcomes up to 8 weeks postpartum (44). However, neither trial reported any long-term follow-up on perineal function, psychological well-being, or outcomes and complications (44). A prospective cohort study of 172 women found no difference at 6 weeks or 12 weeks postpartum between sutured and nonsutured groups with regard to urinary or anal incontinence, sexual activity, or sexual function (45). Because of the lack of evidence that one approach is superior to the other, clinical judgment should determine whether to repair a first-degree or second-degree laceration.

Overt Versus Occult Obstetric Anal Sphincter Injuries

In women who undergo a vaginal delivery, overt OASIS (ie, clinically recognized at the time of occurrence) has been reported in 4% of women in the United States (8). Occult OASIS, or laceration of the anal sphincter complex with no clinical findings but later identified by endoanal ultrasonography, has been reported to occur in 27% of women after their first vaginal delivery (46). Clinical training and experience can significantly influence the reported incidence of anal sphincter tears through the recognition and assessment of the extent of overt laceration, and by the



skills and criteria used in interpretation of the imaging of the anal sphincter complex for occult lacerations.

Two prospective observational trials from England have shown improved detection of overt OASIS in women undergoing a vaginal delivery when a trained clinical research fellow repeats a perineal and rectal examination after the delivery attendant's assessment but before suturing of the perineum. One trial compared the group who underwent additional assessment with a control group of women managed routinely. There were significantly more third-degree tears identified in the two-assessment group versus the control group (15% versus 8%, respectively; $P=.01$) (47). A second study demonstrated that the identification of overt OASIS increased from 11% to 25% ($P<.01$) when women were re-examined (41).

Variations in occult OASIS incidence diagnosed by endoanal ultrasonography are influenced by interpretation and by observer error. Although intraobserver variation has been reported as showing substantial agreement ($\kappa=0.63$), interobserver variation has been reported as only fair ($\kappa=0.34$) (48). In a randomized controlled trial in which women with second-degree lacerations identified immediately after delivery were allocated to either clinical examination and laceration repair or to endoanal ultrasonography and sphincter repair if a full-thickness OASIS injury was found, there were no differences in reported fecal incontinence symptoms at 3-months or 1-year postpartum. However, women who underwent endoanal ultrasonography evaluation and treatment were less likely to report symptoms of severe incontinence at the same time intervals. Importantly, 24% of women diagnosed with a sphincter tear by endoanal ultrasonography did not have confirmation of anal sphincter damage at the time of surgical exploration, which suggests a high false-positive rate for endoanal ultrasonography in identifying anal sphincter disruption (49).

Implementation of education programs to improve identification of severe perineal lacerations may increase the detection of overt OASIS, which can then be repaired at the time of delivery. Routine endoanal ultrasonography immediately postpartum for the identification of occult OASIS is of limited value and not recommended.

► *How should lacerations other than OASIS be repaired?*

First-Degree Perineal Lacerations

A systematic review of two randomized controlled trials (2,603 women) found that leaving the perineal skin unsutured but apposed (with the vagina and perineal muscles sutured) may be more effective than conventional repair in reducing dyspareunia and perineal pain in first-degree and second-degree tears and episiotomies, but may

increase the proportion of women with a gaping wound at 48 hours (50). First-degree lacerations that do not distort anatomy and are not bleeding may not need to be repaired.

A randomized controlled trial that compared adhesive glue to traditional suturing for closure of first-degree perineal tears without "excessive bleeding" found that at 6 weeks postpartum the cosmetic and functional results of the two closure methods were similar. Additionally, the use of adhesive glue was associated with a shorter mean repair time (2.3 minutes versus 7.8 minutes), less need for local anesthetic (3% versus 66%), and a lower patient visual pain analog score (1.7 versus 4.1) (51). Either standard suture or adhesive glue may be used to repair a hemostatic first-degree laceration or the perineal skin of a second-degree laceration.

Episiotomy and Second-Degree Lacerations

Continuous suturing of a second-degree laceration is preferred over interrupted suturing. Meta-analysis of 16 trials (8,184 women) that compared continuous versus interrupted absorbable sutures (for all layers or perineal skin only) for repair of episiotomy and second-degree perineal tears found that continuous repairs are associated with less pain for up to 10 days postpartum (RR, 0.76; 95% CI, 0.66–0.88; nine trials, 4,231 women), less analgesia use (RR, 0.70; 95% CI, 0.59–0.84; six trials, 2,971 women), and a lower risk of having to have suture material removed postpartum (RR, 0.56; 95% CI, 0.32–0.98; six trials, 3,453 women). However, no differences were seen in dyspareunia, long-term pain, or the need for wound resuturing (52).

An absorbable synthetic suture such as polyglactin is recommended for repair of first-degree and second-degree lacerations. In a meta-analysis (11 trials; 5,072 women), absorbable synthetic suture was compared with catgut and found to be associated with less pain up to 3 days after delivery (RR, 0.83; 95% CI, 0.76–0.90; nine trials, 4,017 women) and less analgesia up to 10 days postpartum (RR, 0.71; 95% CI, 0.59–0.87, five trials, 2,820 women) (53). More women with catgut suture required resuturing compared with those who received absorbable synthetic suture (RR, 0.25; 95% CI, 0.08–0.74, four trials, 2,402 women), although the numbers of women requiring resuturing in both groups were small. More women with absorbable synthetic suture required the removal of unabsorbed suture material (RR, 1.81; 95% CI, 1.46–2.24; three trials, 2,520 women) as compared with catgut. Comparing absorbable synthetic with rapidly absorbing synthetic suture showed no differences in short-term and long-term pain, with fewer women with rapidly absorbing suture using analgesics at 10 days postpartum (RR, 0.57; 95% CI,



0.43–0.77; one trial, 1,539 women). More women in the absorbable synthetic suture group required suture removal compared with those in the rapidly absorbed suture group (RR, 0.24; 95% CI, 0.15–0.35; two trials, 1,847 women). There were no differences between groups for long-term pain at 3 months after delivery, dyspareunia at 3 months, or dyspareunia at 6–12 months (53).

In one randomized trial, adhesive glue was compared with suture in women undergoing mediolateral episiotomy as an option for closing the perineal skin after repair of the perineal muscles and subcutaneous tissue with suture. No differences in reported pain while lying, sitting, or walking were noted between groups, and the application of the skin adhesive required less time than subcuticular suturing (19 minutes versus 23 minutes; $P < .01$) (54).

Vulvar, Vaginal, and Cervical Lacerations

In the absence of bleeding or distortion of anatomy, vulvar, vaginal, or cervical lacerations usually are not repaired. There are no data on which to recommend a specific practice for closure of vulvar, vaginal, and cervical laceration. Clinical practice generally is guided by experience and expert opinion.

The repair of vulvar or vaginal lacerations is similar to that of first-degree and second-degree perineal lacerations. If a laceration needs repair, use of running-locking suture or interrupted suture that incorporates the underlying tissue to restore normal anatomy is recommended. Expert opinion suggests either 2-0 chromic or polyglactin suture may be used for this closure, with each bite incorporating substantial amounts of tissue (6, 42).

Hemorrhage from cervical lacerations usually arises from the upper angle of the laceration. The first suture, using absorbable material, is placed above the apex of the laceration. Subsequently, either interrupted or continuous locking sutures of 2-0 chromic or polyglactin are placed outward toward the operator through the raw edges of the laceration, incorporating the entire thickness of the cervix (6, 42).

► **What technique should be used for repair of lacerations that involve the internal and external anal sphincter?**

Suture Technique for Anal Mucosa

Expert opinion varies on the technique and type of suture material that should be used to repair the anal epithelium. A subcuticular running repair that uses a transvaginal approach and interrupted sutures with knots tied in the anal lumen have been described (6, 42, 55). Suggested

suture materials have been a delayed absorbable 4-0 or 3-0 polyglactin or chromic. Some experts recommend that a second suture layer be placed through the rectal muscularis using a 3-0 polyglactin suture in a running or interrupted fashion (6, 42). No comparative trials of the various techniques or types of suture materials have been performed.

Suture Technique for the Internal and External Anal Sphincter

If the internal anal sphincter can be adequately identified, repair has been recommended either as a part of the distal portion of the reinforcing second layer of the rectal muscularis using a 3-0 polyglactin suture or separately from the external anal sphincter using a 3-0 monofilament polydioxanone suture (6, 56).

End-to-end and overlap repair are two recognized methods for repairing the external anal sphincter. Care should be taken to identify the torn ends of the anal sphincter. The two edges usually will be retracted laterally, and Allis clamps may be necessary to identify the torn edges and bring them together in the midline. When repairing the anal sphincter, it is important to suture the fascial sheath and not just the muscle. In the end-to-end repair, the torn ends of the external anal sphincter are approximated and sutured. The overlapping repair brings one end of the torn external anal sphincter over the other for suturing. Because the overlap repair requires a full thickness disruption and 1–1.5 cm of torn muscle on either end, overlap should not be used for grade 3a and partial thickness grade 3b sphincter injuries. Expert opinion has recommended use of 3-0 polyglactin, 3-0 polydioxanone, or 2-0 polyglactin suture (6, 56).

A meta-analysis of six randomized controlled studies (588 women) of variable quality that compared end-to-end repair versus overlap repair for a grade 3c or greater laceration found no differences between the two techniques at 12 months in incidence of perineal pain, dyspareunia, or flatal incontinence. However, a lower incidence of fecal urgency (RR, 0.12; 95% CI, 0.02–0.86; one trial, 52 women) and lower anal incontinence scores (standardized mean difference, -0.70 ; 95% CI, -1.26 to -0.14 ; one trial, 52 women) were observed in women undergoing overlap repair. The overlap technique was associated with a lower risk of anal incontinence symptoms over 12 months (RR, 0.26; 95% CI, 0.09–0.79; one trial, 41 women). There were no significant differences in quality of life or in anal incontinence symptoms (either flatal incontinence or fecal incontinence) 36 months after repair (57). For full-thickness external anal sphincter lacerations, end-to-end repair or overlap repair is acceptable.



The only randomized controlled trial that compared suture types in the repair of anal sphincter injury (with no attempt made to separately identify the internal anal sphincter) did not find a difference between 3-0 polydioxanone or 3-0 polyglactin suture-related morbidity at 6 weeks postpartum or level of bowel continence or quality-of-life score at 3 months postpartum (58). There are currently no studies evaluating bioadhesives for the closure of injuries to the internal anal sphincter or external anal sphincter and, therefore, bioadhesives are not recommended for repair.

Antibiotics for Obstetric Anal Sphincter Injuries

Wound complications including infection, breakdown, or both, from OASIS are decreased when intrapartum antibiotics are administered for any indication (eg, prophylaxis for group B streptococci or chorioamnionitis). In two cohort investigations from the same institution, intrapartum antibiotics were protective in a retrospective (OR, 0.29; 95% CI, 0.14–0.59) and prospective study (adjusted OR, 0.50; 95% CI, 0.27–0.94) (59, 60). In a randomized controlled trial in which patients received a single dose of a second-generation cephalosporin (cefotetan or cefoxitin) versus placebo at the time of repair for OASIS, there were significantly lower rates of postpartum wound complications at 2 weeks with antibiotic use compared with placebo (8% versus 24%, $P=.04$) (61). Although one retrospective study noted an increased rate of perineal wound complications with administration of antibiotics in the immediate postpartum period (OR, 2.46; 95% CI, 1.11–5.63), the authors recommended caution with the interpretation of this observation because none of these patients were given antibiotics at the time of OASIS repair, and antibiotics may have been administered to patients whose wounds appeared infected on postpartum examination (59). A single dose of antibiotic at the time of repair is reasonable in the setting of obstetric anal sphincter injuries, but further research is needed to determine whether severe perineal lacerations warrant routine postpartum antibiotics to prevent complications.

► **What are the immediate sequelae and long-term effects of severe perineal trauma?**

Retained sponges are an uncommon but preventable occurrence after repair of obstetric lacerations. Sponges can be difficult to identify after they are soaked in blood, and retention can cause fever, pain, infection, and psychological harm postpartum. To avoid retained sponges or needles after perineal laceration repair, the same principles that apply to operating room procedures

should apply to repairs of perineal trauma. These include before and after counts of sponges and needles, use of sponges that are detectable on radiography with safety features such as tags and, if a retained sponge is suspected, vaginal examination with pelvic radiography. The sponge count should be recorded in the permanent medical record (62).

During the first 6 weeks postpartum after OASIS, approximately 25% of women experience a wound breakdown, and 20% experience a wound infection. Women who experience a wound complication have significantly more pain than women with normal healing, and this elevated level of pain persists up to 12 weeks postpartum (60).

Perineal–rectal and rectal–vaginal fistulas may develop from unidentified, unrepaired, or poorly healed lacerations. Women who sustain severe perineal tears in their first birth are significantly more likely to have an “associated surgical procedure” within the 12 months after birth. Associated procedures include vaginal, rectal, or anal repair after primary repair, fistula repair, and urinary or fecal incontinence repair (OR 7.6; 95% CI, 6.21–9.22) (63). In the United States, approximately 9% of rectovaginal fistula repairs are associated with obstetric trauma. The rate of rectovaginal fistula repair has steadily dropped, decreasing to 2 per 100,000 women in 2006. The decrease in fistula repairs appears to be linked to decreases in episiotomy, anal sphincter lacerations, and operative vaginal delivery (64).

► **How should women with OASIS be managed postpartum?**

Immediate Care

Immediate care after OASIS includes pain control, avoidance of constipation, and evaluation for urinary retention. Management of post-OASIS constipation was studied in one randomized controlled trial that compared 3 days of an oral laxative (lactulose) versus a constipating regimen (codeine phosphate). The use of an oral laxative was associated with significantly less pain (median pain visual analog scale 2 versus 3 at the time of first bowel movement, $P<.01$) and earlier bowel movements (median 2 days versus 4 days, $P<.01$), compared with the constipating regimen (65). Stool softeners and oral laxatives should be prescribed to women who sustain OASIS and counseling postpartum should include discussing ways to avoid constipation.

Adequate pain control also is an important part of managing severe perineal trauma. Local treatment options include topical anesthetic sprays or creams, icepacks, baths, and rectal suppositories. A meta-



analysis showed no improvement in pain control when topical anesthetics were compared with placebo (66). There is limited evidence to support the effectiveness of local cooling treatments, including ice packs, cold gel pads, and cold or iced baths, applied to the perineum after childbirth to relieve pain. The largest trial available noted that the group that received ice packs reported significantly less moderate or severe pain between 24 hours and 72 hours after birth compared with women who received no treatment (RR, 0.61; 95% CI, 0.41–0.91, 208 women) (67). Rectal suppositories (diclofenac and indomethacin) when compared with placebo in the first 24 hours after birth did not influence patients' numerical pain score; however, the use of additional analgesia for perineal pain was reduced (RR, 0.31; 95% CI, 0.17–0.54, one trial, 89 women) (68). Although women with third-degree and fourth-degree lacerations were included in this trial, the number of women with fourth-degree lacerations was not specified. Expert opinion suggests that rectal suppositories should be used cautiously in women with a fourth-degree laceration because of the theoretical risk of poor wound healing and disruption of the repair. Nonsteroidal antiinflammatory or opiate agents can be offered for pain control, but should be coupled with oral laxatives and stool softeners to help mediate the significant constipating adverse effects of these medications.

Women who sustain severe perineal trauma should be monitored for urinary retention (69). Spontaneous voiding should be carefully monitored, and women that are unable to pass urine or develop discomfort due to bladder distention require prompt evaluation.

Complications

Bleeding from obstetric laceration sites is one of the most frequent complications. Such bleeding usually is easily controlled with conservative measures and compression, but substantial hematoma formation may occur. Infection also may complicate laceration healing. In most cases, such infections are localized and may resolve with perineal wound care. In rare cases, an abscess may form, which results in either the spontaneous breakdown of the repair or the need for intentional disruption of the repair in order to evacuate the abscess. In extreme cases, infections such as necrotizing fasciitis can cause maternal death if not effectively evaluated and treated. In cases of less severe infection with wound breakdown, several approaches can be used. For superficial breakdowns that do not involve the rectum or anal sphincter, expectant management with perineal care may allow spontaneous healing to occur over a period of several weeks. For more extensive breakdowns, or when the logistics of many follow-up visits may be prohibitive, primary closure of

the defect may be attempted. Data suggest that early closure of laceration dehiscence in properly selected cases may be appropriate (70). In rare cases, inadequately repaired lacerations may lead to rectovaginal fistula formation (71). Repair of such defects can be challenging, depending on size and location, and should be repaired by someone familiar with fistula repair techniques, and should be attempted only when all signs of infection have resolved.

Short-term (Postpartum) and Long-term Care

Patients with OASIS should be monitored frequently to evaluate wound healing. Although there are no standard guidelines for follow up, because of the increased rate of wound complications in the short-term postpartum period, expert opinion recommends early and consistent follow-up to reduce the rate of hospital readmissions (60). Pelvic floor exercises performed with a vaginal device that provides resistance or feedback may decrease postpartum urinary incontinence, but the effect on anal incontinence has been mixed with no demonstration of a durable long-term effect (72). The addition of biofeedback physiotherapy has been suggested as a way to improve motor and sensory function and lead to an increase in cortical awareness of the sphincter complex. However, a randomized controlled trial that compared biofeedback physiotherapy to pelvic floor exercises did not show any benefit for quality of life or for fecal incontinence symptoms (73). Women with a history of OASIS are at increased risk of developing anal incontinence (74). No post-OASIS strategies are proved to prevent the development of anal incontinence. Because effective treatments are available for women who develop anal incontinence, women identified with a history of OASIS should be asked about symptoms and referred for further treatment if symptoms are present.

► *How should women with perineal lacerations be counseled about delivery in subsequent pregnancies?*

Interventions in a subsequent pregnancy may be advantageous to reduce the risk of further perineal trauma and the associated morbidities. To date, no prospective trial has evaluated intervention for ensuing pregnancies in women who have previously sustained OASIS (75). Although the risk of OASIS is increased in women who had an OASIS at a previous delivery when compared with women without (OR, 4.2; 95% CI, 3.9–4.5), the absolute risk is low (3%) (72, 73). Large retrospective studies have shown that 67–90% of women with a previous OASIS undergo a subsequent vaginal delivery (76,



77). Although screening methods such as endoanal ultrasonography and anal manometry have been used to determine if women with previous OASIS should attempt a repeat vaginal delivery or undergo cesarean delivery, no differences in fecal urgency, anal incontinence, or bowel-related quality-of-life measures were demonstrated in women after a vaginal or cesarean delivery compared with before parturition (78).

When deciding on the mode of delivery, women should take into consideration the increased morbidity associated with cesarean delivery and balance it against the low risk of OASIS recurrence. Women need to be aware that once a cesarean delivery is performed for this indication, it would become a recurrent recommendation and consequently compound the morbidity of subsequent deliveries. Expert opinion suggests that in a woman with a history of OASIS, a cesarean delivery may be offered in subsequent pregnancies if any of the following is noted: she experienced anal incontinence after the delivery, had complications including wound infection or a need for a repeat laceration repair, or expresses suffering psychological trauma and requests a scheduled cesarean delivery. Thus, the management of a subsequent pregnancy will depend on symptomatic and clinical evaluation. Women who have a history of OASIS should be counseled that the absolute risk of a recurrent OASIS is low with a subsequent vaginal delivery; however, it is reasonable to perform a cesarean delivery based on patient request after advising of the associated risks. Asymptomatic women without any evidence of sphincter compromise may be allowed to have a vaginal delivery (1).

Summary of Recommendations

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

- ▶ Because application of warm perineal compresses during pushing reduces the incidence of third-degree and fourth-degree lacerations, obstetrician–gynecologists and other obstetric care providers can apply warm compresses to the perineum during pushing to reduce the risk of perineal trauma.
- ▶ Restrictive episiotomy use is recommended over routine episiotomy.
- ▶ For full-thickness external anal sphincter lacerations, end-to-end repair or overlap repair is acceptable.
- ▶ ~~A single dose of antibiotic at the time of repair is recommended in the setting of OASIS.~~

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

- ▶ A single dose of antibiotic at the time of repair is reasonable in the setting of obstetric anal sphincter injuries.
- ▶ Perineal massage during the second stage of labor may help reduce third-degree and fourth-degree lacerations.
- ▶ If there is need for episiotomy, mediolateral episiotomy may be preferred over midline episiotomy because of the association of midline episiotomy with increased risk of injury to the anal sphincter complex; however, limited data suggest mediolateral episiotomy may be associated with an increased likelihood of perineal pain and dyspareunia.
- ▶ Either standard suture or adhesive glue may be used to repair a hemostatic first-degree laceration or the perineal skin of a second-degree laceration.
- ▶ Continuous suturing of a second-degree laceration is preferred over interrupted suturing.

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

- ▶ Stool softeners and oral laxatives should be prescribed to women who sustain OASIS, and counseling postpartum should include discussing ways to avoid constipation.
- ▶ Women who have a history of OASIS should be counseled that the absolute risk of a recurrent OASIS is low with a subsequent vaginal delivery; however, it is reasonable to perform a cesarean delivery based on patient request after advising of the associated risks.
- ▶ If the internal anal sphincter can be adequately identified, repair has been recommended either as a part of the distal portion of the reinforcing second layer of the rectal muscularis using a 3-0 polyglactin suture or separately from the external anal sphincter using a 3-0 monofilament polydioxanone suture.

For More Information

The American College of Obstetricians and Gynecologists has identified additional resources on topics related to this document that may be helpful for ob-gyns, other health care providers, and patients. You may view these resources at www.acog.org/more-info/PerinealLacerations.

These resources are for information only and are not meant to be comprehensive. Referral to these resources does not imply the American College of Obstetricians and Gynecologists' endorsement of the organization, the



organization's website, or the content of the resource. The resources may change without notice.

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Prevention and management of obstetric lacerations at vaginal delivery. ACOG Practice Bulletin No. 198. American College of Obstetricians and Gynecologists. *Obstet Gynecol* 2018;132:e87–102.

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 1985 and March 2018. 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.



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