

# Obstetrical Anal Sphincter Injuries (OASIS): Prevention, Recognition, and Repair

This clinical practice guideline has been prepared by the Urogynaecology Committee, reviewed by the Clinical Practice—Obstetrics and the Family Physician Advisory committees, and approved by the Executive and Board of the Society of Obstetricians and Gynaecologists of Canada

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## Abstract

**Objective:** To review the evidence relating to obstetrical anal sphincter injuries (OASIS) with respect to diagnosis, repair techniques and outcomes. To formulate recommendations as to patient counselling regarding route of delivery for subsequent pregnancy after OASIS.

**Options:** Obstetrical care providers caring for women with OASIS have the option of repairing the anal sphincter using end-to-end or overlapping techniques. They may also be involved in counselling women with prior OASIS regarding the route of delivery for future pregnancies.

**Outcomes:** The outcome measured is anal continence following primary OASIS repair and after subsequent childbirth.

**Evidence:** Published literature was retrieved through searches of Medline, EMBASE, and The Cochrane Library in May 2011 using appropriate controlled vocabulary (e.g., anal canal, obstetrics, obstetric labour complication, pregnancy complication, treatment outcome, surgery, quality of life) and key words (obstetrical anal sphincter injur\*, anus sphincter, anus injury, delivery, obstetrical care, surgery, suturing method, overlap, end-to-end, feces incontinence). Results were restricted to systematic reviews, randomized control trials/controlled clinical trials, and observational. There were no date or language restrictions. Searches were updated on a regular basis and incorporated in the guideline to September 2014. Grey (unpublished) literature was identified through searching the websites of health technology assessment and health technology-related agencies, clinical practice guideline collections, clinical trial registries, and national and international medical specialty societies.

**Values:** The quality of evidence in this document was rated using the criteria described in the Report of the Canadian Task Force on Preventive Health Care (Table 1).

**Benefits, harms, and costs:** Benefits from implementation of these guidelines include: improved diagnosis of OASIS, optimal functional outcomes following repair, and evidence-based counselling of women for future childbirth.

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**Table 1. Key to evidence statements and grading of recommendations, using the ranking of the Canadian Task Force on Preventive Health Care**

Quality of evidence assessment*	Classification of recommendations†
I: Evidence obtained from at least one properly randomized controlled trial	A. There is good evidence to recommend the clinical preventive action
II-1: Evidence from well-designed controlled trials without randomization	B. There is fair evidence to recommend the clinical preventive action
II-2: Evidence from well-designed cohort (prospective or retrospective) or case-control studies, preferably from more than one centre or research group	C. The existing evidence is conflicting and does not allow to make a recommendation for or against use of the clinical preventive action; however, other factors may influence decision-making
II-3: Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category	D. There is fair evidence to recommend against the clinical preventive action
III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees	E. There is good evidence to recommend against the clinical preventive action
	L. There is insufficient evidence (in quantity or quality) to make a recommendation; however, other factors may influence decision-making

\*The quality of evidence reported in these guidelines has been adapted from The Evaluation of Evidence criteria described in the Canadian Task Force on Preventive Health Care.<sup>125</sup>

†Recommendations included in these guidelines have been adapted from the Classification of Recommendations criteria described in the Canadian Task Force on Preventive Health Care.<sup>125</sup>

## Summary Statements

- Obstetrical anal sphincter injuries may lead to significant comorbidities, including anal incontinence, rectovaginal fistula, and pain. (II-2)
- Obstetrical anal sphincter injuries are more commonly associated with forceps deliveries than with vacuum-assisted vaginal deliveries. (II-2)
- Obstetrical anal sphincter injuries (OASIS) repair:
  - Suture-related morbidity is similar at 6 weeks following the use of either polyglactin 2-0 or polydioxanone 3-0 for OASIS repairs. (I)
  - Repair of the internal anal sphincter is recommended as women who demonstrate an internal anal sphincter defect on postpartum ultrasound have more anal incontinence. (III)
  - Repair of the external anal sphincter should include the fascial sheath. An overlapping technique often requires more dissection and mobilization of the sphincter ends and is only possible with full thickness 3b sphincter tears or greater. (III)
  - A persistent defect of the external anal sphincter remote from delivery may increase the risk of worsening symptoms following subsequent vaginal deliveries. (II-2)
- Obstetrical anal sphincter injuries are associated with an increased risk of postpartum urinary retention. (II-2)
- After a successful repair of obstetrical anal sphincter injuries, most women can safely deliver vaginally in a future pregnancy. (III)
- Counselling women about future delivery plans:
  - The risk of recurrence of an obstetrical anal sphincter injury at a subsequent delivery is 4% to 8%. (II-2)
  - It was calculated that 2.3 Caesarean sections at the cost of increased maternal risk would be required to prevent one case of anal incontinence in a woman with prior obstetrical anal sphincter injury. (II-2)

## Recommendations

- All women should be carefully examined for perineal or vaginal tears; those with a tear that is more than superficial in depth should have a systematic rectal examination for obstetrical anal sphincter injury prior to repair. (II-2B)
- The World Health Organization classification should be used to classify obstetrical anal sphincter injury. This distinguishes the degree of external sphincter tear (3a: < 50% or 3b: ≥ 50%) and the presence of internal sphincter defects (3c). A button-hole injury is distinct and should be classified separately as such. (III-B)
- In women having a spontaneous vaginal delivery, the rate of obstetrical anal sphincter injury is decreased when the obstetrical care provider slows the fetal head at crowning. (II-2A)
- Episiotomy:
  - At the time of either a spontaneous vaginal or instrumental delivery, the obstetrical care provider should follow a policy of "restricted" episiotomy (i.e., only if indicated), rather than "liberal" use (i.e. routine), for the prevention of obstetrical anal sphincter injuries. (I-A)
  - If an episiotomy is deemed indicated, preference for a mediolateral over a midline should be considered. (II-2B) The optimal cutting angle appears to be no less than 45 degrees, ideally around 60 degrees. (II-2B)
- Repair can be delayed for 8 to 12 hours with no detrimental effect. Delay may be required so a more experienced care provider is available for the repair. (I-A)
- Prophylactic single dose intravenous antibiotics (2nd generation cephalosporin, e.g. cefotetan or cefoxitin) should be administered for the reduction of perineal wound complications following the repair of obstetrical anal sphincter injury. (I-A)
- Laxatives (e.g., lactulose) should be prescribed following the primary repair of obstetrical anal sphincter injury as they are associated with earlier and less painful first bowel motions and earlier discharge from hospital. Constipating agents and bulking agents are not recommended. (I-A)

8. Non-steroidal anti-inflammatories and acetaminophen are the first-line analgesics. Opioids should only be used with caution. Constipation should be avoided by using a laxative or stool softener. (I-A)
9. Following obstetrical anal sphincter injury, providers should disclose to women the degree of injury and arrange follow-up. Detailed documentation of the injury and its repair is required. (III-L)
10. Women with anal incontinence following obstetrical anal sphincter injury should be referred for pelvic floor physiotherapy. (I-A)

## INTRODUCTION

While maternal mortality related to childbirth is now rare in the developed world, there continues to be significant maternal morbidity—including that related to the pelvic floor function. A group of women who are at risk of pelvic floor dysfunction following delivery include those in whom the anal sphincter is disrupted during childbirth.

### Definitions

Perineal trauma occurs either spontaneously with vaginal delivery or secondarily as an extension to an episiotomy. Severe perineal trauma can involve damage to the anal sphincters and anal mucosa. Obstetric anal sphincter injuries include third and fourth degree perineal tears. Third degree tears involve a partial or complete disruption of the anal sphincter complex which includes the external anal sphincter and the internal anal sphincter. Fourth degree tears involve disruption of the anal mucosa in addition to division of the anal sphincter complex.

### Clinical Impact

OASIS can have a significant impact on women by impairing their quality of life in both the short and long term. One of the most distressing immediate complications of perineal injury is perineal pain. Short-term perineal pain is associated with edema and bruising, which can be the result of tight sutures, infection, or wound breakdown. Perineal pain can lead to urinary retention and defecation problems in the immediate postpartum period. In the long term, women with perineal pain may have dyspareunia and altered sexual function. Additionally, complications

of severe perineal tears include abscess formation, wound breakdown, and rectovaginal fistulae.

Injury to the anal sphincter is recognized as the most common cause of anal incontinence and anorectal symptoms in otherwise healthy women. Obstetrical sphincter injuries have a variety of long-term complications of which anal incontinence is the most distressing and disabling. Anal incontinence incorporates a range of symptoms including: flatal incontinence, passive soiling, or incontinence of liquid or solid stool.<sup>1</sup> Fecal urgency can also be a symptom experienced by many women. Any of these symptoms can potentially be a hygienic, social, and psychological problem for women. Women are not always forthcoming with symptoms of anal incontinence either due to embarrassment or they feel that the symptoms are a normal result of vaginal delivery.

The true prevalence of AI related to OASIS may be underestimated. The reported rates of AI following the primary repair of OASIS range between 15% and 61%, with a mean of 39%.<sup>2</sup> This high prevalence highlights the need to ensure our surgical techniques and postoperative management are optimal.

Sustaining an OASIS can have a significant impact on a women's physical and emotional health. There are personal costs to the patient with pad use and missed time from work, and costs to women and the health care system including appointments and treatments. It may also make women apprehensive about future childbirth and adversely affect the remainder of their reproductive lives. Missed tears or inadequate repair may also present a potential source for litigation.

Obstetrical trauma that can lead to AI includes structural damage to the anal sphincter complex, pudendal neuropathy (by direct compression or stretching), or both. Despite sphincter repairs, some women may have residual defects and AI symptoms. The onset of symptoms of AI may occur immediately or several years after delivery; anal incontinence may only appear in old age, when the aging process adds to the delivery insult.

### Summary Statement

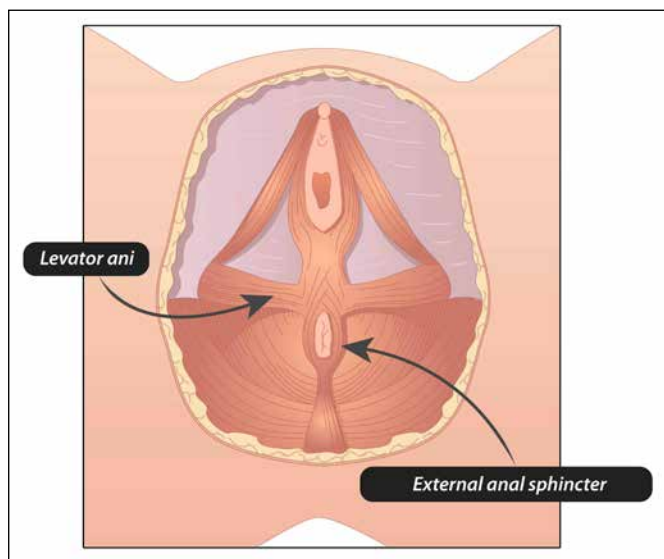
1. Obstetrical anal sphincter injuries lead to significant comorbidities, including anal incontinence, rectovaginal fistula, and pain. (II-2)

## DIAGNOSIS OF OASIS

Careful examination of the perineum, including a rectal examination for those with a tear that is more than superficial in depth, should be performed in all women prior to suturing.<sup>3</sup> Formal training in the recognition of OASIS improves the detection of such injuries,<sup>4</sup> as

## ABBREVIATIONS

AI	anal incontinence
EAS	external anal sphincter
IAS	internal anal sphincter
NSAID	non-steroidal anti-inflammatory
OASIS	obstetric anal sphincter injuries
RTC	randomized control trial
SVD	spontaneous vaginal delivery
WHO	World Health Organization

**Figure 1. Urogenital musculature**

incident rises from 11% to 24.5% when the obstetrical care provider's examination was repeated by a trained fellow.<sup>5</sup>

The inspection should be done with adequate lighting and analgesia and include:

- inspection of perineum with labial parting,
- inspection of the distal (caudal) posterior vagina, and
- inspection for a third degree tear behind an “intact perineum.”

Palpation is best done<sup>3</sup> with the examiner's dominant index inserted in the anus, and the ipsilateral thumb in the vagina. The 2 fingers then palpate with a “pill-rolling” motion to assess thickness.

When the external sphincter tears, the ends retract and a cavity is often palpated along the course of the sphincter muscle. This may be less evident in the presence of an epidural.

Special attention should then be given to the IAS. The IAS is a continuation of the circular smooth muscle of the rectum. This muscle appears pale (like raw white fish), is not very thick, and can be found 6 to 8 mm above (cephalad to) the anal margin (Figure 1; for a more detailed illustration, see online eFigure 1). Examination of the IAS will also permit detection of a button-hole injury.

### Recommendation

1. All women should be carefully examined for perineal or vaginal tears; those with a tear that is more than superficial in depth should have a systematic rectal examination for obstetrical anal sphincter injury prior to repair. (II-2B)

**Table 2. Classification of OASIS**

First degree	Injury to perineal skin only
Second degree	Injury to perineum involving perineal muscles but not involving the anal sphincter
Third degree	Injury to perineum involving the anal sphincter complex:
3a	Less than 50% of EAS thickness torn
3b	More than 50% of EAS thickness torn
3c	Both EAS and IAS torn
Fourth degree	Injury to perineum involving the anal sphincter complex (EAS and IAS) and anal epithelium

### GRADING OF SEVERITY

Traditionally, the severity of perineal tear was limited to 4 grades: grade 1 (superficial vaginal and/or perineal skin), grade 2 (vaginal muscles), grade 3 (in or through external anal sphincter muscle), and grade 4 (external and internal anal sphincters and anorectal lumen).<sup>6</sup>

As there was a lack of consistency in the classification of a partial anal sphincter, with up to 33% of consultant obstetricians classifying a complete or partial tear of the EAS as a second degree tear,<sup>7</sup> Sultan<sup>8</sup> devised a more specific classification, later adopted by the WHO<sup>9</sup> and the International Consultation on Incontinence.<sup>10</sup> In this classification, grade 3 is further refined as involving the anal sphincter complex and is divided into 3a, 3b, 3c (Table 2).

The type of third degree tear seems to have an impact on symptoms, with OASIS grade 3a and 3b having a better prognosis than 3c. In fact, those with a 3c OASIS had symptoms similar in severity to those with a fourth degree laceration.<sup>11</sup>

A button-hole injury, where only the vaginal and rectal mucosa are involved, should not be reported as a third or fourth degree tear if found in isolation. Documentation of the presence or absence of a tear, as evidenced on rectal examination, should be disclosed to the patient and incorporated into the delivery note, and repair should be done to avoid fistulization.

Such a grading system takes into account the degree of tearing experienced by the external sphincter separately from that of the internal sphincter. Such distinction is meant to improve reporting, guide repair, and facilitate outcome research.

## Recommendation

- The World Health Organization classification should be used to classify obstetrical anal sphincter injury. This distinguishes the degree of external sphincter tear (3a: < 50% or 3b: ≥ 50%) and the presence of internal sphincter defects (3c). A button-hole injury is distinct and should be classified separately as such. (III-B)

## EPIDEMIOLOGY OF OASIS

The incidence of OASIS may vary according to many variables including use of any type of episiotomy (lateral, mediolateral, or midline), type of delivery (spontaneous or assisted vaginal), and type of instrument used (vacuum or forceps); parity, type of obstetrical care provider, and race.

Overall, studies looking at the incidence of OASIS based on the WHO's International Classification of Diseases<sup>12</sup> report an incidence of 4% to 6.6% of all vaginal birth,<sup>13–16</sup> with higher rates in assisted deliveries (6%) than in SVD (5.7%).<sup>17</sup>

An OASIS is often misdiagnosed at the time of delivery by obstetrical care providers. One study reported that the overall rate of missed OASIS ranged from 26% to 87%.<sup>5</sup> In that study of primiparous women, all women were examined by a trained fellow after the examination and grading of tear by the obstetrical care provider and confirmed by endoanal ultrasound prior to repair (considered the gold standard). When examined systematically as described above, all but 1.6% (3/182) of women were correctly diagnosed on exam; the other 3 had occult OASIS representing the false-negative rate of examination, 2 of which only affected the internal sphincter, and would have thus been undetectable on physical examination.

When the diagnosis of OASIS is obtained from endoanal ultrasound evaluation within 2 months of delivery, the incidence of any degree of anal sphincter defect in primiparous women is reported to be as high as 27% to 35%, and between 4% and 8.5% of multiparous women have a new sphincter defect.<sup>15,18</sup>

## Risk Factors for OASIS

Risk factors commonly associated with obstetric anal sphincter tears include maternal, delivery, and infant characteristics. Table 3 shows a summary of OR for various risks factors from studies reporting this information.<sup>19–35</sup>

### Maternal Risk Factors

Maternal risk factors are presented in the first section of Table 3. Obesity is protective, in a dose–response manner (BMI 25 to < 30: 0.89 [95% CI 0.85 to 0.95]; 30 to < 35:

**Table 3. Risks factors for OASIS**

Maternal risks factors	OR*
Primiparity <sup>19–24</sup>	3.5 to 9.8
Age (> 35) <sup>24</sup>	1.1
Age (> 27) <sup>23</sup>	1.9
Race <sup>19,23</sup>	1.4 to 2.5
Maternal diabetes <sup>19,23</sup>	1.2 to 1.4
Infibulation <sup>25</sup>	1.8 to 2.7
Delivery risks factors	OR
Operative vaginal delivery†	
Vacuum <sup>19,21,24,26</sup>	1.5 to 3.5
Forceps <sup>19,21,24,26,27</sup>	2.3 to 5.6
Vacuum + forceps <sup>24,28</sup>	8.1
Episiotomy	
Midline <sup>26</sup>	2.3 to 5.5
Mediolateral <sup>26,29</sup>	0.21
Mediolat episiotomy + instrumental <sup>29</sup>	
Vacuum	0.11
Forceps	0.08
Midline episiotomy + instrumental (nulliparous) <sup>30</sup>	
Vacuum	4.5
Forceps	8.6
Unspecified episiotomy + instrumental <sup>31</sup>	
Vacuum	2.9
Forceps	3.9
Epidural <sup>23</sup>	1.1 to 2.2
Second stage >1 h‡	1.5
Shoulder dystocia	2.7 to 3.3
VBAC <sup>21,32</sup>	1.4 to 5.5
Water birth <sup>27</sup>	1.46
Oxytocin augmentation‡ <sup>33</sup>	1.2
Infant risks factors	OR
Birth weight > 4000 gm <sup>20</sup>	2.2 to 3.0
Malpresentation <sup>23</sup>	2.0
Postmaturity <sup>20,24</sup>	1.1 to 2.5
Fetal distress	1.3
OP§	
SVD <sup>23</sup>	2.0
Instrumental <sup>34,35</sup>	4.7

\*All OR 95% confidence intervals are significant, i.e. do not cross 1

†Presence of episiotomy not dissociated from instrumental

‡In primiparous

§Occiput posterior

VBAC: Vaginal birth after Caesarean

**Table 4. Risk of OASIS after instrumental delivery, with or without episiotomy (90% midline)**

Characteristic	Number with factor in sphincter tear group	Number with factor in vaginal control group	Estimated OR for factor being related to tear	95% lower confidence limit for OR	95% upper confidence limit for OR
No vacuum, forceps, episiotomy or OP (reference group)	91	235	1.0		
Forceps	122	25	13.6	7.9	23.2
Fetal position OP	52	21	7.0	3.8	12.6
Vacuum	101	38	6.3	4.0	10.1
Prolonged second stage	138	66	5.6	3.6	8.6
Episiotomy	220	103	5.3	3.8	7.6
Epidural	366	336	3.2	1.6	6.2
Forceps + episiotomy	63	6	25.3	10.2	62.6
Prolonged second stage + forceps + episiotomy	32	3	24.4	6.9	86.5
Epidural + forceps + episiotomy	61	4	41.0	13.5	124.4
Prolonged second stage + epidural + forceps + episiotomy	32	2	40.6	8.6	191.8
OP + forceps	26	3	21.6	6.2	75.6
OP + vacuum	15	4	9.7	3.0	30.8
OP + episiotomy	33	5	15.9	5.8	43.2
OP + episiotomy + forceps	18	1	33.8	4.8	239.5
OP + episiotomy + epidural + forceps	17	0	—	—	—

OR: odds ratio; OP: occiput posterior

0.84 [95% CI 0.76 to 0.92]; and BMI > 35: 0.70 [95% CI 0.59 to 0.82]).<sup>36</sup>

### Delivery Risk Factors

Risks factors occurring at the time of delivery that may be independently associated with OASIS are included in the second section of Table 3. The impact of midline episiotomy and forceps, together or in isolation, are presented in Table 4.<sup>37</sup>

### Infant Risk Factors

Specific infant characteristics appearing to independently increase the risk of OASIS are presented in the third section of Table 3.

## INTERVENTIONS TO PREVENT OASIS

Risk factors for OASIS often become apparent late in labour, and the degree to which these factors can potentially be modified during labour is yet to be determined. However, some methods of performing the delivery may show evidence of protection.<sup>38</sup>

### Head Control

Slowing down the delivery of the head and instructing women to not push at the delivery of the head, using thus only the uterine expulsive efforts, decreases the incidence of OASIS by 50% to 70%, as shown by multicentre studies in Norway.<sup>39,40</sup>

### Perineal Support

The protective role of perineal support (whereby the delivery care provider holds the perineum with a sponge, applying medial pressure) in isolation is unclear. A Cochrane review including RCTs on the topic<sup>41</sup> failed to show a benefit; however, the results were heavily influenced by a large RCT of hands-poised versus hands-on techniques, which included both slowing the head and supporting the perineum. In the study, midwives assigned to poised hands were also allowed to slow the head (by applying pressure on the head itself to control its speed of expulsion) if delivering too fast, which effectively biased the results.

A 2011 Cochrane review showed that the application of warm compresses to the perineum (OR 0.5) as well as intra-partum perineal massage (OR 0.5) both decrease the risk of OASIS.<sup>41,42</sup> Perineal massage is done with lubricant,

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

(towards the rectum) is applied with steady, lateral strokes, which last 1 second in each direction.<sup>43</sup>

### Delivery Position

While kneeling versus sitting has no impact on rate of OASIS, a standing position (upright position without buttocks support: upright standing, squatting, kneeling) versus a sitting position (upright position but with support of the ischial tuberosities, with or without sacral support) might increase the risk of OASIS, as shown in a retrospective analysis of 814 women (650 standing, 264 sitting, any parity) in which women standing for their delivery had a nearly 7-fold increase in OASIS (2.5% vs. 0.38%).<sup>44</sup> A 2012 RCT comparing traditional method of delivery (no passive second stage, and active second stage in the dorsal lithotomy) versus “alternate” method of delivery (passive second stage lasting up to strong urge or 120 min, and active second stage in the lateral “Gasquet” position – with upper hip flexed, foot on stirrup higher than knee) showed no difference in rate of OASIS.<sup>45</sup>

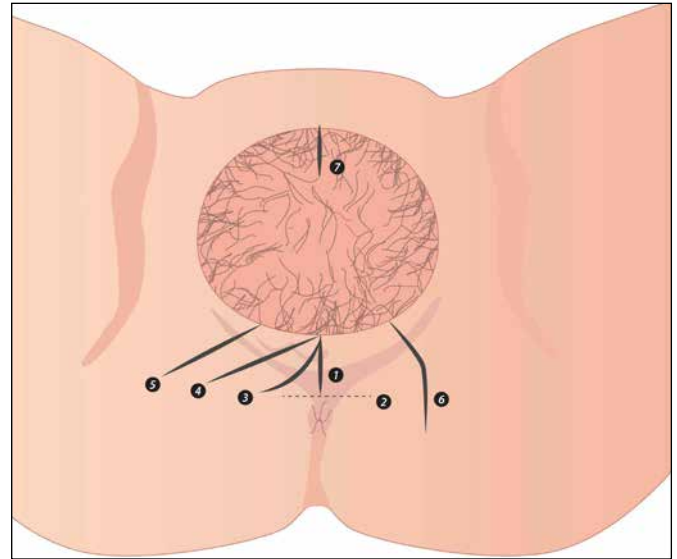
### Episiotomy

There is no doubt that restricted use of episiotomy, of any type, is preferable in women having a spontaneous vaginal delivery.<sup>46</sup> The results of a pilot RCT of routine versus restrictive mediolateral episiotomy in nulliparous women, undergoing instrumental delivery did not reach statistical significance due to a small sample size.<sup>47</sup>

Most studies identify midline episiotomy as a risk factor,<sup>48</sup> but some do not.<sup>19</sup> This might be related to poor coding in those studies that assess the outcome based on database information.<sup>49</sup> However, while the published rate of OASIS following mediolateral episiotomy varies between 0.5% to 7%, it may reach as high as 17% to 19% following a midline episiotomy.<sup>26–50</sup> In those having an operative vaginal delivery, a retrospective large Dutch database study suggested that a mediolateral or lateral episiotomy lead to less anal sphincter injuries than no episiotomy or a midline episiotomy.<sup>29</sup>

The impact of mediolateral episiotomy is somewhat controversial in instrumental deliveries in primiparous women. Some authors report an independent increased risk of OASIS if a mediolateral episiotomy is performed during instrumented birth (OR 4.04);<sup>51</sup> however, once adjusted for instrumental delivery, the type of episiotomy no longer remained a risk factor. Others report a lower rates of OASIS<sup>52–54</sup> and severe perineal trauma (high vaginal sulcus and OASIS combined)<sup>46</sup> with mediolateral episiotomy than with no episiotomy (OR 0.2 to 0.8). The balance of the evidence suggests that a mediolateral episiotomy likely does not increase the risk of OASIS at the time of instrumental delivery of a primiparous

**Figure 2. Episiotomy sites**



woman, and in fact, may decrease the incidence of OASIS compared with no episiotomy.

There is only one published RCT (published in 1980) comparing rates of OASIS between midline and mediolateral episiotomy in nulliparas.<sup>55</sup> In that study, 12% of women who had a midline episiotomy sustained an OASIS, versus 2% of those who had a mediolateral. This study had significant limitations including a number of protocol violations. For example, if an obstetrical care provider was opposed to midline incisions, a mediolateral episiotomy was performed instead and the patient excluded from the analysis. In a prospective cohort study of 1302 women who delivered vaginally, and who all received an episiotomy, 426 received midline and 876 mediolateral episiotomy, according to the practitioner's preferences.<sup>56</sup> Deep perineal tears (which included but were not limited to OASIS) were present in 14.8% of those who had a midline episiotomy versus 7% of those who had a mediolateral episiotomy.

The terminology used in the literature is at times unclear between midline, mediolateral, and lateral episiotomies. A standardization has been proposed<sup>57</sup> (as shown in Figure 2; for a more detailed illustration, see online eFigure 2). A midline episiotomy (line #1) should indicate those starting in the midline and continuing at a 0° angle from the vertical; mediolateral (line #4) episiotomies should represent those done starting in the midline but at an angle greater than 0° from the vertical line; while a lateral (#5) episiotomy starts off the midline and is carried at an angle greater than 0° from the vertical. Other incisions shown include: modified median (inverted “T” incision, #2), “J”-shaped episiotomy (#3), and the seldom used radical lateral (Schuchardt incision, #6).<sup>58</sup>

The angle of the episiotomy affects the occurrence of OASIS. A more acute (vertical) angle appears to increase the risk of OASIS; in an RCT comparing mediolateral episiotomies made at 60° and 40° angles from the vertical, the risk of OASIS was 2.4% versus 5.5%, respectively (did not reach statistical significance); however, 60° episiotomies carried higher short-term pain.<sup>59</sup> This likely reflects how far away from the anal sphincter complex the incision is.

The impact of the starting point of the episiotomy (mediolateral vs. lateral) appears less important. In a large RCT, published only in abstract form in 2014, comparing mediolateral to lateral episiotomies.<sup>60</sup> In this trial of 790 women, the incidence of OASIS did not differ between a mediolateral (60° off the midline) and a lateral incision (1 to 2 cm laterally from the midline, angled towards the ischial tuberosity): 1.5% versus 1.3%, respectively. There also seem to have no impact on postpartum pain or sexually between mediolateral and lateral.<sup>61</sup>

Looking at healed episiotomy scars, the risk of sustaining an OASIS is decreased when<sup>58</sup>:

- the tip of the episiotomy is further away from a vertical line drawn from the vagina to anus: OR 0.30 for each 5.5 mm increase in the distance between the midline vertical line and the tip of the episiotomy,
- a lateral incision is done: OR 0.44 for each 4.5 mm distance increase off the midline for the incision start (i.e. less OASIS when the incision started off the 6 o'clock location on the introitus, e.g. 4 o'clock),
- a longer episiotomy was done: OR 0.25 for each increase of 5.5 mm in episiotomy length, and/or
- the healed angle is between 15° and 60°.

In another study, primigravidas who had mediolateral episiotomies and OASIS had, when examined 3 months postpartum, a mean healed angle of 30°, compared with 38° in those without OASIS.<sup>62</sup> However, it was shown that there is a 20° difference between the incision angle of an episiotomy (typically performed when the head is crowning) and the sutured angle once healed: whereas the incision angle was 40° from midline, the angle measured once healed and scarred was 20°.<sup>63</sup> In other words, to obtain a healed angle of 30°, one must incise at a 50° angle.

### Instrumental Delivery

If instrumental delivery is indicated, vacuum extraction carries less risk to the anal sphincter than forceps.<sup>64,65</sup> Most data support the use of mediolateral episiotomy to protect against OASIS in primiparous women having instrumental delivery over no episiotomy.<sup>29,53,66,67</sup> When

a midline episiotomy is performed concurrently with an operative vaginal delivery, it acts synergistically in increasing OASIS.<sup>30,68</sup> 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 in forceps and vacuum deliveries, when combined with other practices such as rotating an occiput posterior baby to an occiput anterior position, selecting a vacuum instead of a forceps, performing a mediolateral episiotomy rather than a midline (only if an episiotomy is deemed necessary), and using minimal necessary maternal expulsive efforts at time of expulsion.<sup>64</sup> Some have raised the point of informed consent at the time of instrumental delivery, arguing that disclosure of the OASIS risk should be included, as well as the risks and benefits of any alternative such as Caesarean section.<sup>69</sup>

Clearly, performing a Caesarean would prevent OASIS, but performing it late in labour may not fully protect the anal canal, as nerve injury can still occur.<sup>70,71</sup>

### Other

Studies evaluating antepartum perineal massage,<sup>72</sup> pushing position (kneeling vs. sitting),<sup>73</sup> open versus closed glottis pushing,<sup>74</sup> Ritgen's manoeuvre,<sup>75</sup> water birth,<sup>76</sup> and delayed pushing (in women with epidural)<sup>77</sup> failed to show evidence of a protective effect on the anal canal.

### Summary Statement

2. Obstetrical anal sphincter injuries are more commonly associated with forceps deliveries than with vacuum-assisted vaginal deliveries. (II-2)

### Recommendations

3. In women having a spontaneous vaginal delivery, the rate of obstetrical anal sphincter injury is decreased when the obstetrical care provider slows the fetal head at crowning. (II-2A)
4. Episiotomy:
  - a. At the time of either a spontaneous vaginal or instrumental delivery, the obstetrical care provider should follow a policy of "restricted" episiotomy (i.e. only if indicated), rather than "liberal" use (i.e. routine), for the prevention of obstetrical anal sphincter injury. (I-A)
  - b. If an episiotomy is deemed indicated, preference for a mediolateral over a midline should be considered. (II-2B) The optimal cutting angle appears to be no less than 45 degrees, ideally around 60 degrees. (II-2B)

## PRINCIPLES AND TYPES OF REPAIRS

Obstetric anal sphincter injuries should be repaired by appropriately trained clinicians comfortable with such repairs. Repairs are typically carried out in the delivery room or the operating room. The operating room offers the benefits of access to optimal lighting, appropriate equipment, and aseptic conditions.<sup>3</sup> Additional equipment may be required for anal sphincter repairs including self-retaining retractors and Allis clamps. There have been no studies that have evaluated anaesthetics used in the repair of obstetric anal sphincter injuries. Although commonly repaired under local anaesthetic, general or regional anaesthesia maybe optimal as they provide both analgesia and muscle relaxation.<sup>3</sup> The EAS has inherent tone and when torn does retract 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 by either the end-to-end or the overlap technique. Local anaesthetic may be sufficient when only the superficial fibres of the EAS are disrupted,<sup>78</sup> 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.<sup>79</sup> The SOGC Urogynaecology Committee does not feel this is always necessary, as long as adequate analgesia is provided, either using local infiltration or pudendal nerve block.

### Suture Material

Although the type of suture material used in the repair of obstetric anal sphincter tears may be important, there has been very little research carried out comparing different suture types used for sphincter repairs. Both absorbable and delayed absorbable sutures are commonly used. Although some colorectal surgeons use non-absorbable sutures for secondary repairs of anal sphincters, there is concern that such sutures may result in stitch abscesses or suture ends may cause discomfort requiring their removal.<sup>80</sup> The suture ends should be cut short and the knots covered by the overlying superficial perineal muscles in order to minimize any discomfort from suture ends and knots. Monofilament sutures maybe beneficial as they are less likely to harbour organisms and predispose to infection.<sup>78</sup>

A randomized trial by Williams et al.<sup>81</sup> (n = 112), compared OASIS repairs with polyglactin (Vicryl) and polydioxanone (PDS). At 6 weeks, there was no significant difference in suture-related morbidity. There may be benefit to delayed absorbable suture with respect to longer term functional outcomes but this has yet to be evaluated in clinical trials. Many of the more recently published studies have used delayed absorbable sutures but have not been undertaken

to compare suture material. Randomized trials with longer term outcomes including anal incontinence are required to compare suture materials.

### Repair of the Anal Mucosa

Following a fourth degree perineal tear, the anal mucosa can be approximated by a number of techniques.<sup>78</sup> The mucosal repair can be carried out with an interrupted 3-0 Vicryl suture with the knots tied in the anal lumen or external to the anal canal. Alternatively the anal mucosa can be approximated with a 3-0 PDS suture with a submucosal continuous suture. There are currently no studies that suggest a benefit from any of these repair techniques for the anal mucosa with respect to outcomes including anovaginal and rectovaginal fistulas. However figure-of-eight sutures should not be used as they can cause ischemia and poor healing of the anorectal mucosa.

### Separate Repair of the IAS

The literature related to the techniques of repairing the anal sphincter following obstetric trauma has primarily focused on the repair of the external anal sphincter. However, the muscles involved in maintaining anal continence include not only the EAS but also the internal anal sphincter.

The internal sphincter is a 3 to 5 mm thick continuation of the rectal smooth muscle and is under autonomic control. The IAS is responsible for maintaining continence at rest, by contributing to 70% to 85% of the resting anal pressure, and, to a lesser degree, of the anal pressure in response to sudden and constant rectal distension (40% and 65%, respectively).<sup>10</sup>

In response to rectal distension by feces, liquids, or gases, the pressures in the IAS drop to allow “sampling” (whereby the rectal content transiently enters in contact with sensory nerve ending of the anal canal to determine the bowel content (liquid, gas, or solid) and allow processing and decision about appropriateness of evacuation), associated with a reflex recto-anal contractile reflex if time is inconvenient.<sup>82</sup> Damage to the IAS muscle may lead to a poor seal and an impaired sampling reflex,<sup>10</sup> leading to passive incontinence.

Sultan and Thakar<sup>78</sup> described identifying and approximating the IAS with interrupted sutures in addition to the overlap repair of the EAS. It can be difficult to identify the IAS which lies between the EAS and the anal mucosa. In comparison to the striated muscle of the EAS, the IAS is thin with a pale pink appearance in close proximity to the anal mucosa. It may appear similar to a “fascial” layer. A small prospective study, with historical controls, published by Lindqvist and Jernetz in 2010,<sup>83</sup>

suggested that identifying and separately suturing the IAS may improve anal continence at 1 year. Both previously mentioned studies approximated the IAS in an “end-to-end” fashion using delayed absorbable sutures. In a randomized trial of obstetric sphincter repairs,<sup>84</sup> 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.

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 degree of symptoms than those without IAS.<sup>22,65,85,86</sup>

### EAS Repair Techniques

When repairing a torn anal sphincter following vaginal delivery the external anal sphincter can be approximated by 1 of 2 repair techniques; end-to-end repair or overlap repair. The torn ends of the EAS, normally under tonic contraction, tend to retract within their sheaths and can be found latero-posteriorly to the tear, often by palpation of a depression downward rather than lateral. The muscle ends must be identified and grasped with Allis clamps.

With an end-to-end repair (for a detailed illustration, see online eFigure 3), 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. In theory, mattress sutures may cause less tissue necrosis although there is no evidence to support one technique over the other. Sutures should include the fascial sheath.<sup>3</sup>

With an overlap repair (for a detailed illustration, see online eFigure 3), the torn EAS muscle ends often needs much more dissection and mobilization.<sup>3</sup> 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.<sup>80</sup> This type of repair is only possible with 3b or greater OASIS.<sup>50</sup>

Following the anal sphincter repair, which approximates the disrupted anal sphincter complex, 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 is carried out to confirm the adequacy of the repair.

If an obstetrical care provider is insufficiently experienced in the repair of third and fourth degree tear and an experienced obstetrical care provider is not available immediately or locally, repair can be delayed for 8 to 12

hours with no impact on anal incontinence and pelvic floor symptoms.<sup>87</sup>

### Summary Statement

3. Obstetrical anal sphincter injuries (OASIS) repair:
  - a. Suture-related morbidity is similar at 6 weeks following the use of either polyglactin 2-0 or polydioxanone 3-0 following repair. (I)
  - b. Repair of the internal anal sphincter is recommended as women who demonstrate an internal anal sphincter defect on postpartum ultrasound have more anal incontinence. (III)
  - c. Repair of the external anal sphincter should include the fascial sheath. An overlapping technique often requires more dissection and mobilization of the sphincter ends and is only possible with full thickness 3b sphincter tears or greater. (III)
  - d. A persistent defect of the external anal sphincter remote from delivery may increase the risk of worsening symptoms following subsequent vaginal deliveries. (II-2)

### Recommendation

5. Repair can be delayed for 8 to 12 hours with no detrimental effect. Delay may be required so a more experienced care provider is available for the repair. (I-A)

### Comparison of Repair Techniques

Historically, the most popular technique for the primary repair of obstetrical anal sphincter injuries has been the end-to-end approximation of the external anal sphincter with interrupted or figure-of-eight sutures. In contrast, the technique commonly used by colorectal surgeons to repair anal sphincter tears remote from delivery or unrelated to delivery is the overlap technique. The overlap technique, described by Parks and McPartlin<sup>88</sup> for the secondary repair of anal sphincters, was first evaluated for the primary repair of obstetric anal sphincter tears by Sultan et al. in his 1999 seminal study.<sup>89</sup> The small study (n = 27) showed that in comparison to matched historical controls with end-to-end repairs, overlap repairs resulted in less anal incontinence (8% vs. 41%).<sup>90</sup> Following this study several randomized trials have been published comparing end-to-end approximation and overlap repair of the EAS.

A 2013 Cochrane review compared the effectiveness of these 2 immediate primary repair techniques in reducing subsequent anal incontinence, perineal pain, dyspareunia and improving quality of life.<sup>50</sup> The authors included 6 trials involving 588 women.<sup>81,84,91</sup> Three trials followed women for 12 months.<sup>91</sup> The only outcomes showing a difference

was for fecal urgency and fecal incontinence score, in favour of the overlapping repair from one trial with 52 women followed up at 12 months.<sup>91</sup> An overlap repair resulted in fewer with deterioration of incontinence from 6 weeks to 12 months later ( $n = 41$ ).<sup>91</sup> Another trial showed that at 36 months, these differences were no longer present.<sup>92</sup>

However, the data are limited given the heterogeneity in the outcome measures, time points, and reported results. These studies included primiparous and parous women and partial and complete third degree tears. Furthermore, their surgical experience is not evaluated in the included studies. Consequently, the current literature does not support recommending one obstetric anal sphincter repair technique over the other

## POSTOPERATIVE MANAGEMENT

### Prophylactic Antibiotics

Only one randomized trial compared the effect of a single IV dose of a second generation cephalosporin (cefotetan or cefoxitin) on postpartum perineal wound complications (purulent discharge, or abscess and breakdown of repair) 2 weeks following third and fourth degree tears.<sup>80</sup> Prophylactic antibiotics given at the time of obstetrical anal sphincter repair decreases maternal morbidity related to perineal wound complications: 8.2% of women who received antibiotics and 24.1% of women who received placebo suffered a wound complication ( $P < 0.05$ ), with a relative risk of 0.34 (95% CI 0.12 to 0.96).<sup>93,94</sup> This Cochrane review reported that the study was limited by a high (27.2%) proportion of lack of follow-up. There are currently no studies that have evaluated the value of additional doses of antibiotics following repair of third and fourth degree perineal tears.

#### Recommendation

6. Prophylactic single dose intravenous antibiotics (2nd generation cephalosporin, e.g., cefotetan or cefoxitin) should be administered for the reduction of perineal wound complications following the repair of obstetrical anal sphincter injury. (I-A)

### Postoperative Bowel Regimen

Postoperative bowel regimens following the primary repair of OASIS vary. Some regimens consist of laxatives and bulking agents to avoid constipation and any potential disruption of the repair from the passage of hard stool. Other regimens consist of bowel confinement techniques with the concern that bowel motions in the immediate postoperative period may threaten the integrity of the repair.

Mahony et al.<sup>95</sup> performed a randomized trial to compare a laxative regiment (lactulose) with a constipating regiment

(codeine phosphate) in the 3 days following repair of primary OASIS in 105 women. Laxative use was associated with a significantly earlier and less painful first bowel motion and an earlier hospital discharge postpartum. Troublesome constipation was noted in 19% of women receiving the constipating regimen compared to 5% receiving the laxative regimen. Two patients that received the constipating regimen required hospital admission for fecal impaction. Overall there were no significant differences in continence scores or anal manometry and endoanal scan findings between the groups at 3 months postpartum.

In 2007 Eogan et al.<sup>96</sup> randomized ( $n = 147$ ) women to receive laxatives alone (lactulose) or laxatives and a bulking agent (lactulose and ispaghula husk, Fybogel) for 10 days after the repair of OASIS. Incontinence in the immediate postnatal period was more frequent in women taking the 2 preparations than in those taking lactulose alone (33% vs. 18%). There were no significant differences between the groups with respect to time to first bowel motion, length of hospital stay, or overall satisfaction related to bowel habits, and no significant difference in functional outcomes at 3 months.

#### Recommendation

7. Laxatives (e.g., lactulose) should be prescribed following the primary repair of obstetrical anal sphincter injury as they are associated with earlier and less painful first bowel motions and earlier discharge from hospital. Constipating agents and bulking agents are not recommended (I-A).

### Postoperative Analgesia

While there are no data regarding the use of analgesics following repair of OASIS, a Cochrane review published in 2003<sup>97</sup> found that rectal analgesia including diclofenac reduces perineal trauma related pain during the first 24 hours following birth and results in women using less additional analgesia during the first 48 hours. Because of the constipating effect of opioids, an NSAID in conjunction with acetaminophen is likely preferable as first-line management of perineal pain. Although rectal administration of NSAID may be better, it should be avoided in cases of fourth degree laceration, because it theoretically could impair.<sup>98</sup> However, opioids should not be withheld, but rather used along with a stool softener.

#### Recommendation

8. Non-steroidal anti-inflammatories and acetaminophen are the first-line analgesics. Opioids should only be used with caution. Constipation should be avoided by using a laxative or stool softener. (1-A)

## Bladder Catheterization

Studies have demonstrated a relationship between significant perineal trauma and postpartum urinary retention.<sup>99–102</sup> Glavind and Bjork looked specifically at sphincter injuries and found sphincter rupture was observed in 33% of women with postpartum urinary retention compared with 1% of the total population of women giving birth during the study period.<sup>101</sup>

The pathophysiology of postpartum urinary retention related to perineal injury is unclear but maybe related to perineal discomfort, urethral and perineal edema, and neurologic damage.

### Summary Statement

4. Obstetrical anal sphincter injuries are associated with an increased risk of postpartum urinary retention. (II-2)

## RISK MANAGEMENT/DOCUMENTATION

Operative delivery, while often indicated, is a risk factor for sphincter tear, and obstetrical care providers should consider discussing the possibility of operative delivery and any potential sequelae prior to labour. The decision for instrumental delivery should take into consideration the potential for anal sphincter injury. In addition, prolonged labour may be associated with sphincter tears and practitioners may consider discussing this with patients in situations when labour progression is slow.

When faced with an OASIS, the obstetrical care giver should document (ideally as a formal operative note) the delivery course, including indication for operative vaginal delivery, consent obtained, description of procedure, type and extent of perineal injury, repair method and suture used, and antibiotics administered. Furthermore, the patient should be informed of the injury sustained, and upon discharge a follow-up plan should be made.

### Recommendation

9. Following obstetrical anal sphincter injury, providers should disclose to women the degree of injury and arrange follow-up. Detailed documentation of the injury and its repair is required. (III-L)

## OUTCOMES FOLLOWING REPAIR

The outcomes following the primary repair of obstetric anal sphincter injuries 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. A summary of outcomes following primary OASIS repair is presented in Table 5.<sup>3,103–105</sup>

The outcomes following OASIS repair appear to be related to the extent of the initial sphincter tear, with 3c or fourth degree OASIS showing worse results than other types (see Table 6).<sup>11,25,94</sup>

Remote from delivery (median follow-up 14 years), the extent of sphincter damage was found to be independent of the development of fecal incontinence.<sup>106</sup>

Following OASIS, the incidence of anal incontinence may increase with time: from 3–6 months to 3–8 years following delivery, the rate went from 31% to 54%.<sup>107</sup> Women's continence over time may be affected by aging, subsequent deliveries, and lifestyle factors.

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. Fortunately, the management of anal incontinence, including that following repaired OASIS, can be successful with pelvic floor physiotherapy.<sup>108,109</sup>

### Recommendation

10. Women with anal incontinence following obstetrical anal sphincter injury should be referred for pelvic floor physiotherapy. (I-A)

## SUBSEQUENT PREGNANCY

Many factors may be taken into account in counselling women following an OASIS: the functional status (i.e. symptoms experienced shortly and remotely from the index delivery), the extent of residual anatomical and/or functional defects as shown on anal ultrasound and/or anal manometry, and the patient's wishes.

A woman who had an OASIS after her first delivery has 3.8- to 5.9-fold greater odds of a repeat OASIS at her next delivery than a woman without prior OASIS (Table 7).<sup>103–105,110–114</sup>

Although higher than in women without a prior OASIS, the risk of having a recurrent OASIS is the same for a woman with previous OASIS as the baseline risk at first delivery; both around 5.3% in Ontario.<sup>33</sup> The vast majority of women with a previous OASIS will not have a recurrent OASIS during a subsequent vaginal delivery. In fact, 64% to 90% of all OASIS occurring at a second delivery are in women without a previous OASIS.<sup>112,113</sup>

Overall, the rate of anal incontinence in women with OASIS and a subsequent vaginal delivery worsens in 19% to 56% of women,<sup>115–118</sup> particularly if a women had transient anal incontinence after the index OASIS.<sup>116</sup> On the basis of these studies, the Royal College of Obstetrics and

**Table 5. Summary of outcomes from primary OASIS repair**

Reference	Repair technique/injury	Follow-up Interval(s)	Outcome measure(s)	Prevalence mean (range)
Sultan and Thakar 2009 <sup>3</sup> (35 studies)	End-to-end repair	1–30 months	Anal incontinence (flatal and/or fecal incontinence)	39% (15 to 61%) (35 studies)
			Liquid or solid fecal incontinence	14% (2 to 29%) (25 studies)
			Fecal urgency	6% to 28%
			Sonographic anal sphincter defects	34% to 91%
			Anal incontinence with coitus (flatal and/or fecal incontinence)	17%
Bagade and Mackenzie 2010	End-to-end or overlap, n = 79	6 months	Anal incontinence	11%
			Fecal incontinence	7.5%
Tjandra et al. 2008	End-to-end, n = 114	18.8 months	Fecal incontinence (Wexner $\geq 1$ )	20.7%
Samarasekera et al. 2008	Unspecified, n = 53	$\geq 10$ years	Overall anal incontinence (Wexner $\geq 1$ )	53%
			Flatal incontinence	51%
			Incontinence to liquid	32%
			Incontinence to solid	26%

**Table 6. Outcomes following OASIS repairs according to the extent of the initial sphincter tear.**

Reference	Degree of injury	Type of repair	Follow-up Interval(s)	Outcome measure(s)	Prevalence
Nichols et al. 2005	4th, n = 17	unspecified	6 to 8 weeks	Anal incontinence and/or fecal urgency	3rd: 28%
	3rd, n = 39				4th: 59%
Roos et al. 2010 <sup>11</sup>	3a or 3b: n = 439	End-to-end or overlap	8 to 12 weeks	Bothersome fecal incontinence or fecal urgency Any incontinence to liquid stool	3c and 4th had worse scores on symptoms questionnaires than 3a and 3b
	3b or 4: n = 92				
Fenner et al 2003 <sup>26</sup>	3rd and 4th, n = 165	unspecified	6 months	Worsening bowel control after pregnancy	4th: 30.8% 3rd: 3.6%

**Table 7. Risks of OASIS at next delivery, based on presence of OASIS at 1st delivery**

	OASIS at 1st delivery	No OASIS at 1st delivery
OASIS at subsequent delivery	3.7% to 7.5% <sup>104,105,110–114</sup>	0.6% to 3.2% <sup>104,105,112,113</sup>

Gynaecologists recommend that “All women who have sustained an obstetric anal sphincter injury in a previous pregnancy and who are symptomatic or have abnormal endoanal ultrasonography and/or manometry should have the option of elective Caesarean birth.”<sup>79</sup>

A 2003 study using a decision analysis modeling explored universal Caesarean section in continent women with previous OASIS.<sup>119</sup> Based on the literature, they used the following assumptions: 5.1% risk of repeat OASIS, anal incontinence rate of 44% after 2nd OASIS. To prevent one case of anal incontinence (flatus, liquid, or stool) in women with prior OASIS who were presumed continent 2.3 elective Caesarean sections would need to be done, at

the cost of increased maternal risks, including an increased morbidity rate from 4.2% following vaginal delivery to 11.3% after Caesarean section. Furthermore, there would be one maternal death for 1880 cases of anal incontinence averted. The balance of risks and benefits should be discussed when counselling women on the route of future deliveries after OASIS in a previous pregnancy.

#### **Outcome of Subsequent Vaginal Delivery Depending on Symptoms Following OASIS at Index Delivery**

Only one published study assessed anal symptoms in women with a subsequent delivery based on their symptoms after the index OASIS.<sup>116</sup> Women who

sustained a fourth degree tear in a previous delivery associated with transient anal incontinence had a greater rate of developing subsequent anal incontinence after a subsequent vaginal delivery (39%, 9/23; 4 of these women became permanently incontinent compared with 7% [2/29] of asymptomatic women after their OASIS). In a recent preliminary report, low baseline symptom scores may predict good outcomes after a vaginal delivery in women with prior OASIS.<sup>120</sup>

### **Outcome of Subsequent Vaginal Delivery Depending on Finding on Endoanal Ultrasound Following OASIS at Index Delivery**

The literature is limited in number and size of studies, but the presence of a persistent defect appears to increase the risk of worsening symptoms. In women who had ultrasound evidence of anal sphincter injury 3 months following a first vaginal delivery (any degree of tear), a subsequent vaginal delivery may increase the rate of abnormal anorectal symptoms (38%), compared with women who did not have another child (16%; not statistically significant). Women without ultrasound evidence of OASIS 3 months postpartum had a rate of anal incontinence of 3% in the absence of a subsequent pregnancy versus 10% if they delivered again (not statistically significant).<sup>118</sup>

In women who have a second vaginal delivery, the presence of anal injury on antenatal ultrasound between deliveries increases the rate of worsening anorectal symptoms: from 7% of women following a subsequent vaginal delivery without evidence of persistent defect, to 37% if ultrasound showed a pre-existing injury (no significant difference).<sup>121</sup>

### **Outcome of Subsequent Vaginal Delivery Depending on Combined Finding on Endoanal Ultrasound and Anal Manometry Following OASIS at Index Delivery**

Sultan reported his results following antenatal counselling for the route of delivery in subsequent pregnancy for women with previous OASIS,<sup>114</sup> with updated results presented in 2013.<sup>122</sup> In his study, substantial anal compromised was defined as either:

- external sphincter defect on ultrasound > 30° and a maximum squeeze pressure increment of < 20 mmHg on anal manometry;  
OR
- defect <30° and a maximum squeeze pressure increment of < 20 mmHg;  
OR
- no defect and a maximum squeeze pressure increment of < 20 mmHg.

Women who had substantial anal compromise were counselled on having a Caesarean section. All others were counselled on vaginal delivery. In those women who delivered as counselled (75% of the study group), results on anal manometry did not significantly change and anorectal symptoms did not worsen following delivery. Similar results have been presented as abstracts.<sup>123</sup>

### **Summary Statements**

5. After a successful repair of obstetrical anal sphincter injuries, most women can safely deliver vaginally in a future pregnancy. (III)
6. Counselling women about future delivery plans:
  - a. The risk of recurrence of an obstetrical anal sphincter injuries at a subsequent delivery is 4% to 8%. (II-2)
  - b. It was calculated that 2.3 Caesarean sections at the cost of increased maternal risk would be required to prevent one case of anal incontinence in a woman with prior obstetrical anal sphincter injuries. (II-2)

### **LEARNING MODEL**

For the past decade, Sultan and his group has devised a hands-on workshop on OASIS repair. The hands-on part uses both an artificial model and a repair of fresh anuses originating from male pig.<sup>4</sup> It has been shown that a surgical skill laboratory improves learners' acquisition of the skills necessary to repair OASIS as evidenced on the Objective Structured Assessment of Technical Skills and written examination administered before and after an OASIS repair workshop.<sup>124</sup>

### **SUMMARY**

Obstetrical anal sphincter injuries represent a significant morbidity encountered after vaginal delivery. Some intrapartum measures can be taken to diminish the risk of occurrence. Careful examination after every delivery is of paramount importance to avoid missing an OASIS. Systematic repair of the entire anal sphincter complex should be done by a trained caregiver; full disclosure and close follow-up should be offered. Most women following OASIS are good candidates to have a subsequent vaginal delivery; antenatal evaluation of symptoms and anal function testing can help guide the choice of future mode of delivery.

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