SOGC CLINICAL PRACTICE GUIDELINE

It is the Society of Obstetricians and Gynaecologists of Canada (SOGC) policy to review the content 5 years after publication, at which time the document may be revised to reflect new evidence, or the document may be archived.

No. 457, December 2024 (Replaces No. 330, December 2015)

Guideline No. 457: Obstetrical Anal Sphincter Injuries (OASIS) Part I: Prevention, Recognition, and Immediate Management

(En français : Lésions obstétricales du sphincter anal (LOSA) — Partie I : prévention, détection et prise en charge immédiate)

The English document is the original version; translation may introduce small differences in the French version.

This clinical practice guideline was prepared by the authors, reviewed by the SOGC Clinical Obstetrics Committee (2024), and approved by the SOGC Guideline Management and Oversight Committee (2024).
This clinical practice guideline supersedes No. 330, published in December 2015.

Authors

Dobrochna Globerman, MD, Winnipeg, MB
Alison Carter Ramirez, MD, Calgary, AB
Maryse Larouche, MD, MPH, Montréal, QC
Dante Pascali, MD, Ottawa, ON
Sinead Dufour, PT, PhD, Milton, ON
Maria Giroux, MD, Regina, SK

J Obstet Gynaecol Can 2024;■(■):102719

https://doi.org/10.1016/j.jogc.2024.102719

© 2024 The Society of Obstetricians and Gynaecologists of Canada/La Société des obstétriciens et gynécologues du Canada. Published by Elsevier Inc. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

SOGC Clinical Obstetrics Committee (2024): Sebastian Hobson, Kenneth Lim, Ernesto Figueiro Filho, Kimberly Butt

Acknowledgement: The authors would like to acknowledge and thank special contributor Abdul Sultan, MB ChB, MD, FRCOG (Croydon, Surrey, UK) for his invaluable insights and expertise. The authors would also like to acknowledge Marie-Andrée Harvey and Marianne Pierce for their pioneering work in publishing the 2015 OASIS guideline.

Disclosures: Statements were received from all authors. Dr. Maryse Larouche reported personal fees from Abbvie and FemTherapeutics as well as grants from St. Mary's Research Centre and Quebec Network on Aging Research outside the submitted work. Dr. Dante Pascali disclosed involvement with the Allergan Advisory Board and participation on the SOGC Board of Directors from 2020 to 2023. All authors have indicated that they meet the journal's requirements for authorship.

Subject Categories: Obstetrics, Urogynecology

Keywords: obstetric delivery; obstetric surgical procedures; obstetric labor complications; anal canal; episiotomy

This document reflects emerging clinical and scientific advances as of the publication date and is subject to change. The information is not meant to dictate an exclusive course of treatment or procedure. Institutions are free to amend the recommendations. The SOGC suggests, however, that they adequately document any such amendments.

Informed consent: Patients have the right and responsibility to make informed decisions about their care, in partnership with their health care provider. To facilitate informed choice, patients should be provided with information and support that is evidence-based, culturally appropriate, and personalized. The values, beliefs, and individual needs of each patient in the context of their personal circumstances should be considered and the final decision about care and treatment options chosen by the patient should be respected.

Language and inclusivity: The SOGC recognizes the importance to be fully inclusive and when context is appropriate, gender-neutral language will be used. In other circumstances, we continue to use gendered language because of our mission to advance women's health. The SOGC recognizes and respects the rights of all people for whom the information in this document may apply, including but not limited to transgender, non-binary, and intersex people. The SOGC encourages health care providers to engage in respectful conversation with their patients about their gender identity and preferred gender pronouns and to apply these guidelines in a way that is sensitive to each person's needs.

Corresponding Author: Dobrochna Globerman, dgloberman2@sbgh.mb.ca

RECOMMENDED CHANGES IN PRACTICE

1. Systematic rectal examination should be offered to all women immediately after vaginal delivery for the detection of obstetrical anal sphincter injury or buttonhole tears.
2. In primiparous patients undergoing an operative vaginal delivery, a mediolateral episiotomy should strongly be considered for the prevention of obstetrical anal sphincter injury.
3. If an experienced provider is unavailable for immediate repair of obstetrical anal sphincter injury, repair can be delayed for up to 12 hours without detrimental effect on anal continence.
4. Health care providers should pay careful attention to postpartum voiding function in patients with an obstetrical anal sphincter injury given the high risk of urinary retention.

KEY MESSAGES

1. Sultan's classification is the standard for grading obstetrical anal sphincter injuries, and all injuries should be documented using this approach.
2. Multiple preventive strategies exist to minimize obstetrical anal sphincter injury. These include a combination of fetal head control, perineal support, warm compresses, and selective mediolateral episiotomy.
3. The external anal sphincter may be repaired end-to-end or in an overlapping fashion. The internal anal sphincter should be identified and repaired separately from the external anal sphincter.
4. Obstetrical anal injuries may have significant short-term and long-term impacts. These include wound complications, pain, voiding dysfunction, anorectal symptoms, and overlap with other pelvic floor disorders, including pelvic organ prolapse, urinary incontinence, and sexual dysfunction.

ABSTRACT

Objective: The purpose of this guideline is to promote recognition and preventive strategies for obstetrical anal sphincter injuries. Furthermore, it provides guidance on primary repair and immediate postpartum management for obstetrical anal sphincter tears in order to minimize further negative sequelae.

Target Population: All patients having a vaginal delivery and those who have sustained an obstetrical anal sphincter injury.

Outcomes: Certain preventive strategies have been associated with lower rates of obstetrical anal sphincter injuries (e.g., fetal head flexion and control, appropriate use of mediolateral episiotomy). Management strategies, including appropriate diagnosis and repair of obstetrical anal sphincter injuries, antibiotic prophylaxis, and bowel and bladder function management can decrease associated short- and long-term complications.

Benefits, Harms, and Costs: Implementation of the recommendations in this guideline may increase detection, prevention, and appropriate management of obstetrical anal injuries, thus limiting the future burden associated with these injuries. Implementation of the recommended classification of obstetrical anal sphincter injuries will improve national and international research efforts.

Evidence: Published literature was retrieved through searches of PubMed, Ovid, Medline, Embase, Scopus, and the Cochrane Library from September 1, 2014, through November 30, 2023, using appropriate MeSH terms (delivery, obstetrics, obstetric surgical procedures, obstetric labor complications, anal canal, episiotomy) and keywords (OASIS, obstetrical anal sphincter injury, anal injury, anal sphincter, vaginal delivery, suture, fecal incontinence, anal incontinence, overlap repair, end-to-end repair, bladder protocol, analgesia). Results were restricted to systematic reviews, meta-analyses, randomized controlled trials/controlled clinical trials, observational studies, and clinical practice guidelines. Results were limited to English- or French-language materials. Evidence was supplemented with references from the 2015 Society of Obstetricians and Gynaecologists of Canada guideline no. 330.

Validation Methods: The authors rated the quality of evidence and strength of recommendations using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach. See online Appendix A (Tables A1 for definitions and A2 for interpretations of strong and conditional recommendations).

Intended Audience: Obstetrical care providers.

Tweetable Abstract: Updated Canadian guideline on recognition, prevention and management of obstetrical anal sphincter injuries (OASIS).

SUMMARY STATEMENTS:

1. Obstetrical anal sphincter injuries can lead to significant comorbidities, including anal incontinence, rectovaginal fistula, and pain (*moderate*).
2. The strongest risk factors for obstetrical anal sphincter injury include: primiparity, fetal macrosomia, operative vaginal delivery, and midline episiotomy (*high*).
3. Complete examination and classification of obstetrical perineal trauma is essential to ensure appropriate repair and improve reporting, thus decreasing the risk of residual anal sphincter defects (*moderate*).
4. Although the optimal cutting angle for mediolateral episiotomy has not been clearly established, it appears to be closer to 60° from the midline at crowning (*moderate*).
5. Obstetric anal injuries are more commonly associated with forceps-assisted deliveries than with vacuum-assisted deliveries (*high*).
6. Suture-related morbidity is similar at 6 weeks following repair with either polyglactin (Vicryl) or polydioxanone (PDS) sutures (*moderate*).
7. A rupture of the external anal sphincter can be repaired with either an overlapping or end-to-end technique. Existing evidence does not support recommending one technique over the other. However, the overlapping technique is only feasible with full-thickness external anal sphincter tears (*strong*).
8. Obstetrical anal sphincter injuries are associated with an increased risk of postpartum urinary retention (*moderate*).
9. Patients with obstetrical anal injuries are at risk for a range of pelvic floor disorders, including anorectal symptoms, urinary incontinence, pelvic organ prolapse, and sexual dysfunction (*moderate*).

RECOMMENDATIONS:

1. All patients should be carefully examined for perineal and vaginal tears immediately after vaginal delivery. Every patient should be offered a rectal examination for detection of obstetrical anal sphincter injuries and buttonhole tears (*strong*, *moderate*).

2. Clinicians should use Sultan's classification to grade obstetrical perineal trauma to ensure consistent reporting (*strong, moderate*).
3. The degree of perineal laceration should be disclosed to the patient and documented in the medical record (*good practice point*).
4. The obstetrical care provider should attempt to slow the delivery of the fetal head at crowning during spontaneous vaginal delivery (via flexion of fetal head, perineal support, and/or cessation of maternal pushing) (*strong*, *moderate*).
5. Given the minimally invasive nature of warm perineal compress and perineal massage, the obstetrical care provider should consider these for prevention of obstetrical anal sphincter injury (*strong, moderate*).
6. The obstetrical care provider should follow a policy of restricted episiotomy during spontaneous vaginal delivery, rather than routine use of episiotomy (*strong*, *high*).
7. If episiotomy is indicated, the obstetrical care provider should perform a mediolateral over midline episiotomy (*strong*, *moderate*).
8. In primiparous patients undergoing an operative vaginal delivery, a mediolateral episiotomy should strongly be considered by the obstetrical care provider, especially with forceps-assisted deliveries (*strong*, *high*).
9. Third- and fourth-degree anal sphincter injuries should be repaired by experienced care providers (*strong, high*).
10. If a more experienced care provider is required for repair of obstetrical anal sphincter injury, clinicians can delay repair for 8–12 hours with no detrimental effect on anal incontinence (*strong, moderate*).
11. A single dose of prophylactic intravenous antibiotics should be administered immediately following repair of obstetrical anal sphincter injury to reduce postpartum wound complications. A second-generation cephalosporin (e.g., cefotetan or cefoxitin) should be administered. For patients with a history of anaphylactic allergy to penicillin, clindamycin can be administered (*strong, moderate*).
12. Laxatives should be prescribed following primary repair of obstetrical anal sphincter injury. Constipating bowel agents are not recommended (*strong*, *moderate*).
13. Non-steroidal anti-inflammatory drugs and acetaminophen should be used as first-line analgesics. Opioids should only be used with caution and should be used in conjunction with a laxative to avoid constipation (*strong*, *moderate*).
14. Health care providers should pay careful attention to voiding function in patients with an obstetrical anal sphincter injury, particularly as these patients may have a number of compounding risk factors (*strong, moderate*).
15. Clinicians may consider bladder rest via indwelling catheter for up to 24 hours following repair of obstetrical anal sphincter injury, particularly in patients with numerous risk factors for postpartum voiding dysfunction (*good practice point*).

INTRODUCTION

Maternal health related to childbirth is of utmost importance globally. While 95% of maternal mortality occurs in low- and middle-income countries, maternal morbidity remains an ongoing concern worldwide. Birth-related perineal trauma has a significant impact on a woman's physical and emotional well-being.

Birth-related perineal trauma occurs either spontaneously with vaginal delivery or secondarily as an episiotomy extension. Perineal trauma includes anterior and posterior injuries. Anterior injuries rarely have long-term sequelae and can involve the urethra, clitoris, vagina, and vulva. Posterior injuries involve the vagina, perineal muscles, external and internal anal sphincters (EAS and IAS), and anal mucosa.[1] This guideline pertains to obstetrical anal sphincter injuries (OASIS), which encompass disruption of the EAS, IAS, and/or the anorectal mucosa.

OASIS rates are used internationally as quality indicators of health systems and health care.[2] This emphasizes the importance of access to a trained birth attendant who has the knowledge and skill to diagnose and repair OASIS. Misdiagnosis and under-diagnosis of OASIS continues to impact quality of care for patients, with resulting complications.[3] Understanding the risk factors, mechanisms, and management of OASIS is essential for health care providers involved in obstetric care. Equally important is providing comprehensive support and resources to women who experience these injuries. This includes effective treatment options, counselling, and access to ongoing specialized care.

Both short- and long-term sequelae exist from OASIS. One of the most distressing immediate complications is perineal pain, which can result from edema, bruising, tight sutures, infection, or wound breakdown. Perineal pain can lead to urinary retention and defecatory dysfunction in the immediate postpartum period. In the long term, women with perineal pain may experience dyspareunia and altered sexual function. Additional severe wound complications include abscess formation and rectovaginal fistula.

ABBREVIATIONS

EAS	External anal sphincter
IAS	Internal anal sphincter
OASIS	Obstetrical anal sphincter injuries
PDS	Polydioxanone
POP	Pelvic organ prolapse

Injury to the anal sphincter complex is recognized as the most common cause of anal incontinence and anorectal symptoms in otherwise healthy women. Anal incontinence is the most distressing and disabling long-term consequence of OASIS. It incorporates a range of symptoms including flatal and fecal incontinence, as well as passive soiling.[4] Many women also experience fecal urgency. Anal incontinence may only appear in later years when the aging process adds to the delivery insult. This condition can lead to embarrassment, social isolation, and diminished self-esteem, thus ultimately having profound implications on a woman's quality of life, mental health, and interpersonal relationships.

Furthermore, OASIS can result in personal costs to the patient with pad use, additional care-related appointments, and missed time from work. Under-diagnosed tears or inadequate repair represents a potential cause of litigation. Lastly, OASIS may also result in apprehension about future childbirth and adversely affect the remainder of a woman's reproductive life.

Summary Statement 1

EPIDEMIOLOGY

Incidence and Prevalence

From a global perspective, the prevalence of OASIS varies greatly, from 0.2% in Poland to 15% in the Philippines.[5] In Canada, the incidence of OASIS is 4.2% of all vaginal deliveries.[6] The incidence is highly dependent on the accuracy of OASIS diagnosis, which has been shown to improve with a systematic approach to physical examination.[7] The incidence of OASIS also varies in accordance with a number of established factors that either potentiate or mitigate risk.

Risk Factors

The majority of risk factor data is gathered from a large meta-analysis published in 2014 and subsequently updated in 2020, with a total of 43 included studies on this topic.[8,9] Risk factor data are presented in Table 1.[9–22] Notably, an inverse relationship has been reported for maternal BMI, such that obesity is seen as significantly protective (OR 0.6 for BMI >25 kg/m^2 vs. OR 0.27–0.7 for BMI >35 kg/m^2).[23–26]

Evidence exists for prolonged second stage as a risk factor for OASIS. A prospective trial demonstrated a direct relationship between length of second stage and risk of OASIS.[27] The rate of OASIS was reported as 2.9% with a

Table 1. Risk Factors for obstetrical anal sphincter injuries

Risk factor	Odds ratio[a]
Maternal factors	
Primiparity	3.24
Age >27 y	1.9
Age >35 y	1.1
Asian ethnicity	2.74
Infibulation	1.8–2.7
Infant factors	
Birth weight >4000 g	2.07–6.02
Occiput posterior position	3.09
Delivery factors	
Vacuum delivery	3.98
Forceps delivery	5.5
Combined vacuum and forceps	8.1
Midline episiotomy	3.82
Epidural	1.95
Second stage >1 h (multiparous)	1.42
Second stage >3 h (nulliparous)	1.4–1.9
VBAC	1.27–5.5
Labour augmentation	1.95
Shoulder dystocia	2.8–3.6

[a]All odds ratios are significant with 95% CIs.

VBAC: vaginal birth after cesarean delivery.

second stage lasting <1 hour, 3.5% between 1 and 2 hours, 5.7% between 2 and 3 hours, 7.8% between 3 and 4 hours, 16.1% between 4 and 5 hours, and 28.6% >5 hours ($P < 0.001$).

The association between episiotomy and OASIS is strongly influenced by type of episiotomy performed and mode of delivery (see Episiotomy section). Lastly, a perineal body length <3.5 cm in nulliparous women has recently been prospectively investigated and may be associated with increased risk of OASIS.[28]

Summary Statement 2

DIAGNOSIS AND GRADING

Diagnosis of Perineal Injuries and OASIS

Injury to the pelvic floor during vaginal delivery occurs through multiple mechanisms that can impact genitourinary and anorectal functions, including visually identifiable and/or palpable damage to the integrity of the epithelium, fascial tissues, and musculature; and neurogenic damage to the pelvic floor, including pudendal nerve stretch and compression, possibly resulting in denervation.[1,29]

A systematic examination of the perineum at the time of delivery is paramount. When the perineum appears to be intact, it is important to inspect for OASIS and buttonhole tears behind the posterior fourchette.[30] Digital rectal examination is an invaluable tool to ensure accurate detection of OASIS, which may not be initially obvious. Knowledge of perineal and pelvic floor muscular anatomy is required for accurate diagnosis of OASIS (depicted in Figure 1). Formal didactic and practical training on relevant anatomy and in the recognition of OASIS improves the detection of such injuries.[31–34] In a prospective study of 254 primiparous women, incidence of OASIS rose from 11% to 24.5% when the obstetrical care provider's examination was repeated by a trained fellow.[7] If there is any uncertainty regarding diagnosis, a second opinion from a trained provider should be requested.[32,33] Continuing medical education in diagnosis and repair of OASIS is important for professionals providing obstetrical care.[32]

Inspection should be done with adequate lighting, proper exposure (best in lithotomy), and analgesia after obtaining informed patient consent and cooperation for a vaginal-rectal examination.[30,35] One should also ensure appropriate equipment and assistance is available for the exam and repair. The examination should include inspection of the following:

- The perineum with gentle labial parting
- The external genitalia and vulvar epithelium
- The vaginal epithelium, with care to identify the tear's apex, when applicable
- The cervix circumferentially, when indicated
- The bulbocavernosus and transverse perineal muscles and the anal sphincter
- The rectal mucosa

Figure 1. Pelvic floor musculature.

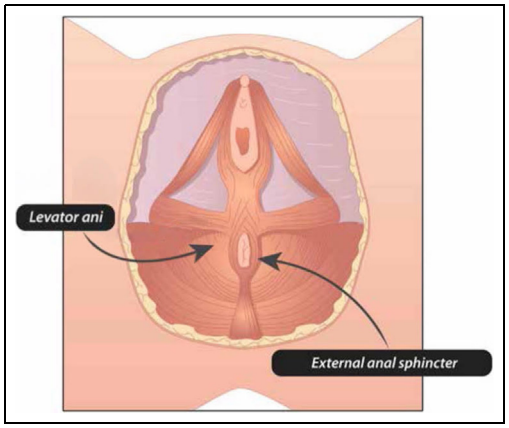
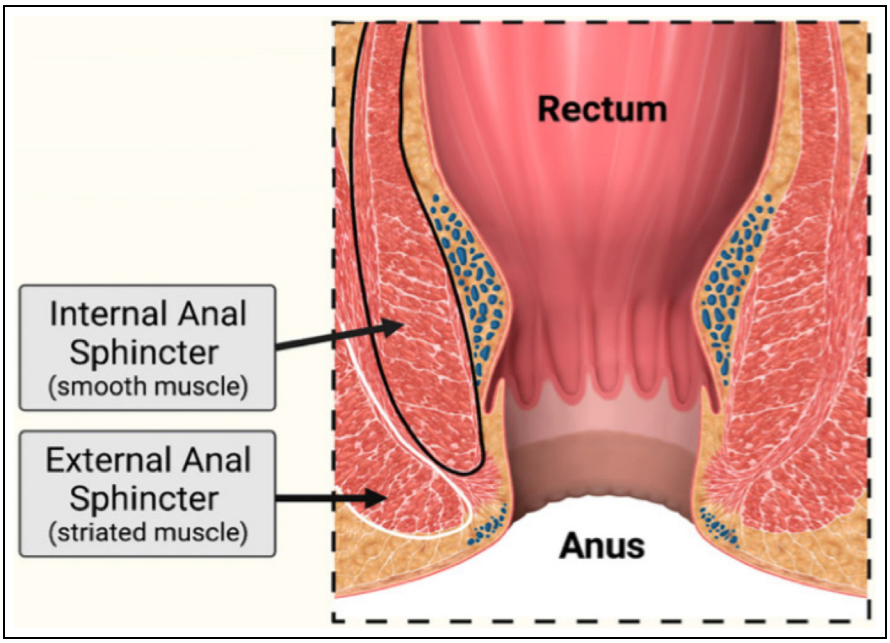


Figure 2. Internal and external anal sphincters. Reused from Peterson and Cooper, which is under an open access Creative Commons CC BY license.[159]



Palpation is best done with the examiner's dominant index finger inserted in the anus, and the ipsilateral thumb in the vagina. The 2 fingers then palpate with a "pill-rolling" motion to assess thickness.[30,35] The EAS can be palpated from 9 o'clock to 3 o'clock and is on average 3 cm in length cranio-caudally. This muscle appears dark red in colour and is normally under tonic contraction. When the EAS is torn, the ends retract within its capsular sheath and a cavity is often palpated along the anterior sphincter muscle. If uncertain, the provider can ask the patient to contract the EAS to enhance palpation of the anterior gap in the case of an injury. Baseline tone and ability to contract may be less evident in the presence of an epidural.[30,35]

During rectal examination, a finger lift test can differentiate tearing of the EAS from the superficial transverse perineal muscle. With a finger in the anus, traction is applied to the grasped muscle. Traction applied on the EAS elevates the anal canal and results in symmetric lift around the finger, whereas traction applied to the superficial transverse perineal muscle results in traction on the attachment of the muscle to the inner aspect of ischial tuberosity.[36]

Special attention should then be given to the IAS, which can be difficult to identify. The IAS is a continuation of the circular smooth muscle of the rectum and lies between the EAS and the anal mucosa (Figure 2). This muscle appears white and thin (3–5 mm). It terminates 6–8 mm cephalad to the anal margin. Examination of the IAS will also permit detection of a buttonhole injury.[36]

Grading of Perineal Injuries and OASIS

Based on the International Continence Society (ICS)/International Urogynecological Association (IUGA) 2023 Joint Terminology Report, obstetric perineal injuries are classified according to Sultan's criteria (presented in Table 2).[4,35] These criteria have been adopted by the World Health Organization. Such distinction is meant to improve reporting, guide repair, and facilitate research.

OASIS is defined as trauma involving the anal sphincter complex following vaginal delivery (also known as third- and fourth-degree tears).[35] The anal sphincter complex includes the EAS and IAS. Injuries can be considered partial or complete.[35] When there is uncertainty regarding the extent of injury, it is preferable to overestimate rather than underestimate the degree of EAS injury (for example, if uncertain whether a tear is Grade 3a or 3b, it should be classified as 3b).[4]

An obstetric rectovaginal perforation, also known as a rectal "buttonhole" tear, is an isolated tear of the rectal mucosa and vaginal epithelium, typically without involvement of the anal sphincters.[37] These can be associated with a third- or fourth-degree tear when there is an intact island of anorectal mucosa between the two injuries.[37] These rare tears have been reported in 0.014% of all vaginal

Table 2. Sultan Classification of perineal injuries

First degree	Injury to vaginal mucosa and/or perineal skin only
Second degree	Injury involving perineal muscles but not the anal sphincter complex
Third degree	Injury involving the anal sphincter complex
3a	Less than 50% of EAS thickness torn
3b	50% or more of EAS thickness torn
3c	Both EAS and IAS torn
Fourth degree	Injury involving the anal sphincter complex and anal epithelium
Rectal buttonhole tear	Isolated tear of the rectal mucosa extending into vagina

EAS: external anal sphincter; IAS: internal anal sphincter.

deliveries.[37] They are typically measured lengthwise in centimetres. Buttonhole tears are not part of Sultan's classification and should not be reported as a third- or fourth-degree tear (unless one is simultaneously present).[35]

In order to encourage adequate diagnosis and reporting, ongoing education and advocacy are required to eliminate provider stigma associated with OASIS.[1,32,34] Obstetrical injuries should always be disclosed as part of the routine post-delivery debrief with the patient. Complete documentation using appropriate nomenclature and classification should always be documented in the medical record.

Summary Statement 3 and Recommendations 1, 2, and 3

INTERVENTIONS FOR OASIS PREVENTION

Certain OASIS risk factors can be reviewed in the antepartum period and appropriate patient counselling can be provided. However, many risk factors often become apparent late in labour, and the degree to which these factors can potentially be modified during labour is yet to be determined. Certain methods of performing the delivery may show evidence of protection.[38] When considering the impact on OASIS, the provider must interpret the evidence for these interventions in the context of a complex interplay between other possibly confounding interventions and risk factors.

Head Control and Perineal Protection

Support of the fetal head to maintain flexion and control speed of delivery in conjunction with perineal support has been studied as a method for OASIS prevention. A Norwegian protocol (or "bundle") based on traditional techniques used in Finland, where the OASIS rate has remained very low, has been studied in many centres internationally.[39–43] The protocol consists of 3 manoeuvres during crowning: slowing delivery of the head with one hand, instructing women to stop pushing, and applying medial pressure on the perineum. Mediolateral episiotomy is performed selectively. Pre- and post-intervention studies in Norway reported a 50%–70% decrease in OASIS rates with this protocol.[39–41] A similar trend was observed when similar protocols were studied in other countries.[42–45] Implementation of the protocol in a U.S. centre was not associated with a significant decrease of overall OASIS rates.[46] However, data collection included women whose deliveries were managed by non-implementing physicians, as the protocol was not mandatory. A recent study separated the elements of this bundle in a regression model and found a statistically significant reduction in OASIS with head control alone (whole hand on fetal head) and medial perineal protection alone.[45]

In contrast, a Cochrane review of randomized controlled trials (RCTs) examining "hands-on" interventions failed to show a benefit over no intervention.[47] All studies included some form of head control with perineal support in the "hands-on" arm versus careful observation in the "hands-poised" arm. Notably, there was significant heterogeneity between the RCTs and adherence was not monitored. In many studies, the method of perineal support and head flexion were not clearly defined. Despite application of head flexion, intentional head slowing was not stated. Furthermore, the results were heavily influenced by the largest RCT in which there was 27% non-compliance in the hands-poised group, whereby the midwife applied support to the head and/or perineum.[48] Thus, the accumulated evidence to support this review is of poor quality overall.

Recommendation 4

Warm Compress and Perineal Massage

Application of warm compress to the perineum (OR 0.46) as well as intrapartum perineal massage (OR 0.5) both

decrease the risk of OASIS.[47] Perineal massage is done with lubricant and described as:

Using a gentle, slow massage, with 2 fingers of the [obstetrical care provider's] gloved hand moving from side to side just inside the patient's vagina. Mild, downward pressure (toward the rectum) is applied with steady, lateral strokes, which last 1 second in each direction.

Recommendation 5

Delivery Position

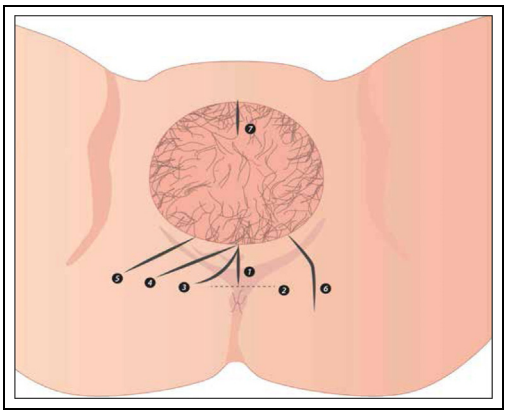
Certain maternal birth positions may increase the risk of perineal tears, although the evidence for this association stems mostly from scarce observational data. In comparison to the sitting position as a reference point, squatting and lithotomy positions have been associated with higher rates of OASIS after adjustment for other risk factors.[49,50] A 2017 Cochrane review analyzed upright birthing positions (sitting, kneeling, squatting with or without support) versus supine (dorsal, lateral, semi-recumbent and lithotomy).[51] No difference was found for the outcome of OASIS. Four of the 6 RCTs specifically looked at squatting versus supine positions and none detected a significant difference in OASIS. A major flaw of this review was the combination of lateral positions ("sacrum freeing") with recumbent lying ("sacrum blocking"). Comparison of published literature is difficult given the different reference positions between studies as well as definitions of individual and composite positions. Currently, no high-level evidence exists to support a protective effect of any particular birthing position.

Episiotomy

The rate of episiotomy in Canada among spontaneous vaginal deliveries and operative vaginal deliveries is 9.4% and 45.9%, respectively.[6] Episiotomy rates have been declining over the last 3 decades.[6,52] Restricted use of episiotomy, of any type, is preferable to routine episiotomy in women with an intended spontaneous vaginal birth.[53] With respect to operative vaginal delivery, the only published RCT found no difference in OASIS between restricted versus routine episiotomy; however, the study was underpowered and did not reach statistical significance.[54]

The terminology used in the literature is at times unclear between midline, mediolateral, and lateral episiotomies. A standardization has been proposed (as shown in Figure 3).[55] A midline episiotomy (line 1) indicates those

Figure 3. Episiotomy sites.



starting in the midline and continuing at a 0° angle from the vertical. Mediolateral episiotomy (line 4) represents those starting in the midline and cut at an angle greater than 0° from the vertical. A lateral episiotomy (line 5) starts away from the midline and is cut at an angle greater than 0° from the vertical. Other incisions depicted include the modified median (inverted T incision; line 2), J-shaped episiotomy (line 3), and the seldom used radical lateral (Schuchardt incision; line 6).[55]

Midline episiotomy increases the severity of perineal lacerations and is a strong independent risk factor for OASIS.[9] The published rate of OASIS following midline episiotomy may reach as high as 20.6%.[56] In the U.S., where midline episiotomy is most commonly performed, the most recent American College of Obstetricians and Gynecologists (ACOG) guideline has abandoned midline in favour of mediolateral episiotomy.[57] Existing comparative studies examining midline versus mediolateral episiotomy suggest lower OASIS rates in the mediolateral episiotomy groups.[58–60]

In general, the impact of mediolateral episiotomy on OASIS is somewhat controversial. Some authors report a protective effect of mediolateral episiotomy as compared with no episiotomy (OR 0.2–0.8).[61–63] Others report an independent increased risk when mediolateral episiotomy was performed (OR 4.04).[7] A 2020 meta-analysis of just 2 studies revealed no difference in OASIS rates between those who had a selective mediolateral episiotomy versus no episiotomy.[64] Most publications did not distinguish between parity and mode of delivery, and it is becoming more clear that the effect of episiotomy on OASIS is influenced by these factors as further described.[65]

Most authors report a protective effect on OASIS with the use of mediolateral episiotomy at the time of operative vaginal delivery in primiparous women (OR 0.08−0.83).[58,63,65−68] A recent systematic review and meta-analysis reported a significant reduction of OASIS in this subgroup when mediolateral episiotomy was performed versus no episiotomy (OR 0.51 in vacuum deliveries and OR 0.32 in forceps deliveries).[69] The data are conflicting in multiparous women with operative vaginal delivery, with some reporting an increased risk of OASIS with mediolateral episiotomy,[70] some showing a protective effect from mediolateral episotomy,[67] and others reporting no difference.[65,69] It is likely that multiparous women requiring operative vaginal delivery have multiple confounding factors increasing their risk for OASIS over and above that of a potentially protective mediolateral episiotomy.

With respect to spontaneous vaginal delivery, one small meta-analysis of observational studies reported that mediolateral episiotomy reduced the risk of OASIS as compared with no episiotomy in combined primiparous and multiparous women, but not in primiparous women alone.[71] However, it must be cautioned that almost all analyzed studies were retrospective, with significant heterogeneity and confounding variables. No RCTs exist in this subgroup.

The risk of OASIS with episiotomy depends on several factors, including angle of episiotomy, lateral starting point in relation to the posterior fourchette, and episiotomy length. With respect to angle, a more acute (closer to midline) angle appears to increase the risk of OASIS.[72,73] This likely reflects how far the incision is from the anal sphincter complex. A case-control study showed that those with OASIS had a more acute healed incision angle than those who did not sustain an OASIS (30° vs. 38°, $P < 0.001$).[72] Furthermore, a 20° difference exists between the incision angle of an episiotomy (typically performed at the time of crowning) and the post-delivery sutured angle.[73,74] Thus, a cutting angle closer to 60° at crowning has been recommended; however, robust evidence is lacking on the ideal mediolateral episiotomy angle for OASIS prevention.[73−76] An angle greater than 60° from midline is no longer protective and may begin to increase the risk of OASIS.[55] Presumably, an angle >60° may no longer absorb the crowning force, which would then be directed back to midline near the anal sphincters. When it comes to the starting point of the episiotomy, an RCT of 790 women comparing mediolateral with lateral episiotomies showed that the incidence of OASIS did not differ between a 60° mediolateral episiotomy (beginning at the fourchette) and a lateral incision (beginning 1−2 cm lateral from the midline, angled toward the ischial tuberosity)—1.5% versus 1.3%, respectively.[77] There was no reported difference in postpartum or sexual pain between these two types of episiotomies.[74] Lastly, the length of episiotomy may also be important. A small case-control study reported a 75% decrease in OASIS for each 5.5-mm increase in episiotomy length.[55]

Studies demonstrate that fewer than one-quarter of clinicians cut a true 60° mediolateral episiotomy.[76,78,79] Taking all of the above factors into account, the Episcissors-60 (Medivent Ltd, UK) were launched in 2014. When properly positioned over the perineum, the incision starts at 4.5 mm from the midline and is designed to achieve a post-suture angle of 40°−60°. No RCTs exist comparing this device to standard scissors. Observational studies have been promising, showing decreased OASIS rates.[80−82] A 2021 meta-analysis of 6 studies (n = 14 027 nulliparous patients) was published, with the primary outcome being OASIS rates before and after the implementation of Episcissors-60.[83] An overall statistically significant risk difference (RD) was seen (RD −0.02 [95% CI −0.03 to 0.00]). A smaller meta-analysis reported a number needed to treat of 25 to prevent 1 OASI.[84] This information has to be interpreted in the context of the quality of the studies, which have been deemed to be of low to fair quality, showing a high level of heterogeneity and some with high risk of bias.[85] Some of the included studies also implemented other initiatives to decrease OASIS rates alongside the use of Episcissors-60. Additionally, as the majority of studies did not report demographic variables, assessment for confounders was not possible. Lastly, a 2023 Canadian study revealed that introduction of Episcissors-60 was associated with a significant decrease in OASIS rate, but no difference was observed within the episiotomy subgroup, emphasizing that a combination of preventive interventions may be required to reduce an outcome that is multifactorial in nature.[86]

Summary Statement 4 and Recommendations 6, 7, and 8

Operative Vaginal Delivery

If operative vaginal delivery is indicated, vacuum extraction carries less risk of injury to the anal sphincter than forceps.[9,87,88] A Cochrane review found an OASIS rate of 15.6% with forceps and 8.2% with vacuum, resulting in a risk ratio of 1.83 for forceps as compared with vacuum.[87] Similarly, a recent Canadian database study reported an

overall OASIS rate of 21.5% with forceps (2.2% fourth degree) and 11.7% with vacuum (1.2% fourth degree).[88] As previously described, most data support the use of mediolateral episiotomy to protect against OASIS in primiparous women undergoing operative vaginal delivery over no episiotomy. It is possible that early removal of forceps (after delivery is assured, but before the largest diameter of the head is expelled) may also assist in limiting OASIS.[89] Risk of OASIS should be included in the consent discussion for operative vaginal delivery, alongside a discussion of risk and benefits of possible alternatives, such as a cesarean delivery.[90] Performing a cesarean delivery would clearly prevent OASIS; however, it may not fully protect against anal incontinence if performed late in labour, as nerve injury may still occur.

Summary Statement 5

REPAIR OF OASIS

OASIS should be repaired by trained clinicians comfortable with such repairs.[30,91] In trials reporting favorable outcomes after repairs, all repairs were performed by trained staff (urogynaecologists, colorectal surgeons, and those who have completed OASIS workshops).[92] If an obstetrical care provider is insufficiently experienced in OASIS repair and an experienced obstetrical care provider is not available immediately or locally, repair can be delayed for 8 to 12 hours without detrimental impact on anal incontinence and pelvic floor symptoms at 1 year postpartum.[93] In this instance, consideration can be given to the use of vaginal packing and administration of tranexamic acid for hemostasis, while awaiting repair.

Repairs are typically performed in the delivery or operating room. The operating room offers the benefits of optimal lighting, appropriate equipment, and aseptic conditions.[30] Additional equipment may be required, including self-retaining retractor and Allis clamps. There is a paucity of studies on the optimal type of anaesthesia for the repair of OASIS. Although it is feasible to perform these repairs with local anaesthetic alone, general or regional anaesthesia should be considered as they provide both analgesia and sufficient muscle relaxation.[30] The EAS has inherent tone and, when torn, retracts within its capsular sheath. With muscle relaxation, the extent of the tear can be thoroughly evaluated and the sphincter ends can be identified, grasped, and repaired in a tension-free manner.[30] Local anaesthetic may be sufficient when only the superficial fibres of the EAS are disrupted; although without good analgesia, it may be difficult to make a proper diagnosis. In the United Kingdom, experts recommend completing the repair under general or epidural anaesthesia, which allows for proper assessment and minimizes the risk of under- and over-diagnosis of OASIS.[91] This approach may not always be necessary, as long as adequate analgesia and optimal muscle relaxation is achieved.

Recommendations 9 and 10

Suture Material

Although the type of suture material used in the repair of OASIS may be important, little research has been carried out comparing different suture types used for sphincter repairs. Both absorbable polyglactin (Vicryl) and delayed absorbable polydioxanone (PDS) sutures are commonly used. Non-absorbable sutures should be avoided due to concerns regarding suture abscess formation and discomfort from suture ends.[94] Suture ends should be cut short and the knots covered by the overlying superficial perineal muscles in order to minimize any discomfort. Monofilament sutures may be beneficial as they have been shown to promote less bacterial adherence in in vitro studies[95] and are thought to be less likely to predispose the patient to infection.[96]

A randomized trial of 112 participants compared OASIS repairs with Vicryl and PDS.[92] At 6 weeks, there was no significant difference in suture-related morbidity, defined as need for suture removal due to pain, suture migration, or dyspareunia. At 3 months post OASIS repair, there was no difference in anal continence scores between the two suture types, but this study was underpowered to determine outcomes relating to continence.[92] Whether the use of delayed absorbable sutures in OASIS repairs confers benefit with respect to longer term outcomes has yet to be evaluated in clinical trials. More recent publications describe the use of delayed absorbable sutures, but comparative studies have not been undertaken.

Summary Statement 6

Repair of the Anorectal Mucosa

Following a fourth-degree tear, the anorectal mucosa is typically repaired with interrupted 3-0 Vicryl suture with the knots tied on either side of the anal lumen (Table 3). Alternatively, 3-0 PDS suture can be used in a non-locking, continuous fashion. There are currently no studies that suggest a benefit from any of these mucosal repair

Table 3. Repair of obstetrical anal sphincter injuries

Structure	Repair type	Suture type
Anorectal mucosa	• Interrupted or continuous non-locking submucosal sutures • Knots can be positioned on either side of anal lumen • Avoid figure of 8 sutures to prevent ischemia	• 3-0 Vicryl for interrupted sutures • 3-0 PDS for continuous sutures
IAS	• Interrupted or mattress sutures • End to end	• 3-0 PDS or 2-0 Vicryl
EAS	Partial-thickness defect: • End to end Full-thickness defect: • End to end • Overlapping	• 3-0 or 2-0 PDS • 2-0 Vicryl
Buttonhole injury	• Rectal mucosa: as above • Rectovaginal fascia: interrupted mattress • Vaginal mucosa: continuous non-locking	• Rectal mucosa: as above • Rectovaginal fascia: 2-0 or 3-0 PDS • Vaginal mucosa: 2-0 Vicryl sutures

PDS: polydioxanone; IAS: internal anal sphincter; EAS: external anal sphincter.

techniques with respect to anorectal outcomes, including fistulas. However, figure-of-eight sutures and locking sutures should be avoided as they can cause ischemia and result in poor healing of the mucosa.

Repair of the IAS

Literature related to anal sphincter repair following obstetric trauma has primarily focused on EAS repair. However, the muscles involved in maintaining anal continence include not only the EAS but also the IAS. The IAS is a thin continuation of rectal smooth muscle and is under autonomic control. It is responsible for maintaining continence at rest by contributing 70%–85% of the resting anal pressure and, to a lesser degree, anal pressure in response to sudden and constant rectal distension (40% and 65%, respectively).[97] The pressures in the IAS decrease in response to rectal distension by feces, liquids, or gas in order to allow for "sampling," whereby the rectal contents transiently come in contact with sensory nerve endings of the anal canal to determine the type of bowel contents. This allows processing and voluntary control of defecation. If a decision is made that bowel evacuation is inconvenient, recto-anal contractile reflex occurs and the bowel contents travel back into the colon until the time for bowel evacuation is more appropriate.[98] Damage to the IAS muscle may lead to a poor seal and an impaired sampling reflex, leading to passive anal incontinence.[97] Studies looking at functional results following OASIS repair report that more women with an IAS defect on endoanal ultrasound 6 months postpartum have anal incontinence, and those with incontinence report worse a degree of symptoms than those without an IAS defect.[99–102] Given these findings, it is crucial to repair the IAS at the time of delivery, as it is very difficult to find and repair at the time of a secondary anal sphincter repair.

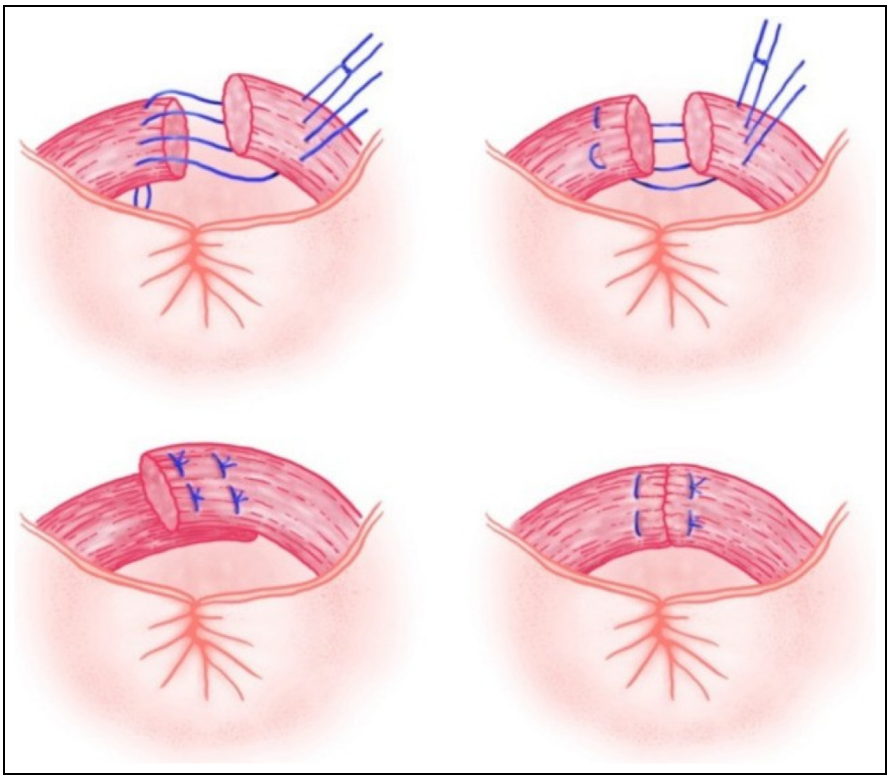
The IAS is repaired independently from the EAS. Sultan and Thakar described approximating the IAS with interrupted sutures.[96] A small prospective study with historical controls suggested that separately suturing the IAS may improve anal continence at 1 year postpartum.[103] Both previously mentioned studies approximated the IAS in an "end-to-end" fashion using delayed absorbable sutures. In a randomized trial of OASIS repairs, 9 women had sphincter tears that included the IAS and were independently approximated. In all 9 women, the IAS was intact on follow-up endoanal ultrasound.[104]

Repair of the EAS

The EAS can be approximated by either end-to-end repair or overlap repair (Figure 4). The torn ends of the EAS tend to retract within their sheaths and can be found posterio-lateral to the tear, often by palpation of a depression downward rather than laterally. The muscle ends must be identified and grasped with Allis clamps.

All partial-thickness EAS tears should be repaired using an end-to-end technique. With an end-to-end repair, the EAS ends may need to be mobilized using Metzenbaum scissors for the dissection. The muscle ends are then approximated end-to-end with 2 or 3 mattress sutures. Cunningham and Pilkington also described the traditional technique of using four interrupted sutures in the capsule of EAS at the anterior, posterior, superior, and inferior points.[105] In theory, mattress sutures are less likely than interrupted sutures to cut through muscle, especially with sphincter muscle contraction, although there is no evidence to support one technique over the other. Sutures should include the fascial sheath.[30]

Figure 4. External anal sphincter repair methods: overlap technique (left) and end-to-end technique (right). Reused from Spinelli et al., which is under an open access Creative Commons CC BY license.[1]



With an overlap repair, the torn EAS muscle ends often need much more dissection and mobilization. The dissection is carried out using the ischioanal fat laterally as a landmark. The full lengths of the torn ends of the EAS (including fascial sheath) are overlapped in a double-breasted fashion.[106] This type of repair is only possible with full-thickness EAS tears.

Following the anal sphincter repair, the perineal body is reconstructed by suturing the perineal muscles. This takes tension off and provides support for the underlying muscle repair. The vaginal mucosa and perineal skin are repaired in the usual fashion. A rectovaginal exam at the completion of the repair must be performed to confirm the adequacy of the repair and to exclude inadvertent placement of sutures in the rectum.[30,91] If sutures have inadvertently been sewn through the rectum, these should be removed so as to reduce the risk of forming an anovaginal fistula.

Comparison of EAS Repair Techniques

Historically, the most popular technique for primary OASIS repair has been the end-to-end approximation of the EAS with interrupted or figure-of-eight sutures. In contrast, the technique commonly used by colorectal surgeons and urogynaecologists to repair anal sphincter tears remote from delivery or unrelated to delivery is the overlap technique. Several randomized trials have been published comparing end-to-end approximation and overlapping repair of the EAS. A 2013 Cochrane review compared the effectiveness of these 2 primary repair techniques in reducing subsequent anal incontinence, perineal pain, and dyspareunia and improving quality of life.[107] The authors included 6 trials involving 588 women.[92,104,108–111] Four trials followed women for 12 months.[92,108,109,111] There was no difference in perineal pain, flatal incontinence, and dyspareunia between the two techniques at 12 months. The only outcomes showing a difference stemmed from a small trial with 64 women, showing less fecal urgency and lower anal incontinence scores at 12 months in women with an overlapping repair.[108] In this trial, overlapping repair also resulted in fewer women with deterioration of anal incontinence from 6 weeks to 12 months later (0% with overlap vs. 16% with end-to-end). Only one trial followed women beyond 12 months and demonstrated no differences in flatal or fecal incontinence between the two repair techniques at 36 months.[109] These findings are limited by small numbers (n = 68 women).

Overall, data are limited given the heterogeneity in outcome measures, time points, and reported results. These studies included both primiparous and multiparous women, as well as partial- and full-thickness third-degree tears. Furthermore, surgical experience of the clinicians performing the repairs was not evaluated in any of the included studies. Consequently, the current literature does not support recommending one EAS repair technique over the other.

Summary Statement 7

Buttonhole Injury

A buttonhole injury is best repaired transvaginally using vicryl sutures.[30,112] The anal sphincter should not be divided to repair a buttonhole tear, provided that the distal end of the tear is fully visible. To minimize the risk of rectovaginal fistula, a three-layer closure is recommended, which includes vaginal epithelium, rectovaginal fascia, and rectal mucosa (see Table 3 for details).[112] If there is concern about a complex injury (e.g., high buttonhole tears >7 cm from the anal verge), colorectal surgery in a tertiary care centre must be consulted.[112] A colostomy is very rarely indicated but may be considered in high rectal buttonhole or extended fourth-degree tears.[30,112]

POST-OPERATIVE MANAGEMENT

Prophylactic Antibiotics

There has only been one published randomized placebo-controlled study examining the impact of prophylactic antibiotics on prevention of postpartum perineal wound complications in patients with OASIS.[94] This trial of 147 patients compared the effect of a single intravenous dose of a second-generation cephalosporin (1 g of cefotetan or cefoxitin), administered at the time of OASIS repair, on wound complications at 2 weeks following repair. If patients were allergic to penicillin, they received 900 mg intravenous clindamycin instead; however, it was not reported how many patients received clindamycin instead of a cephalosporin. The authors of this trial defined wound complications as purulent discharge or abscess and breakdown of the repair. Prophylactic antibiotics given at the time of OASIS repair were shown to decrease maternal morbidity related to perineal wound complications; 8.2% of women who received antibiotics and 24.1% of women who received placebo had a wound complication ($P < 0.05$), with a relative risk of 0.34 (95% CI 0.12–0.96). Cochrane reviews examining this trial highlight that the study was limited by a high lack of follow-up at 2 weeks postpartum (27.2%).[107,113] At 6 weeks postpartum, there was a non-significant difference in wound complications between the two groups, with a 12.9% loss to follow-up.[94] There are currently no studies that have evaluated the value of additional doses of antibiotics following repair of OASIS. Several international guidelines on OASIS repair and management advocate for postpartum prophylactic antibiotics; however, these recommendations are largely based on expert opinion.[114–117]

Recommendation 11

Postpartum Bowel Regimen

Very little data exists on bowel regimens following OASIS repair. Overall, laxative use seems to confer some benefit. Mahony et al. performed a randomized trial to compare a laxative regimen (lactulose) with a constipating regimen (codeine phosphate) in the 3 days following repair in 105 patients.[118] Laxative use was associated with a significantly earlier and less painful bowel movement. Troublesome constipation was reported in 19% of those receiving the constipating regimen (with 2 requiring readmission for fecal impaction), as compared with 5% receiving the laxative. At 3 months postpartum, there were no differences in continence scores, anal manometry or endoanal scan findings between the 2 groups. A 2016 publication reported a significantly lower rate of laxative use in those with a failed primary repair (defined as defect on imaging and persistent fecal incontinence) as compared with those with a successful repair (31.4% vs. 85.4%, respectively).[119]

Recommendation 12

Postpartum Analgesia

There are no published data regarding analgesia management following OASIS repair. Recommendations are extrapolated from literature pertaining to postpartum patients in general, including those with intact perineum. Non-steroidal anti-inflammatory drugs have been found to be effective for postpartum pain relief and may be scheduled regularly with acetaminophen.[120–122] Rectal administration should likely be avoided in those with fourth-degree tears, so as to avoid disruption of sutures. Caution should be used with opioids because if their constipating side effects. If required, opioids should be used in combination with laxatives. A 10-minute ice pack application for up to 2 hours has been found to be effective in an RCT.[123] Lastly, there is no evidence

for topical anesthetics as reported in a Cochrane review of 8 trials.[124]

Recommendation 13

Postpartum Bladder Protocol

Studies have demonstrated a relationship between significant perineal trauma and postpartum voiding dysfunction.[125–128] Glavind and Bjork observed that sphincter rupture was present in 33% of women with postpartum urinary retention compared with 1% of the total population of women who gave birth during the study period.[127] Another large cohort study of over 5000 women found that OASIS was an independent predictor of postpartum urinary retention.[129] The pathophysiology of postpartum voiding dysfunction related to perineal injury is unclear but may be related to perineal discomfort, urethral and perineal edema, and impaired nerve conduction. Other independent risk factors for postpartum voiding dysfunction include nulliparity, epidural use, opioid use, cesarean delivery, episiotomy and assisted vaginal delivery.[129–131]

Failure to diagnose and manage postpartum voiding dysfunction via intermittent or indwelling catheterization may result in a distension injury to the detrusor muscle and irreversible bladder dysfunction. Bladder emptying can be assessed through a number of means, including measurement of post-void residual using a portable bladder scanner or in and out catheterization. A number of international organizations advocate for postpartum bladder volume assessment and catheterization to be considered if spontaneous voiding has not occurred within 6 hours of any birth.[132,133] Some experts advocate for routine indwelling catheterization for 24 hours following OASIS repair, or until the patient's bladder sensation and/or vulvar edema improves such that they are able to spontaneously empty their bladder every 3–4 hours.[30]

Summary Statement 8 and Recommendations 14 and 15

OUTCOMES FOLLOWING REPAIR

Wound Complications

One of the potential devastating sequelae following OASIS is a wound complication. Stock et al. conducted a retrospective chart review of over 1000 women at a tertiary care institution who sustained OASIS between 2005 and 2010.[134] They found that wound complications (any of: infection, breakdown, need for packing, operative intervention, secondary repair) occurred in 7.3% of patients. With respect to specific wound complications after OASIS, large retrospective cohort studies describe the following: a 2.4%–3.5% wound infection rate,[134–136] a 2.2%–4.6% wound dehiscence rate,[134–136] a 1.0%–3.5% rate of operative revision for various indications,[135,137] and 1.0%–1.5% of patients requiring secondary sphincter repair.[134,135] In these studies, many patients experienced a number of these wound complications concurrently.[134,136] Interestingly, a systematic review reported a wider range of incidence in wound infection (0.1%–19.8%) and wound dehiscence (1.9%–24.6%).[138] This illustrates the heterogeneity in this outcome. Some of the drivers of these higher rates include smaller sample sizes and follow-up at very close intervals following delivery. This may lead to the detection and inclusion of wound concerns at the earliest stage.[137] There were no discernible differences in antibiotic use reported between these different studies that would reliably explain the heterogeneity in these rates.

Operative vaginal delivery was strongly associated with postpartum wound complications following OASIS,[134,137] even when authors controlled for length of labour in multivariable analysis.[134] Use of antibiotics, either intrapartum for any obstetrical indication[134,137] or prophylactic dosing at the time of repair,[94,113] was found to be protective against wound complications.

The burden of perineal wound complications can be high for the new parent. One large cohort reported a 44% rate of hospital readmission following OASIS in those who developed a wound complication.[134] The same authors found that three-quarters of the complications occurred in the first 2 weeks postpartum. Early postpartum follow-up (7–10 days post-delivery) may present an invaluable opportunity to detect and manage early wound complications.

Anorectal Outcomes

Bowel function outcomes following primary repair of OASIS are difficult to establish as there is significant heterogeneity between studies. Studies vary greatly with respect to repair techniques, outcome measures, and follow-up intervals. In general, anal incontinence has been reported in 20%–59% of OASIS patients within 6 months of delivery.[135,139–141] Longer term studies report an anal incontinence incidence of 22%–39% at 3–4 years following delivery[142,143] and up to 59% at 11.6 years from delivery.[144] Specifically, flatal incontinence has been reported in 19% within 9 weeks post repair[140] and between

15% and 32% at 3–4 years.[142,143] Loose fecal incontinence has been reported in 10.2%–18.3%[142,145] and solid fecal incontinence in 1.4%–2.6%[142,143,145] of patients at 3–5.5 years postpartum. Fecal urgency, another distressing symptom, was seen in 29% of patients at 9 weeks following repair[140] and in 18%–31% at 2–3 years.[142,146] With respect to quality of life, 82% were found to be affected by anorectal symptoms at 4 years after repair,[143] and 29.2% at 11.6 years.[144]

Outcomes following primary OASIS repair appear to be related to the extent of the initial sphincter tear.[141,144,147–149] In their recent meta-analysis, Okeahialam et al. reported a significantly higher incidence of anal incontinence in those with 3c tears (OR 1.79; 95% CI 1.09–2.94) and fourth-degree tears (OR 2.37; 95% CI 1.40–4.02) as compared with 3a tears.[147] Most authors note that higher order tears (3c and fourth-degree) are associated with worse defecatory symptoms and greater impact on quality of life than lower grade tears (3a or 3b).[135,139,140,150,151] The relationship between extent of initial sphincter tear and severity of anorectal outcomes has been demonstrated in cohorts as early as 9 weeks to 6 months postpartum[135,139–141,148,150,151] and more than a decade remote from delivery.[144,149] Roos et al. postulated that involvement of the IAS in the laceration appears to be a poor prognostic factor, despite recognition and primary repair.[140] Possible explanations for this finding include the inability to completely restore function to a repaired IAS, or that a tear severe enough to include the IAS or anal mucosa will inevitably lead to massive collateral impact on the pudendal innervation, adjacent pelvic fascia, and pelvic floor musculature during the delivery.[141]

Overall, the outcomes following the primary repair of OASIS are not encouraging, with studies reporting that many women suffer from various degrees of anal incontinence. Furthermore, anal continence over time may be further impacted by aging, subsequent deliveries, and lifestyle factors. Fortunately, persistent bowel symptoms following OASIS can be mitigated with targeted management.[152,153]

Urinary Incontinence and Pelvic Organ Prolapse

The impacts of OASIS extend beyond bowel function and are associated with other areas of pelvic floor dysfunction, including pelvic organ prolapse and urinary incontinence. Published rates of urinary incontinence in women with a history of OASIS, specifically reported between 10 weeks and 12 months postpartum, range between 16% and 38%.[135,150,154] In a cohort study where 100 primiparous women with OASIS were matched to 104 controls (second-degree tear or episiotomy), significantly more women with OASIS reported overall urinary incontinence compared with controls.[154] The majority of patients who reported urinary incontinence at 4–12 months postpartum experienced stress urinary incontinence.[150] Reported long-term outcomes in OASIS patients (5–7 years postpartum) reveal a high prevalence of urinary incontinence, ranging from 32% by symptom report[155] to 62% diagnosed by positive cough stress test.[145]

Literature documenting rates of pelvic organ prolapse (POP) following OASIS is sparse. In a German cohort, at a median follow-up of 5.5 years from the index delivery, 18.3% of participants with history of OASIS had stage 2 POP, defined by the Pelvic Organ Prolapse Quantification System (POP-Q).[145] Of the entire cohort, 14.1% stated they were bothered by symptoms of prolapse. As this study lacked a control group, it is not possible to determine whether POP symptoms were more common in women with OASIS than in those who delivered vaginally without sustaining OASIS. In a large retrospective observational study based in the U.K., women with major tears (grades 3c and 4) were 5.4 times more likely to develop symptoms of POP than their counterparts with lower grades of OASIS.[135] More data comparing women with OASIS to those who delivered vaginally but did not sustain OASIS is required to more accurately understand the association between OASIS and POP.

In the absence of large cohort studies where patients are matched with controls so as to account for the different risk factors that can predispose women to urogenital dysfunction, it is difficult to ascertain the precise impact of OASIS on these conditions. Nevertheless, as with non-OASIS patients, it is important to recognize that women with a history of OASIS may additionally be suffering from symptoms of POP and urinary incontinence.

Sexual Function

In recent years, a growing number of authors have sought to shed light on the impacts of OASIS on sexual function. Their work reports high rates of sexual dysfunction after OASIS.

Between 4 and 12 months postpartum, apareunia or dyspareunia was reported in 25% of women enrolled in a prospective cohort study following patients who had sustained OASIS.[150] Gommesen et al. examined rates of dyspareunia in primiparous women at 12 months postpartum across different degrees of perineal lacerations.[156] They found that more than half of women (53%) with OASIS experienced dyspareunia. Women with no tears, as

well as those with first- and second-degree tears, had lower rates of dyspareunia and sexual dysfunction as compared to those with OASIS. However, since all groups showed an increase in sexual dysfunction compared with pre-pregnancy rates, post-childbirth sexual dysfunction is likely multifactorial and not solely related by the extent of perineal injury.

Studies examining the impact of OASIS on sexual function remote from delivery are limited by small numbers (n = 47–71).[145,155,157] Nonetheless, their findings suggest that the impact of OASIS on sexual function may bear out years following the index delivery (follow-up ranges 3–11 years). In their follow-up study of participants enrolled in FORCAST (For Optimal Recovery: Care After Severe Tears), a prospective cohort study of women with history of OASIS, O'Shea et al. reported that 35%–47% of participants met criteria for sexual dysfunction.[157] Similarly, a prospective cohort study based in Germany followed patients for several years after OASIS and found that 37% of their population reported no or seldom sexual activity.[145] The existing literature sheds light on potential negative implications of OASIS on the following domains of sexual function: reduced desire,[145,155] infrequency of intercourse,[157] pain,[145,155] and lack of lubrication and decreased sensation.[145] The aforementioned studies do not include comparator groups, thus a knowledge gap exists in the trajectory of long-term sexual function in women with history of OASIS compared with those without.

Summary Statement 9

CONCLUSION

OASIS rates have long been a marker of health care quality. On an international scale, Canada's OASIS rate of 4.2% is moderate. As the impact of maternal obstetrical trauma is becoming more recognized, this number may partially reflect more robust attention to diagnosis. Other factors contributing to this rate may include the presence of high-risk factors such as forceps-assisted deliveries and how these techniques are being taught and performed.[158] Canada's rate emphasizes the importance of ongoing education around risk factors, preventive strategies, proper diagnosis, and repair.

Furthermore, the effects of OASIS reach far beyond the immediate postpartum period. Patients sustaining an injury must be closely monitored for bowel and bladder function and be provided appropriate wound care and pain relief. Establishment of specialized perineal clinics will allow for long-term monitoring, counselling, and intervention. Ultimately, the goal is to decrease the burden of OASIS, both in respect to decreasing its incidence and minimizing its consequences for those affected.

SUPPLEMENTARY MATERIAL

Supplementary material related to this article can be found at https://doi.org/10.1016/j.jogc.2024.102719.

REFERENCES

1. Spinelli A, Laurenti V, Carrano FM, et al. Diagnosis and treatment of obstetric anal sphincter injuries: New evidence and perspectives. J Clin Med 2021;10.
2. Aguiar M, Farley A, Hope L, et al. Birth-related perineal trauma in low- and middle-income countries: A systematic review and meta-analysis. Matern Child Health J 2019;23:1048–70.
3. Blondel B, Alexander S, Bjarnadóttir RI, et al. Variations in rates of severe perineal tears and episiotomies in 20 European countries: A study based on routine national data in euro-peristat project. Acta Obstet Gynecol Scand 2016;95:746–54.
4. Sultan AH, Monga A, Lee J, et al. An international urogynecological association (IUGA)/international continence society (ICS) joint report on the terminology for female anorectal dysfunction. Int Urogynecol J 2017;28:5–31.
5. Roper JC, Okeahialam NA, Thakar R, et al. A clinical risk calculator to predict obstetric anal sphincter injuries in laboring patients. Female Pelvic Med Reconstr Surg 2020;26:779.
6. Muraca GM, Liu S, Sabr Y, et al. Episiotomy use among vaginal deliveries and the association with anal sphincter injury: A population-based retrospective cohort study. Cmaj 2019;191:e1149–58.
7. Andrews V, Sultan AH, Thakar R, et al. Occult anal sphincter injuries–myth or reality? BJOG 2006;113:195–200.
8. Pergialiotis V, Vlachos D, Protopapas A, et al. Risk factors for severe perineal lacerations during childbirth. Int J Gynaecol Obstet 2014;125:6–14.
9. Pergialiotis V, Bellos I, Fanaki M, et al. Risk factors for severe perineal trauma during childbirth: An updated meta-analysis. Eur J Obstet Gynecol Reprod Biol 2020;247:94–100.
10. Gerdin E, Sverrisdottir G, Badi A, et al. The role of maternal age and episiotomy in the risk of anal sphincter tears during childbirth. Aust N Z J Obstet Gynaecol 2007;47:286–90.
11. Baghestan E, Irgens LM, Børdahl PE, et al. Trends in risk factors for obstetric anal sphincter injuries in norway. Obstet Gynecol 2010;116:25–34.
12. Berggren V, Gottvall K, Isman E, et al. Infibulated women have an increased risk of anal sphincter tears at delivery: A population-based swedish register study of 250 000 births. Acta Obstet Gynecol Scand 2013;92:101–8.
13. Gonzalez Rios AR, Zighelboim I, Anasti J, et al. A search for novel risk factors for obstetric anal sphincter injury. Female Pelvic Med Reconstr Surg 2022;28:104–8.
14. Jansson MH, Franzén K, Hiyoshi A, et al. Risk factors for perineal and vaginal tears in primiparous women - the prospective popract-cohort study. BMC Pregnancy Childbirth 2020;20:749.
15. D'Souza JC, Monga A, Tincello DG. Risk factors for perineal trauma in the primiparous population during non-operative vaginal delivery. Int Urogynecol J 2020;31:621–5.

16. Chill HH, Lipschuetz M, Atias E, et al. Association between birth weight and head circumference and obstetric anal sphincter injury severity. Eur J Obstet Gynecol Reprod Biol 2021;265:119–24.

17. Levin G, Rottenstreich A, Tsur A, et al. Risk factors for obstetric anal sphincter injury among parous women. Arch Gynecol Obstet 2021;303:709–14.

18. Murphy DJ, Macleod M, Bahl R, et al. 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.

19. Simic M, Cnattingius S, Petersson G, et al. Duration of second stage of labor and instrumental delivery as risk factors for severe perineal lacerations: Population-based study. BMC Pregnancy Childbirth 2017;17:72.

20. Rouse DJ, Weiner SJ, Bloom SL, et al. Second-stage labor duration in nulliparous women: Relationship to maternal and perinatal outcomes. Am J Obstet Gynecol 2009;201:357.e1-7.

21. Perslev K, Mørch EJ, Jangö H. Increased risk of obstetric anal sphincter injury in women undergoing vaginal delivery after caesarean section: A systematic review and meta-analysis. Bjog 2022;129:1961–8.

22. Gauthaman N, Walters S, Tribe IA, et al. Shoulder dystocia and associated manoeuvres as risk factors for perineal trauma. Int Urogynecol J 2016;27:571–7.

23. Lindholm ES, Altman D. Risk of obstetric anal sphincter lacerations among obese women. BJOG 2013;120:1110–5.

24. Garretto D, Lin BB, Syn HL, et al. Obesity may be protective against severe perineal lacerations. J Obes 2016;2016:9376592.

25. Richter HE, Brumfield CG, Cliver SP, et al. Risk factors associated with anal sphincter tear: A comparison of primiparous patients, vaginal births after cesarean deliveries, and patients with previous vaginal delivery. Am J Obstet Gynecol 2002;187:1194–8.

26. Tavakoli A, Panchal VR, Mazza GR, et al. The association of maternal obesity and obstetric anal sphincter injuries at time of vaginal delivery. AJOG Glob Rep 2023;3:100272.

27. Naqvi M, Jaffe EF, Goldfarb IT, et al. Prolonged second stage of labor and anal sphincter injury in a contemporary cohort of term nulliparas. Am J Perinatol 2022;39:937–43.

28. Lane TL, Chung CP, Yandell PM, Kuehl TJ, Larsen WI. Perineal body length and perineal lacerations during delivery in primigravid patients. Proc (Mayl Univ Med Cent) 2017;30(2):151–3.

29. Snooks SJ, Setchell M, Swash M, et al. Injury to innervation of pelvic floor sphincter musculature in childbirth. Lancet 1984;2:546–50.

30. Sultan AH, Thakar R. Third and fourth degree tears. In: Sultan AH, Thakar R, Fenner DE, editors. Perineal and anal sphincter trauma. 1st ed. London (GB): Springer-Verlag; 2009. p. 33–51.

31. Andrews V, Thakar R, Sultan AH. Structured hands-on training in repair of obstetric anal sphincter injuries (oasis): An audit of clinical practice. Int Urogynecol J Pelvic Floor Dysfunct 2009;20:193–9.

32. Ducarme G, Pizzoferrato AC, de Tayrac R, et al. Perineal prevention and protection in obstetrics: Cngof clinical practice guidelines. J Gynecol Obstet Hum Reprod 2019;48:455–60.

33. Gachon B, Becam E, Barussaud ML, et al. How can we improve our practices in obstetric anal sphincter injury prevention, diagnosis, and management of symptomatic women? J Gynecol Obstet. Hum Reprod 2021;50:102183.

34. Hickman LC, Propst K. Accurate diagnosis and repair of obstetric anal sphincter injuries: Why and how. Am J Obstet Gynecol 2020;222:580.e1-.e5.

35. Doumouchtsis SK, de Tayrac R, Lee J, et al. An international continence society (ICS)/ international urogynecological association (IUGA) joint report on the terminology for the assessment and management of obstetric pelvic floor disorders. Int Urogynecol J 2023;34:1–42.

36. Sultan AH, Thakar R. Management of acute obstetric anal sphincter injuries (OASIs). In: Sultan AH, Thakar R, Lewicky-Gaupp C, editors. Pelvic floor, perineal and anal sphincter trauma during childbirth. 2nd ed. London (GB): Springer; 2024 (in press).

37. Roper JC, Thakar R, Sultan AH. Re: "Isolated rectal buttonhole tears in obstetrics: Case series and review of the literature". Int Urogynecol J 2021;32:745.

38. Thakar R, Eason E. Prevention of perineal trauma. In: Sultan AH, Thakar R, Fenner DE, editors. Perineal and anal sphincter trauma. 1st ed. London (GB): Springer-Verlag; 2009. p. 52–64.

39. Laine K, Pirhonen T, Rolland R, et al. Decreasing the incidence of anal sphincter tears during delivery. Obstet Gynecol 2008;111:1053–7.

40. Hals E, Øian P, Pirhonen T, et al. A multicenter interventional program to reduce the incidence of anal sphincter tears. Obstet Gynecol 2010;116:901–8.

41. Laine K, Skjeldestad FE, Sandvik L, et al. Incidence of obstetric anal sphincter injuries after training to protect the perineum: Cohort study. BMJ Open 2012;2(5).

42. De Meutter L, A DvH, van der Woerdt-Eltink I, et al. Implementation of a perineal support programme for reduction of the incidence of obstetric anal sphincter injuries and the effect of non-compliance. Eur J Obstet Gynecol Reprod Biol 2018;230:119–23.

43. Naidu M, Sultan AH, Thakar R. Reducing obstetric anal sphincter injuries using perineal support: Our preliminary experience. Int Urogynecol J 2017;28:381–9.

44. Gurol-Urganci I, Bidwell P, Sevdalis N, et al. Impact of a quality improvement project to reduce the rate of obstetric anal sphincter injury: A multicentre study with a stepped-wedge design. BJOG 2021;128:584–92.

45. Rasmussen OB, Yding A, Andersen CS, et al. Which elements were significant in reducing obstetric anal sphincter injury? A prospective follow-up study. BMC Pregnancy Childbirth 2021;21(1):781.

46. Yeung J, Stecher A, Crisp CC, et al. Incidence of obstetric anal sphincter injuries after training to protect the perineum. Female Pelvic Med Reconstr Surg 2018;24:126–9.

47. Aasheim V, Nilsen ABV, Reinar LM, et al. Perineal techniques during the second stage of labour for reducing perineal trauma. Cochrane Database Syst Rev 2017;6:Cd006672.

48. McCandlish R, Bowler U, van Asten H, et al. A randomised controlled trial of care of the perineum during second stage of normal labour. Br J Obstet Gynaecol 1998;105:1262–72.

49. Gottvall K, Allebeck P, Ekéus C. Risk factors for anal sphincter tears: The importance of maternal position at birth. BJOG 2007;114:1266–72.

50. Elvander C, Ahlberg M, Thies-Lagergren L, et al. Birth position and obstetric anal sphincter injury: A population-based study of 113 000 spontaneous births. BMC Pregnancy Childbirth 2015;15:252.

51. Gupta JK, Sood A, Hofmeyr GJ, et al. Position in the second stage of labour for women without epidural anaesthesia. Cochrane Database Syst Rev 2017;5:Cd002006.

52. Graham ID, Graham DF. Episiotomy counts: Trends and prevalence in Canada, 1981/1982 to 1993/1994. Birth 1997;24:141–7.

53. Jiang H, Qian X, Carroli G, et al. Selective versus routine use of episiotomy for vaginal birth. Cochrane Database of Systematic Reviews 2017;2:CD000081.

54. Murphy DJ, Macleod M, Bahl R, et al. A randomised controlled trial of routine versus restrictive use of episiotomy at operative vaginal delivery: A multicentre pilot study. BJOG 2008;115:1695–702.

55. Stedenfeldt M, Pirhonen J, Blix E, et al. Episiotomy characteristics and risks for obstetric anal sphincter injuries: A case-control study. BJOG 2012;119:724–30.

56. Labrecque M, Baillargeon L, Dallaire M, et al. Association between median episiotomy and severe perineal lacerations in primiparous women. CMAJ 1997;156:797–802.

57. Bulletins-Obstetrics CoP. Acog practice bulletin no. 198: Prevention and management of obstetric lacerations at vaginal delivery. Obstet Gynecol 2018;132:e87–102.

58. de Leeuw JW, de Wit C, Kuijken JP, et al. Mediolateral episiotomy reduces the risk for anal sphincter injury during operative vaginal delivery. BJOG 2008;115:104–8.

59. Coats PM, Chan KK, Wilkins M, et al. A comparison between midline and mediolateral episiotomies. Br J Obstet Gynaecol 1980;87:408–12.

60. Sooklim R, Thinkhamrop J, Lumbiganon P, et al. The outcomes of midline versus medio-lateral episiotomy. Reprod Health 2007;4:10.

61. de Leeuw JW, Struijk PC, Vierhout ME, et al. Risk factors for third degree perineal ruptures during delivery. Bjog 2001;108:383–7.

62. Revicky V, Nirmal D, Mukhopadhyay S, et al. Could a mediolateral episiotomy prevent obstetric anal sphincter injury? Eur J Obstet Gynecol Reprod Biol 2010;150:142–6.

63. Räisänen S, Selander T, Cartwright R, et al. The association of episiotomy with obstetric anal sphincter injury–a population based matched cohort study. PLoS One 2014;9:e107053.

64. Pereira GMV, Hosoume RS, de Castro Monteiro MV, et al. Selective episiotomy versus no episiotomy for severe perineal trauma: A systematic review with meta-analysis. Int Urogynecol J 2020;31:2291–9.

65. Morgan R, Korb D, Sibony O. Classification and evaluation of episiotomy practices from 2004 to 2020 and association with oasis. Int J Gynaecol Obstet 2022;159:237–45.

66. Jangö H, Langhoff-Roos J, Rosthøj S, et al. Modifiable risk factors of obstetric anal sphincter injury in primiparous women: A population-based cohort study. Am J Obstet Gynecol 2014;210(59):e1–6.

67. van Bavel J, Hukkelhoven C, de Vries C, et al. The effectiveness of mediolateral episiotomy in preventing obstetric anal sphincter injuries during operative vaginal delivery: A ten-year analysis of a national registry. Int Urogynecol J 2018;29:407–13.

68. Lund NS, Persson LK, Jangö H, et al. Episiotomy in vacuum-assisted delivery affects the risk of obstetric anal sphincter injury: A systematic review and meta-analysis. Eur J Obstet Gynecol Reprod Biol 2016;207:193–9.

69. Okeahialam NA, Wong KW, Jha S, et al. Mediolateral/lateral episiotomy with operative vaginal delivery and the risk reduction of obstetric anal sphincter injury (oasi): A systematic review and meta-analysis. Int Urogynecol J 2022;33:1393–405.

70. Räisänen SH, Vehviläinen-Julkunen K, Gissler M, et al. Lateral episiotomy protects primiparous but not multiparous women from obstetric anal sphincter rupture. Acta Obstet Gynecol Scand 2009;88:1365–72.

71. Verghese TS, Champaneria R, Kapoor DS, et al. Obstetric anal sphincter injuries after episiotomy: Systematic review and meta-analysis. Int Urogynecol J 2016;27:1459–67.

72. Eogan M, Daly L, O'Connell PR, et al. Does the angle of episiotomy affect the incidence of anal sphincter injury? BJOG 2006;113:190–4.

73. El-Din AS, Kamal MM, Amin MA. Comparison between two incision angles of mediolateral episiotomy in primiparous women: A randomized controlled trial. J Obstet Gynaecol Res 2014;40:1877–82.

74. Kalis V, Karbanova J, Horak M, et al. The incision angle of mediolateral episiotomy before delivery and after repair. Int J Gynaecol Obstet 2008;103:5–8.

75. Tincello DG, Williams A, Fowler GE, et al. Differences in episiotomy technique between midwives and doctors. BJOG 2003;110:1041–4.

76. Andrews V, Thakar R, Sultan AH, et al. Are mediolateral episiotomies actually mediolateral? BJOG 2005;112:1156–8.

77. Karbanova J, Rusavy Z, Betincova L, et al. Clinical evaluation of early postpartum pain and healing outcomes after mediolateral versus lateral episiotomy. Int J Gynaecol Obstet 2014;127:152–6.

78. Silf K, Woodhead N, Kelly J, et al. Evaluation of accuracy of mediolateral episiotomy incisions using a training model. Midwifery 2015;31:197–200.

79. Naidu M, Kapoor DS, Evans S, et al. Cutting an episiotomy at 60 degrees: How good are we? Int Urogynecol J 2015;26:813–6.

80. Koh LM, van Roon Y, Pradhan A, et al. Impact of the episcissors-60 mediolateral episiotomy scissors on obstetric anal sphincter injuries: A 2-year data review in the united kingdom. Int Urogynecol J 2020;31:1729–34.

81. Mohiudin H, Ali S, Pisal PN, et al. Implementation of the rcog guidelines for prevention of obstetric anal sphincter injuries (oasis) at two london hospitals: A time series analysis. Eur J Obstet Gynecol Reprod Biol 2018;224:89–92.

82. van Roon Y, Vinayakarao L, Melson L, et al. Comparative study of episiotomy angles achieved by cutting with straight mayo scissors and the episcissors-60 in a birth simulation model. Int Urogynecol J 2017;28:1063–6.

83. Kastora S, Kounidas G, Triantafyllidou O. Obstetric anal sphincter injury events prior and after episcissors-60 implementation: A systematic review and meta-analysis. Eur J Obstet Gynecol Reprod Biol 2021;265:175–80.

84. Divakova O, Khunda A, Ballard PA. Episcissors-60™ and obstetrics anal sphincter injury: A systematic review and meta-analysis. Int Urogynecol J 2020;31:605–12.

85. O'Connell S, Dale M, Morgan H, et al. Episcissors-60 for mediolateral episiotomy: Evaluation of clinical and economic evidence to inform nice medical technologies guidance. Appl Health Econ Health Policy 2022;20:159–69.

86. Giroux M, Emslie E, Karreman E, et al. Implementation of episcissors-60 for prevention of obstetric anal sphincter injuries (oasis) in a centre with low episiotomy rates. J Obstet Gynaecol Can 2023;45:410–6.

87. Verma GL, Spalding JJ, Wilkinson MD, et al. Instruments for assisted vaginal birth. Cochrane Database Syst Rev 2021;9:Cd005455.

88. Muraca GM, Boutin A, Razaz N, et al. Maternal and neonatal trauma following operative vaginal delivery. CMAJ 2022;194:E1–12.

89. Hirsch E, Haney EI, Gordon TE, et al. Reducing high-order perineal laceration during operative vaginal delivery. Am J Obstet Gynecol 2008;198:668.e1–5.

90. Farrell SA. Cesarean section versus forceps-assisted vaginal birth: It's time to include pelvic injury in the risk-benefit equation. CMAJ 2002;166:337–8.

91. Royal College of Obstetricians and Gynaecologists. The management of third- and fourth-degree perineal tears. 2007 Green Top Guideline No. 29. London (GB): RCOG. 2015. Available at: https://www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg29.

92. Williams A, Adams EJ, Tincello DG, et al. How to repair an anal sphincter injury after vaginal delivery: results of a randomised controlled trial. BJOG 2006;113:201–7.

93. Nordenstam J, Mellgren A, Altman D, et al. Immediate or delayed repair of obstetric anal sphincter tears-a randomised controlled trial. BJOG 2008;115:857–65.

94. Duggal N, Mercado C, Daniels K, et al. Antibiotic prophylaxis for prevention of postpartum perineal wound complications: a randomized controlled trial. Obstet Gynecol 2008;111:1268–73.

95. Fowler JR, Perkins TA, Buttaro BA, et al. Bacteria adhere less to barbed monofilament than braided sutures in a contaminated wound model. Clin Orthop Relat Res 2013;471(2):665–71.

96. Sultan AH, Thakar R. Lower genital tract and anal sphincter trauma. Best Pract Res Clin Obstet Gynaecol 2002;16:99–115.

97. Koelbl H, Nitti V, Baessler K, et al. Pathophysiology of urinary incontinence, faecal incontinence and pelvic organ prolapse. In: Abrams P, Cardozo L, Khoury S, Wein A, eds. Incontinence, 4th ed. St Hillier, (GB): Health Publication; 2009: p. 255–330.

98. Lunniss J, Scott S. Pathophysiology of anal incontinence. In: Sultan AH, Thakar R, Fenner DE, editors. Perineal and anal sphincter trauma. 1st ed. London (GB): Springer-Verlag; 2009. p. 89–101.

99. Richter HE, Fielding JR, Bradley CS, et al. Endoanal ultrasound findings and fecal incontinence symptoms in women with and without recognized anal sphincter tears. Obstet Gynecol 2006;108:1394–401.

100. O'Mahony F, Hofmeyr GJ, Menon V. Choice of instruments for assisted vaginal delivery. Cochrane Database Syst Rev 2010;11:Cd005455.

101. Nichols CM, Nam M, Ramakrishnan V, et al. Anal sphincter defects and bowel symptoms in women with and without recognized anal sphincter trauma. Am J Obstet Gynecol 2006;194:1450–4.

102. Nichols CM, Lamb EH, Ramakrishnan V. Differences in outcomes after third- versus fourth-degree perineal laceration repair: a prospective study. Am J Obstet Gynecol 2005;193:530–4.

103. Lindqvist PG, Jernetz M. A modified surgical approach to women with obstetric anal sphincter tears by separate suturing of external and internal anal sphincter. A modified approach to obstetric anal sphincter injury. BMC Pregnancy Childbirth 2010;10:51.

104. Fitzpatrick M, Behan M, O'Connell PR, et al. A randomized clinical trial comparing primary overlap with approximation repair of third-degree obstetric tears. Am J Obstet Gynecol 2000;183:1220–4.

105. Cunningham CB, Pilkington JW. Complete perineotomy. Am J Obstet Gynecol 1955;70:1225–31.

106. Sultan AH, Monga AK, Kumar D, et al. Primary repair of obstetric anal sphincter rupture using the overlap technique. Br J Obstet Gynaecol 1999;106:318–23.

107. Fernando RJ, Sultan AH, Kettle C, et al. Methods of repair for obstetric anal sphincter injury. Cochrane Database Syst Rev 2013;12:Cd002866.

108. Fernando RJ, Sultan AH, Kettle C, et al. Repair techniques for obstetric anal sphincter injuries: a randomized controlled trial. Obstet Gynecol 2006;107:1261–8.

109. Farrell SA, Flowerdew G, Gilmour D, et al. Overlapping compared with end-to-end repair of complete third-degree or fourth-degree obstetric tears: three-year follow-up of a randomized controlled trial. Obstet Gynecol 2012;120:803–8.

110. Garcia V, Rogers RG, Kim SS, et al. Primary repair of obstetric anal sphincter laceration: a randomized trial of two surgical techniques. Am J Obstet Gynecol 2005;192:1697–701.

111. Rygh AB, Korner H. The overlap technique versus end-to-end approximation technique for primary repair of obstetric anal sphincter rupture: a randomized controlled study. Acta Obstetricia et Gynecologica Scandinavica 2010;89(10):1256–62.

112. Roper JC, Thakar R, Sultan AH. Isolated rectal buttonhole tears in obstetrics: case series and review of the literature. Int Urogynecol J 2021;32(7):1761–9.

113. Buppasiri P, Lumbiganon P, Thinkhamrop J, et al. Antibiotic prophylaxis for third- and fourth-degree perineal tear during vaginal birth. Cochrane Database Syst Rev 2014;10:Cd005125.

114. Queensland clinical guidelines. Queensland clinical guidelines: Perineal Care 2018. Available at: https://www.health.qld.gov.au/__data/assets/pdf_file/0022/142384/g-pericare.pdf.

115. Department for Health and Wellbeing. South Australian Perinatal Practice Guideline - Third and fourth degree tear management 2018. Available at: https://www.sahealth.sa.gov.au/wps/wcm/connect/1faf87004eedec4db635b76a7ac0d6e4/Third+and+Fourth+Degree+Tear+Management_PPG_v5_1.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-1faf87004eedec4db635b76a7ac0d6e4-n1mzbge.

116. Aigmueller T, Bader W, Beilecke K, et al. Management of 3rd and 4th degree perineal tears after vaginal birth. German guideline of the German Society of Gynecology and Obstetrics (AWMF registry no. 015/079, October 2014) Geburtshilfe Frauenheilkd 2015;75:137–44.

117. Aigmueller T, Umek W, Elenskaia K, et al. Guidelines for the management of third and fourth degree perineal tears after vaginal birth from the Austrian Urogynecology working group. Int Urogynecol J 2013;24:553–8.

118. Mahony R, Behan M, O'Herlihy C, et al. Randomized, clinical trial of bowel confinement vs. Laxative use after primary repair of a third-degree obstetric anal sphincter tear. Diseases of the colon & rectum 2004;47:12–7.

119. Kirss J, Pinta T, Böckelman C, et al. Factors predicting a failed primary repair of obstetric anal sphincter injury. Acta Obstet Gynecol Scand 2016;95(9):1063–9.

120. Wuytack F, Smith V, Cleary BJ. Oral non-steroidal anti-inflammatory drugs (single dose) for perineal pain in the early postpartum period. Cochrane Database Syst Rev 2016;7:Cd011352.

121. Saad J, Painter C. Management of postpartum perineal wound complications. Curr Opin Obstet Gynecol 2023;35(6):505–9.

122. Hedayati H, Parsons J, Crowther CA. Rectal analgesia for pain from perineal trauma following childbirth. The Cochrane database of systematic reviews 2003:CD003931.

123. Francisco AA, De Oliveira SMJV, Steen M, et al. Ice pack induced perineal analgesia after spontaneous vaginal birth: Randomized controlled trial. Women Birth 2018;31:e334–40.

124. Hedayati H, Parsons J, Crowther CA. Topically applied anaesthetics for treating perineal pain after childbirth. Cochrane Database Syst Rev 2005:CD004223.

125. Yip SK, Brieger G, Hin LY, et al. Urinary retention in the postpartum period. The relationship between obstetric factors and the postpartum post-void residual bladder volume. Acta Obstet Gynecol Scand 1997;76:667–72.

126. Ching-Chung L, Shuenn-Dhy C, Ling-Hong T, et al. Postpartum urinary retention: assessment of contributing factors and long-term clinical impact. Aust N Z J Obstet Gynaecol 2002;42:365–8.

127. Glavind K, Bjork J. Incidence and treatment of urinary retention postpartum. Int Urogynecol J 2003;14:119–21.

128. Musselwhite KL, Faris P, Moore K, et al. Use of epidural anesthesia and the risk of acute postpartum urinary retention. Am J Obstet Gynecol 2007;196:472.e1-.e5.

129. Buchanan J, Beckmann M. Postpartum voiding dysfunction: identifying the risk factors. Aust N Z J Obstet Gynaecol 2014;54(1):41–5.

130. Mulder FE, Rengerink KO, van der Post JA, et al. Delivery-related risk factors for covert postpartum urinary retention after vaginal delivery. Int Urogynecol J 2016;27:55–60.

131. Lamblin G, Chene G, Aeberli C, et al. Identification of Risk Factors for Postpartum Urinary Retention Following Vaginal Deliveries: A Retrospective Case-Control Study. Eur J Obstet Gynecol Reprod Biol 2019;243:7–11.

132. Routine Postnatal Care of Women and their Babies. London: National Institute for Health and Clinical Excellence Guideline 37; 2006.

133. World Health Organization. World Health Organization Technical Consultation on Postpartum and Postnatal Care. Geneva: World Health Organization; 2010.

134. Stock L, Basham E, Gossett DR, et al. Factors associated with wound complications in women with obstetric anal sphincter injuries (OASIS). Am J Obstet Gynecol 2013;208:327.e1–6.

135. Wan OY, Taithongchai A, Veiga SI, et al. A one-stop perineal clinic: our eleven-year experience. Int Urogynecol J 2020;31(11):2317–26.

136. Goldaber KG, Wendel PJ, McIntire DD, et al. Postpartum perineal morbidity after fourth-degree perineal repair. Am J Obstet Gynecol 1993;168:489–93.

137. Lewicky-Gaupp C, Leader-Cramer A, Johnson LL, et al. Wound complications after obstetric anal sphincter injuries. Obstet Gynecol 2015;125(5):1088–93.

138. Okeahialam NA, Wong KW, Thakar R, et al. The incidence of wound complications following primary repair of obstetric anal sphincter injury: A systematic review and meta-analysis. Am J Obstet Gynecol 2022;227:182–91.

139. Everist R, Burrell M, Mallitt KA, et al. Postpartum anal incontinence in women with and without obstetric anal sphincter injuries. Int Urogynecol J 2020;31(11):2269–75.

140. Roos AM, Thakar R, Sultan AH. Outcome of primary repair of obstetric anal sphincter injuries (OASIS): does the grade of tear matter? Ultrasound Obstet Gynecol 2010;36(3):368–74.

141. Patton V, Kumar S, Parkin K, et al. The relationship between residual sphincter damage after primary repair, faecal incontinence, and anal sphincter function in primiparous women with an obstetric anal sphincter injury. Neurourol Urodyn 2019;38(1):193–9.

142. Reid AJ, Beggs AD, Sultan AH, et al. Outcome of repair of obstetric anal sphincter injuries after three years. Int J Gynaecol Obstet 2014;127(1):47–50.

143. Cornelisse S, Arendsen LP, van Kuijk SM, et al. Obstetric anal sphincter injury: a follow-up questionnaire study on longer-term outcomes. Int Urogynecol J 2016;27(10):1591–6.

144. Jangö H, Langhoff-Roos J, Rosthøj S, et al. Long-term anal incontinence after obstetric anal sphincter injury-does grade of tear matter? Am J Obstet Gynecol 2018;218(2):232.e1. 10.

145. Schütze S, Hohlfeld B, Friedl TWP, et al. Fishing for (in)continence: long-term follow-up of women with OASIS-still a taboo. Arch Gynecol Obstet 2021;303(4):987–97.

146. Richter HE, Nager CW, Burgio KL, et al. Incidence and Predictors of Anal Incontinence After Obstetric Anal Sphincter Injury in Primiparous Women. Female Pelvic Med Reconstr Surg 2015;21(4):182–9.

147. Okeahialam NA, Taithongchai A, Thakar R, et al. The incidence of anal incontinence following obstetric anal sphincter injury graded using the sultan classification: A network meta-analysis. American journal of obstetrics and gynecology 2023;228:675–688.e13.

148. Kuismanen K, Nieminen K, Karjalainen K, et al. Outcomes of primary anal sphincter repair after obstetric injury and evaluation of a novel three-choice assessment. Tech Coloproctol 2018;22(3):209–14.

149. de Leeuw JW, Vierhout ME, Struijk PC, et al. Anal sphincter damage after vaginal delivery: functional outcome and risk factors for fecal incontinence. Acta Obstet Gynecol Scand 2001;80:830–4.

150. Anglim B, Kelly L, Fitzpatrick M. Risk factors and outcome of repair of obstetric anal sphincter injuries as followed up in a dedicated perineal clinic. Int Urogynecol J 2019;30(10):1649–55.

151. Cerro CR, Franco EM, Santoro GA, et al. Residual defects after repair of obstetric anal sphincter injuries and pelvic floor muscle strength are related to anal incontinence symptoms. Int Urogynecol J 2017;28(3):455–60.

152. Fynes MM, Marshall K, Cassidy M, et al. A prospective, randomized study comparing the effect of augmented biofeedback with sensory biofeedback alone on fecal incontinence after obstetric trauma. Dis Colon Rectum 1999;42:753–61.

153. Mahony RT, Malone PA, Nalty J, et al. Randomized clinical trial of intra-anal electromyographic biofeedback physiotherapy with intra-anal electromyographic biofeedback augmented with electrical stimulation of the anal sphincter in the early treatment of postpartum fecal incontinence. Am J Obstet Gynecol 2004;191:885–90.

154. Scheer I, Andrews V, Thakar R, et al. Urinary incontinence after obstetric anal sphincter injuries (OASIS)–is there a relationship? Int Urogynecol J Pelvic Floor Dysfunct 2008;19(2):179–83.

155. Barbosa M, Glavind-Kristensen M, Christensen P. Early secondary repair of obstetric anal sphincter injury: postoperative complications, long-term functional outcomes, and impact on quality of life. Tech Coloproctol 2020;24(3):221–9.

156. Gommesen D, Nøhr E, Qvist N, et al. Obstetric perineal tears, sexual function and dyspareunia among primiparous women 12 months postpartum: a prospective cohort study. BMJ Open 2019;9(12):e032368.

157. O'Shea MS, Lewicky-Gaupp C, Gossett DR. Long-Term Sexual Function After Obstetric Anal Sphincter Injuries. Female Pelvic Med Reconstr Surg 2018;24(2):82–6.

158. Muraca GM, Ralph LE, Christensen P, et al. Maternal and neonatal trauma during forceps and vacuum delivery must not be overlooked. BMJ 2023;383:e073991.

159. Peterson JAM, Cooper TA. Clinical and Molecular Insights into Gastrointestinal Dysfunction in Myotonic Dystrophy Types 1 & 2. International Journal of Molecular Sciences 2022;23(23):14779. https://doi.org/10.3390/ijms232314779..