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Techniques for Repair of Obstetric Anal Sphincter Injuries

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Abstract

Importance—Obstetric anal sphincter injuries (OASIS) complicate up to 11% of vaginal deliveries; obstetricians must be able to recognize and manage these technically challenging injuries.

Objective—To share our approach for management of these challenging complications of childbirth based on a multidisciplinary collaboration between general obstetrician-gynecologists, maternal fetal medicine specialists, and female pelvic medicine and reconstructive surgeons established at our institution.

Evidence Acquisition—A systematic literature search was performed in 3 search engines: PubMed 1946-, Embase 1947-, and The Cochrane Database of Systematic Reviews using keywords for obstetric anal sphincter injuries and episiotomy repair.

Results—Identification should begin with an assessment of risk factors, notably nulliparity and operative vaginal delivery, consistently associated with the highest risk of OASIS, and proceed with a thorough examination to grade the degree of laceration. Repair should be performed or supervised by an experienced clinician in an operating room with either regional or general anesthesia. The external anal sphincter may be repaired using either an overlapping or end-to-end anastomosis. Providers should be comfortable with both approaches as the degree of laceration may necessitate one approach over the other. We advocate for use of monofilament suture on all

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layers to decrease risk of bacterial seeding as well as preoperative antibiotics and postoperative bowel regimen, which are associated with improved outcomes.

Conclusions and Relevance—Long-term sequelae, including pain, dyspareunia, and fecal incontinence, significantly impact quality of life for many patients who suffer OASIS and may be avoided if evidence-based guidelines for recognition and repair are utilized.

Target Audience—Obstetricians and gynecologists, family physicians

Introduction and Background

Despite increasing attention on prevention of obstetric anal sphincter injuries (OASIS), these still occur in up to 11% of vaginal deliveries (1). Therefore, it is incumbent upon obstetricians to be well-versed in techniques to prevent OASIS and the optimal management of these technically-challenging injuries. However, recent studies have noted that obstetrics and gynecology residents are poorly trained to identify and repair third and fourth degree lacerations (2,3). At our institution, we have begun collaboration among general obstetrician-gynecologists, maternal-fetal medicine specialists, and female pelvic medicine and reconstructive surgeons to improve provider education at all levels surrounding management and repair of OASIS. In this review, we share our approach for the repair and management of these challenging complications of childbirth.

In the United States, the definition and classification of OASIS generally follows that outlined by the American Congress of Obstetricians and Gynecologists (ACOG) (4). OASIS includes third and fourth degree lacerations. Among 3a lacerations, less than 50% of the external anal sphincter thickness is torn; 3b means more than 50% of the external anal sphincter is torn; 3c is defined by both the external and internal anal sphincters being torn; fourth degree lacerations are diagnosed when both the sphincter complex as well as the anal epithelium itself are torn (4).

The exact incidence of OASIS is difficult to establish reliably due to differences in coding and reporting. However, the most recent data from the Nationwide Inpatient Sample from the Agency for Healthcare Research and Quality report an incidence of third degree lacerations of 3.3% and of fourth degree lacerations 1.1% (5). This likely underestimates the true incidence of these injuries (1).

Part of the reason for underestimation of the incidence of OASIS is difficulty in correctly diagnosing the condition at time of delivery. It is estimated that failure to diagnose OASIS occurs in up to 40% of cases, and having a trained senior examiner re-examine the patient prior to repair can double detection rates (6,7). In any questionable case, a second, more senior, examiner should be asked to examine the patient prior to repair.

Although difficult to accurately predict, certain risk factors may suggest an increased risk of OASIS in patients presenting to labor and delivery. Nulliparity is consistently associated with increased risk of OASIS, with some authors reporting up to a 10-fold higher risk compared to multiparous patients (8-11). Further, data suggests that the risk actually lies in the first *vaginal* delivery with patients undergoing vaginal birth after Cesarean at similar risk (OR 5.1-5.46) as nulliparous women (8,12). Risk of OASIS also varies among races. Asian

and Indian races confer the highest risk, nearly 3-fold higher than Caucasians (8,13), while African American race appears to provide a protective effect (OR 0.37)(9). Additionally, increasing neonatal birth weight contributes to an increased risk of OASIS(11). The risk is slightly increased with birth weights over 3500g (9,12) and nearly 2.5-fold higher when birth weight exceeds 4000g (8).

Events during labor and delivery may further increase the risk of OASIS. Notably, operative vaginal delivery is consistently associated with increased risk. Most studies suggest higher risk with use of forceps (up to 13-fold) compared with vacuum-assisted deliveries (up to 4-fold) (8-10,14). Increasing duration of the second stage, midline episiotomies and vertex malpresentation (primarily occiput posterior) have also been associated with increased risk (8,9,12,14). Presence of more than one of these risk factors appears to confer an even greater risk (14). Despite these known risk factors, adequately predicting which patients will ultimately suffer OASIS remains challenging.

Repair of OASIS

The use of evidence-based methods to achieve an adequate primary repair is important in order to reduce potential morbidity that can result from wound infection, breakdown, or incomplete healing of the anal sphincter complex. Providers at our institution employ the following evidence-based approach (Table 1, Figure 1), which is consistent with the recommendations set forth by both ACOG and the Royal College of Obstetricians and Gynecologists (RCOG) on effective methods for OASIS repair (4,15). Providers with experience in OASIS identification and repair are available to either perform or supervise all repairs at our institution. All repairs are performed in an operating room with adequate lighting, and use of regional or general anesthesia to facilitate patient comfort and appropriate positioning. The patient is positioned in the dorsal lithotomy position in boot stirrups (Allen Yellofins® Acton, MA), the perineum and vagina are prepped with 4% chlorhexidine, and a sterile surgical drape is applied. A foley catheter is placed at the start of the procedure.

In the event of a fourth degree laceration, repair of the anal mucosa is performed first with a running stitch of 4-0 Monocryl. We prefer to use monofilament suture for all aspects of the repair due to the increased bacterial adherence and subsequent infection risk with multifilament suture (16).

After the anal mucosa has been reapproximated, or in the case of a third degree laceration with complete disruption of the sphincter complex, the next step is identification and repair of the internal anal sphincter (IAS). The IAS is responsible for the majority of anal sphincter resting tone and should be repaired when identified. The IAS is repaired via end-to-end anastomosis using a simple running stitch of 3-0 or 4-0 PDS. This layer can be difficult to identify as it is often retracted laterally and is substantially thinner than the external anal sphincter (EAS). Identification is most easily achieved by using Allis clamps to grasp the laterally-retracted fibers of the EAS and pull toward the midline. The EAS and IAS overlap for about 1.7cm, and the IAS extends cephalad about 1.2cm from the proximal margin of the EAS (17). With traction on the edges of the EAS, the thinner IAS can often be identified

extending more proximally. Knowledge of this anatomical relationship is imperative in order to correctly identify the IAS.

Next, attention should turn to the EAS. There are two primary techniques for repairing the EAS, overlapping and end-to-end reapproximation, and knowledge of both methods enables providers to select the technique most appropriate for the clinical scenario. Overlapping repair of the EAS is performed using simple interrupted stitches of 3-0 PDS with the goal of overlapping the transected edges of the EAS by 1.5-2cm in the midline. Sequential sutures are passed full-thickness through both segments of the torn EAS and tied above the superior segment. Three-to-four sutures are placed to completely and securely reapproximate the full length of the overlapped segments. End-to-end anastomosis involves direct reapproximation of the ends of the torn EAS with horizontal mattress stitches of 3-0 PDS. Typically, in an end-to-end repair we place 4 sutures – one on each the posterior, inferior, superior, and anterior surfaces – to completely reapproximate the full surface of the torn EAS edges.

Data from a 2013 Cochrane Review suggests better short-term outcomes associated with the overlapping technique with less fecal urgency and anal incontinence symptoms at 12 months (18). Long-term outcomes, however, suggest no difference between repair techniques when quality of life and anal incontinence are evaluated at 36 months (18). To date, no studies evaluate outcomes past 36 months, yet complications like fecal incontinence do not typically present until many years after completion of childbearing. When possible, we prefer the overlapping technique compared to the end-to-end technique, as it allows reapproximation of the full-thickness, intact sphincter. At the time of OASIS, the sphincter edges are often frayed and irregular, and placement of sutures in line with the muscle fibers, as occurs with the end-to-end technique, may increase the risk that the sutures pull through. Furthermore, the overlapping technique results in reapproximation of a larger surface area of muscle fibers, which ensures there is adequate overlap of healthy, well-perfused tissue to promote optimal healing.

Once the anal sphincter complex is repaired, the remainder of the laceration is repaired like a typical second-degree laceration. The deep layers of the vagina and the perineal body are reapproximated with figure-of-eight sutures of 2-0 Monocryl. Contrary to most descriptions of repair of the deeper tissues of an obstetric laceration, we prefer the interrupted fashion of a figure-of-eight stitch as it gives excellent tissue approximation with less chance of pull-out or tearing through the edematous and friable post-labor vaginal fibromuscular tissue. In addition, a running closure is dependent upon one suture strand, thus compromising the repair if the suture should break or pull through. Once reapproximated, the superficial vaginal epithelium and perineal epithelium are repaired with a single, running, intracutaneous 3-0 Monocryl. Continuous suture repair of the vaginal and perineal epithelium has consistently been associated with less pain, less analgesic use, shorter repair time, and similar outcomes when compared to interrupted suture repair of the perineum (19-22). Separate closure of the deep vaginal laceration and perineal body ensures adequate tissue approximation to decrease the risk of hematoma formation and reduce the tension on the epithelial stitch.

Adjunctive measures: Antibiotics, Bowel Regimen, and Analgesia

In line with ACOG's recommendation, we routinely administer a single dose of antibiotics at the time of laceration repair (4). The only randomized-controlled trial of antibiotics in OASIS repair used a second-generation cephalosporin (1 gram of cefoxitin or cefotetan) or, in allergic patients, 900 mg of clindamycin (23). This reduced rates of postoperative wound complications from 24% to 8% ($p=0.04$) (23). Because there are few if any other routine uses of second-generation cephalosporins on the labor and delivery floor, these may need to be specially stocked in the medication administration room. The role of additional prophylactic antibiotics in patients already receiving antibiotics for other indications (such as group-B strep positive status or chorioamnionitis) has not been studied. However, patients receiving antibiotics for other indications have been demonstrated to have lower rates of wound complications after OASIS, suggesting that these are beneficial (24-25). Therefore, we do not routinely add additional antibiotics at time of OASIS repair if the patient has already been receiving them for other indications.

All patients are placed on a strict bowel regimen after repair. Studies comparing intentional constipation versus promotion of stooling have demonstrated improved outcomes with a laxative regimen (26). In a randomized controlled trial of 105 women with third degree lacerations, patients were randomized to three days of lactulose or three days of codeine followed by lactulose (26). As expected, the patients in the constipated group had delayed bowel movements, increased rates of difficult bowel movements (19% versus 5%) and more painful first bowel movements (26). There was no improvement in continence scores, anal manometry findings, or results on endoanal ultrasound in follow-up (26). The use of a stool-bulking agent in addition to a laxative has not been shown to be beneficial (27). We routinely prescribe polyethylene glycol 17 g twice daily in the initial postpartum period. Once the patient is having soft bowel movements, the medication can be self-titrated for up to six weeks postpartum to achieve soft bowel movements while avoiding diarrhea.

Adequate analgesia is also of primary importance after OASIS repair. Typically, we prescribe ice packs and non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen. Local cooling reduces pain scores in most studies (28), although data remain limited. Topical analgesics such as lidocaine or pramoxine have not been demonstrated to be any more effective than placebo (29). However, many women do find these effective and they are commonly prescribed. Narcotics are best avoided due to their constipating effects, but sometimes may be necessary.

Patient Follow-up

At the conclusion of the repair, patients are monitored in the recovery room until recovery from anesthesia is complete. The foley catheter is left in place overnight, and a voiding trial is performed on post-operative day number one. Postpartum urinary retention, which occurs in 4-45% of deliveries, may predispose to bladder dysfunction later in life and should be monitored in these patients postoperatively (30). Risk factors for postpartum urinary retention are similar to risk factors for OASIS and include increased birth weight, instrumental delivery, and nulliparity(30-31). Episiotomy and OASIS are also independent

risk factors (30-31). Our retrograde void trial is performed on postoperative day number one by retrograde-filling the bladder with 300cc sterile water under gravity and removing the catheter. The patient is asked to void within 30 minutes of the bladder fill, and the volume is recorded. Post-void residual (PVR) volumes greater than 150cc are indicative of urinary retention and intermittent catheterization is performed regularly until resolution of incomplete bladder emptying. Postpartum urinary retention is typically a self-limited condition, and most patients recover spontaneously after several days (30).

Duration of hospitalization is primarily based on obstetric and postpartum indications, and OASIS repair does not routinely prolong hospitalization in these patients. The perineum is examined prior to discharge to ensure adequate perineal hygiene and monitor for early wound separation. Patients return for a wound examination one-to-two weeks after discharge to evaluate for wound separation, suture extrusion, or early evidence of infection or hematoma as these increase the risk of subsequent wound breakdown. We recommend strict pelvic rest for six weeks after repair in order to allow adequate time for wound healing. The early follow up visit provides an opportunity to review the laceration severity, repair, and postoperative instructions. It also provides an opportunity to monitor for constipation, voiding dysfunction, and pain control.

Conclusions

Obstetric anal sphincter injuries continue to complicate up to 11% of vaginal deliveries. Obstetricians must be cognizant of this uncommon but serious complication in order to adequately identify and repair these injuries and prevent long-term sequelae. Although hands-on experience for modern obstetrician-gynecology residents may be suboptimal, it is imperative that young physicians receive appropriate training on recognition and repair through simulation models or continuing educational experiences. In our clinical experience, the initial repair attempt has the highest chance for the best outcomes. Obstetrics units should have a provider experienced in OASIS recognition and repair available to assist junior providers when needed. All providers should be mindful of published risk factors, especially nulliparity and operative vaginal delivery, which are consistently associated with the highest risk.

Repair of OASIS should follow the evidence-based guidelines established by ACOG and RCOG, and institution-based algorithms have been shown to improve adherence to these guidelines (32). The IAS, when identified, should be repaired independent of the EAS in order to ensure adequate reapproximation of this delicate but important layer. Overlapping or end-to-end techniques are both reasonable to address defects in the EAS, with overlapping repair preferred by our providers when the majority of the EAS is compromised. Although 36-month outcomes data suggest no difference in repair types, the majority of complications like fecal incontinence take many years to present. Further investigation into the long-term results with the various repair techniques is warranted. In our opinion, the deep vaginal and perineal layers should be reapproximated with figure-of-eight stitches before continues intracutaneous closure of the vaginal and perineal skin.

Preoperative antibiotics are warranted for patients who have not yet received antibiotics during their intrapartum course. A postoperative bowel regimen to promote easy stooling and avoidance of straining should be prescribed, and we prefer polyethylene glycol for this indication at our institution as patients can be taught to self-titrate this medication to control their stool consistency. Postpartum voiding should be monitored to ensure the patient is not experiencing postpartum urinary retention, as the risk factors for this condition mirror that of OASIS. We strongly encourage formal assessment of voiding function after foley catheter removal and this is most easily monitored with a post-operative voiding trial on post-operative day one. We encourage strict pelvic rest for these patients and close follow-up to ensure adequate healing without evidence of infection or wound breakdown.

Prompt recognition of OASIS at the time of injury and focused primary repair can optimize outcomes for these patients. Long-term sequelae, including pain, dyspareunia, and fecal incontinence, significantly impact quality of life for many patients and may be avoided if evidence-based guidelines are utilized. Providers without experience in treating these injuries should receive ongoing training and support from more experienced providers, and patients should be followed closely to ensure optimal outcomes.

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Learning Objectives

After completing this activity, the learner will be better able to:

1. State risk factors for obstetric anal sphincter injuries (OASIS)
2. Accurately diagnose OASIS
3. Provide a framework for operative repair of OASIS
4. Describe the short- and long-term implications of OASIS for the patient.

Repair of Lacerated Perineum

Figure 1.

Repair of lacerated perineum. Principles of obstetric anal sphincter laceration repair are depicted. Begin with closure of the rectal mucosa with running suture (2) and repair of lacerated anal sphincter using interrupted suture (4). Deep vaginal tissue (3) and perineal body (5, 6) should be repaired with interrupted suture. Closure of perineal skin is completed using continuous intracutaneous stitches (7).

Table 1
Review of repair principles

Principle of repair	Level of Evidence *
Repair should be performed or directly supervised by an experienced clinician in an operating room with adequate lighting.	5 ^{4,6,7,15}
Regional or general anesthesia should be used to facilitate comfort and positioning	5 ¹⁵
The patient should be positioned in dorsal lithotomy using boot stirrups	5
The operative area, including the vagina and perineum, should be cleansed with 4% chlorhexidine solution and a sterile drape applied	5
A foley catheter should be placed prior to the procedure for continuous bladder drainage. A retrograde voiding trial should be performed on post-operative day one to evaluate for evidence of urinary retention.	5 ^{30,31}
Monofilament suture should be used for all portions of the repair	1A ¹⁶
Anal mucosa is repaired first in the case of a fourth degree laceration with running 4-0 Monocryl	5 ^{4,15}
The internal anal sphincter should be identified, if possible, and repaired via end-to-end anastomosis with running 3-0 or 4-0 PDS	5 ¹⁵
The external anal sphincter should be repaired using overlapping or end-to-end anastomosis as indicated.	1A ¹⁸
When possible, an overlapping anastomosis using simple interrupted stitches of 3-0 PDS should be used for repair of the external anal sphincter.	5
When overlapping anastomosis is not possible, the external anal sphincter should be repaired using end-to-end anastomosis with horizontal mattress stitches of 3-0 PDS	5 ^{4,15}
The deep layers of the vagina and perineal body should be reapproximated using figure-of-eight sutures of 2-0 Monocryl	5
Superficial vaginal epithelium and perineal epithelium should be repaired with running intracutaneous 3-0 Monocryl	1A-1B ¹⁹⁻²²
A single dose of antibiotics (second-generation cephalosporin or clindamycin) should be administered at the time of laceration repair	1B ²³
A bowel regimen should be prescribed following repair	1B ^{26, 27}
Post-operative analgesia is best achieved with ice packs and NSAIDs	1A ²⁸
Outpatient follow up should occur at 1-2 weeks following repair to assess healing and monitor for early evidence of wound complications. Patients should practice strict pelvic rest for 6 weeks to optimize the chance for successful repair.	5 ⁴

Review of repair principles with associated levels of evidence.

* Levels of evidence assigned 1-5 based on levels of evidence for therapeutic studies (Burns et al, 2011). Corresponding citations included as superscripts. When no citation listed, the recommendation is based on expert opinion of the authors.