Best Practice & Research Clinical Obstetrics and Gynaecology 56 (2019) 81–92

Contents lists available at ScienceDirect

Best Practice & Research Clinical Obstetrics and Gynaecology

journal homepage: www.elsevier.com/locate/bpobgyn

8

Operative vaginal delivery and pelvic floor complications

Richard P. Deane, Associate Professor in Obstetrics & Gynaecology MD MSc MRCPI MRCOG

Department of Obstetrics and Gynaecology, Trinity College, The University of Dublin, Dublin, Ireland

Keywords:
Episiotomy
Forceps
Obstetric anal sphincter injury
Operative vaginal delivery
Pelvic floor
Vacuum

A B S T R A C T

Operative vaginal delivery (OVD) is associated with injury to the pelvic floor and compromise to the urinary, genital and gastrointestinal systems. There has been significant evolution in recent years in the practice of OVD (from the use of forceps to vacuum delivery), the conduct of delivery (from routine to selective episiotomy) and the recognition and management of obstetric anal sphincter injury (OASIS). This review article considers a number of key questions from the perspective of the clinical practitioner: What effects does OVD have on the pelvic floor? How can the effects of OVD on the pelvic floor be reduced? When and how should episiotomy be performed during OVD? How should future pregnancies following OVD and OASIS be managed? The place of episiotomy during OVD, a much debated strategy to prevent injury to the obstetric anal sphincter during OVD, is considered.

Introduction

The pelvic floor plays a critical role in maintaining healthy function of the urinary, genital and gastrointestinal systems. Operative vaginal delivery (OVD) has been associated with injury to the pelvic floor and compromise to these systems. There has been significant evolution in recent years in the practice of OVD (from the use of forceps to vacuum delivery), the conduct of delivery (from routine to selective episiotomy) and the recognition and management of obstetric anal sphincter injury (OASIS) [1]. The purpose of this article is to review the effect of OVD on the pelvic floor with emphasis on recent publications and emerging trends. The perspective of the clinical practitioner is taken, and four key

E-mail address: deaneri@tcd.ie.

https://doi.org/10.1016/j.bpobgyn.2019.01.013
1521-6934/

questions are addressed. First, what effects does OVD have on the pelvic floor? Second, how can the effects of OVD on the pelvic floor be reduced? Third, when and how should episiotomy be performed during OVD? Fourth, how should future pregnancies following OVD and OASIS be managed? The place of episiotomy during OVD, a much debated strategy to prevent injury to the obstetric anal sphincter during OVD, is considered.

Key definitions

The definition and classification of episiotomy and OASIS are outlined in this section.

Episiotomy: Episiotomy is a surgical enlargement of the vaginal orifice by an incision to the perineum during the last part of the second stage of labour or delivery [2]. Seven types of episiotomies have been described, but only three are commonly used: midline (median), mediolateral and lateral. The classification of episiotomy is based on the origin and direction of the incision and is outlined in Table 1.

Obstetric Anal Sphincter Injury: The classification system for OASIS adopted by the RCOG is outlined in Table 2 [3].

What effects does OVD have on the pelvic floor?

A traditional view of many obstetricians has been that OVD (with or without episiotomy) increases the risk of OASIS, particularly the use of forceps rather than vacuum, but the long-term significance of OASIS is less clear particularly its significance for future pregnancies. This section considers whether recent literature has evolved or changed this prevailing view. Existing national guidelines from English-speaking countries are reviewed followed by analysis of more recent publications.

OASIS and OVD

A Cochrane review was published in 2010 that considered the choice of instruments for OVD [4]. As part of the review, the rate of various complications associated with OVD was considered, including OASIS. The review included 13 studies (with 3338 women) directly comparing forceps with vacuum delivery, with 10 studies reporting on OASIS specifically. The review found that forceps delivery was less likely to fail (relative risk (RR) 0.65, 95% confidence interval (CI) 0.45–0.94) and also more likely to result in OASIS regardless of whether an episiotomy is performed (RR 1.89, 95% CI 1.51–2.37). The review also noted that vaginal trauma was more likely with the use of forceps (RR 2.48, 95% CI 1.59–3.87). A subsequent meta-analysis by Pergialiotis et al. of 22 studies (with 651,934 women) found that OVD increased the risk of OASIS (OR 5.1, 95% CI 3.33–7.83): forceps delivery (odds ratio (OR) 5.50, 95% CI 3.17–9.55) had a higher risk than vacuum delivery (OR 3.98, 95% CI 2.60–6.09) [5].

Table 1
Common types of episiotomies (adapted from Kalis et al. [2]).

Type of Episiotomy	Origin of Incision	Direction of Incision
Median (Midline)	≤3 mm of the midline in the posterior fourchette	Downwards in the midline (25° or less of the sagittal plane)
Mediolateral		Laterally (60° or more from the sagittal plane)
Lateral	>10 mm of the midline in the posterior fourchette	Laterally

Table 2
Classification of perineal tears/injuries (adopted by RCOG [3]).

Type of Tear	Description
First-degree	Injury to perineal skin and/or vaginal mucosa
Second-degree	Injury to perineum involving perineal muscles but not involving the anal sphincter
Third-degree	Injury to the perineum involving the anal sphincter complex
Grade 3a	<50% of external anal sphincter thickness torn
Grade 3b	>50% of external anal sphincter thickness torn
Grade 3c	Both external and internal anal sphincter are torn
Fourth-Degree	Injury to the perineum involving anal sphincter complex and anorectal mucosa

Guidelines on OASIS from various professional bodies (United Kingdom (RCOG) 2015, United States (ACOG) 2018 and Canada (SOGC) 2015) report a wide range in the OASIS rate associated with OVD [3,6,7].

- The RCOG quotes a retrospective cohort study from Gurol-Urganci et al. of 1,035,253 primiparous women across the UK who had a singleton, term, cephalic vaginal birth over the period 2000–2012 [1]. They found that OVD was associated with a high OASIS rate. For forceps delivery, the OASIS rate was 22.7% without episiotomy (adjusted odds ratio (aOR) 6.52, 95% CI 5.57–7.64) and 6.1% with episiotomy (aOR 1.34, 95% CI 1.21–1.49). For vacuum delivery, the OASIS rate was 6.4% without episiotomy (aOR 1.89, 95% CI 1.74–2.05) and 2.3% with episiotomy (aOR 0.57, 95% CI 0.51–0.63). For spontaneous delivery, the OASIS rate was 3.4% without episiotomy and 2.2% with episiotomy (OR 0.57, 95% CI 0.51–0.63). The odds ratios were calculated with reference to a normal delivery without episiotomy.
- The ACOG quotes a retrospective cohort study from Friedman et al. of 7,096,056 women who underwent a vaginal delivery across the US over the period 1998–2010 [8]. They found that OVD was associated with a high OASIS rate. For forceps delivery, the OASIS rate was 28.3% (88,691 women) with episiotomy (18.3% third degree and 10% fourth degree) and 25.7% (50,935 women) without episiotomy (19.3% third degree and 6.4% fourth degree). For vacuum delivery, the OASIS rate was 18.6% (271,138 women) with episiotomy (12.5% third degree and 6.1% fourth degree) and 10.4% (261,261 women) without episiotomy (8.1% third degree and 2.3% fourth degree). Overall, 3.3% (232,762 women) experienced a third-degree tear and 1.1% (76,347 women) experienced a fourth-degree tear.
- The SOGC quotes a range of studies to produce overall odds ratios for OASIS in the context of OVD: 2.3–5.6 for forceps delivery, 1.5–3.5 for vacuum delivery and 8.1 for vacuum and forceps delivery [7].

Therefore, there is considerable variation in the OASIS rate with OVD between 2.3% (vacuum with episiotomy) and 6.1% (forceps with episiotomy) in the UK to 18.6% (vacuum with episiotomy) to 28.3% (forceps with episiotomy) in the US. These rates are in contrast to the rates of OASIS with spontaneous delivery, such as 2.2% with episiotomy in the UK. There are many reasons for this variation: type of instrument used, use and any type of episiotomy used and parity. However, there is a consistent finding that OVD increases the OASIS rate regardless of the instrument used or whether an episiotomy is performed.

OASIS and Complex OVD: A number of studies have examined the role of more complex types of OVD: rotational forceps delivery and sequential delivery. Much of this research work has emerged from the UK, which is understandable given that rotational forceps delivery remains an important part of the obstetric armoury of many UK maternity units.

In relation to rotational forceps delivery, there is no evidence that OASIS is increased by rotational forceps delivery compared to manual rotation followed by direct forceps delivery, direct forceps delivery or vacuum delivery. Bahl et al., in a prospective cohort study of 381 women who underwent a mid-cavity rotational delivery in two UK hospitals (2004–2006), found that there was no difference in OASIS between rotational forceps delivery (Kielland forceps), manual rotation followed by nonrotational forceps delivery and rotational vacuum delivery [9]. Gauthaman et al., in a retrospective cohort study of 1515 women who underwent a forceps delivery in a UK hospital over a five-year period (2007–2012), found that there was no difference in OASIS between rotational forceps delivery (Kielland forceps) and direct forceps delivery (either as the primary instrument or following a failed attempt to deliver using a vacuum), after adjustment for common covariates [10]. O'Brien et al., in a retrospective cohort study of 312 women who underwent a forceps delivery in a UK hospital over 21 months (2010–2012), found that there was no difference in OASIS between rotational forceps delivery (Kielland forceps) and direct forceps delivery [11]. Rotational forceps delivery was associated with increased vaginal birth and also shoulder dystocia.

In relation to the use of sequential instruments, there is evidence that OASIS is increased by the use of sequential forceps. Murphy et al., in a prospective cohort study of 1360 nulliparous women who

underwent OVD, found that the use of sequential instruments increased OASIS compared to delivery using a single instrument only (17.4% versus 8.4%, adjusted OR 2.1, 95% CI 1.2–3.3) [12]. This review did not find any subsequent studies addressing the impact of sequential instruments on OASIS. Fong et al., in a cohort study of 284,357 women who underwent OVD (from a total cohort of 3,556,567 women) in California over an eight-year period (2001–2007), found that forceps and combined delivery were associated with the highest risk of OASIS, with combined rates exceeding forceps-only rates [13].

Human Factors, OASIS and OVD: Human factors play a critical role in the successful and safe completion of an OVD. However, this element of OVD has not been researched in depth. Butler et al., in a prospective cohort study of 597 women who required an OVD in an Irish hospital over a nine-month period (2013), found no difference in OASIS between OVD performed during the day (0800–2000) and that during the night (2000–0800) during which the consultant was based off-site.

In conclusion, there is evidence of an increased risk of OASIS with OVD, particularly forceps delivery. However, a balanced approach is recommended because of the increased risk of failure with vacuum, such as that of the RCOG who state that 'a careful, well-trained operator will select the instrument best suited to the individual circumstances' [14].

Operative vaginal delivery and long-term pelvic floor outcomes

Over the last five years, a number of studies evaluating the impact of OVD on long-term pelvic floor outcomes (urinary function, faecal continence, pelvic pain and sexual function) have been published.

In terms of urinary and bowel function:

- OASIS appears to be associated with an increased risk of long-term faecal incontinence. LaCross et al., in a systematic review and meta-analysis including 19 studies, found that OASIS was significantly associated with anal incontinence after vaginal birth after review of 12 studies (2288 women) (OR 2.66, 95% CI 1.77–3.98) [15]. Halle et al., in a cross-sectional study of 8137 primiparous women who had a vaginal delivery between 1990 and 1997 in a Norwegian hospital, found that the risk of anal incontinence and colorectal-anal distress inventory scores was higher 15–23 years later in women with OASIS [16]. A high proportion of these injuries were not identified at the original or subsequent deliveries.
- There does not appear to be any difference in long-term bowel symptoms between women who have an OVD and women who do not. Dave et al., in a prospective cohort study of 268 women who sustained an OASIS in a US hospital, found that women who had an OVD had greater urinary symptoms and anal incontinence one week postpartum than women who had a spontaneous vaginal delivery (SVD) but that these differences were not present at 12 weeks [17]. Parant et al., in a prospective cohort study of 538 women who underwent a vaginal delivery (176 spatula delivery and 362 spontaneous delivery) in a French hospital, found that there was no difference in the faecal incontinence at two and six months between women who delivered using spatulas compared with those who delivered spontaneously [18]. The high rate of faecal incontinence following vaginal delivery, either spatula or spontaneous, is notable (14.3% of women delivered with spatula and 9.7% of women delivered spontaneously).
- The evidence regarding long-term faecal continence in women who delivered by forceps compared to women who delivered by vacuum is conflicting. Fitzpatrick et al., in a randomised controlled trial (RCT) of 130 primiparous women requiring OVD (61 forceps and 69 vacuum), found that symptoms of altered faecal incontinence were significantly more common following a low-cavity non-rotational forceps delivery than following a vacuum delivery at three months of follow-up [19]. On this basis, they recommended that vacuum should be the instrument of first choice in OVD. However, these complaints were largely flatal incontinence, and there was no difference in endoanal ultrasound between the groups. Handa et al., in a cohort study of 449 women in a US hospital, found that forceps delivery was associated with pelvic floor disorders (stress urinary incontinence, overactive bladder, anal incontinence and pelvic organ prolapse) five to ten years after a first delivery but no association for SVD or vacuum delivery [20]. However, Johanson et al., in a five-year follow-up of a cohort of 228 women who delivered by either forceps (115 women) or vacuum (113 women) in a RCT in the UK, found no difference in the long-term urinary or bowel symptoms between women

who delivered by forceps versus those who delivered by vacuum [21]. However, they noted high rates of morbidity in both groups: 47% had urinary incontinence and 20% had loss of bowel control.

- There does not appear to be a difference in long-term pelvic floor function following OVD or CS. Crane et al., in a prospective cohort study of 109 primiparous women who experienced an arrest in the second stage on their first delivery in a US hospital, found no difference in pelvic floor function or sexual function among women who delivered by OVD compared to women who delivered by caesarean section (CS) one year after delivery [22].
- It is worth remarking that much of the evidence cited for urinary and bowel function is based on postpartum patient self-reporting. However, there is evidence that much of the postpartum morbidity may be present antenatally, which is not been considered by these studies. Macleod et al., in a prospective cohort study of 200 nulliparous woman undergoing an OVD (nested in a RCT on episiotomy use), found that morbidities previously attributed to OVD may be present antenatally to a greater or similar degree [23].

In terms of pelvic pain and/or dyspareunia, there is conflicting evidence regarding long-term pelvic pain and/or dyspareunia following OVD. Some studies have found an increased risk of dyspareunia with forceps and/or vacuum delivery compared to SVD or CS (elective or emergency) [24–26]. These findings reflect the challenge of confounders in interpreting findings in relation to this field particularly the presence of perineal tears and the use of episiotomy. In terms of psychological well-being, Adams et al., in a cohort study of 55,814 women in Norway, showed that emotional distress scores from 30 weeks to six months postpartum were not influenced by mode of delivery (SVD, OVD or CS) [27]. In terms of sexual functioning, Barbara et al., in a cohort study of 269 primiparous women (132 SVD, 45 OVD, 92 CS), found that women who had undergone an OVD had poorer sexual functioning (arousal, need for lubrication, orgasm, global sexual functioning) than SVD and CS, but that mode of delivery did not influence time to resumption of sexual intercourse [28]. Ducarme et al., in a cohort study of 907 women who had an attempted OVD in France, found that mid-cavity OVD was not associated with sexual dysfunction or postpartum depression at six months compared to low-cavity OVD [29].

In conclusion, OASIS appears to be associated with an increased risk of long-term faecal incontinence. However, there does not appear to be any difference in long-term bowel or pelvic floor symptoms between women who have an OVD and women who do not have an OVD (either SVD or CS). The evidence regarding long-term faecal continence in women who delivered by forceps compared to women who delivered by vacuum is conflicting. There is conflicting evidence regarding long-term pelvic pain and/or dyspareunia following OVD. There is evidence that a significant proportion of postpartum pelvic floor symptoms predate delivery.

How can the effects of OVD on the pelvic floor be reduced?

A number of strategies to reduce OASIS have been proposed including perineal support, perineal massage, warm compress, upright or lateral birthing position, episiotomy and OVD prevention. Although there is evidence that these measures may be of benefit in SVD, this evidence does not extend to OVD. Most evidence in the context of OVD relates to episiotomy and is discussed in detail.

When and how should episiotomy be performed during operative vaginal delivery?

The role of episiotomy in vaginal birth has been much debated. The debate has focused on two main questions. First, should episiotomy be performed routinely or selectively (i.e. restricted to certain indications only)? Second, should episiotomy be performed midline or mediolateral/lateral? Most professional bodies do not recommend routine episiotomy in the context of a spontaneous vaginal birth. However, episiotomy may play a particular role in OVD given the increased risk of OASIS, and these questions take on a greater significance. The purpose of this section is to examine the evidence to inform the use of episiotomy in OVD with particular emphasis on recent studies.

Midline versus mediolateral/lateral episiotomy

Most of the early studies (1990s) evaluating the role of episiotomy in OVD to prevent OASIS were conducted in US-based institutions, which used the midline technique as the main method to perform episiotomy [30–33]. These studies showed no benefit to midline episiotomy in reducing OASIS for OVD. Indeed, the risk of OASIS was increased by midline episiotomy. Therefore, there is little evidence to support the use of midline episiotomy in preference to a mediolateral/lateral episiotomy in OVD to reduce OASIS and should be avoided. This conclusion has been reinforced by the fact that this research question has not been revisited for over ten years by any study.

Vacuum delivery

A useful place to begin is a systematic review and meta-analysis undertaken by Lund et al. that evaluated how mediolateral or lateral episiotomy in primiparous women undergoing a vacuum delivery affects the risk of OASIS [34]. The review included 15 observational studies and 321,459 women. The rate of mediolateral or lateral episiotomy was 63.6% (204,296 women). The review found a significant reduction in the OASIS rate for those women who had a mediolateral or lateral episiotomy compared to those women who did not have an episiotomy (OR 0.53 (95% CI 0.37–0.77)) and the number needed to treat was 18.3 (95% CI 17.7–18.9). Most studies involved mediolateral as opposed to lateral episiotomy, but the review noted that the protective effect was found for both methods. However, the limitations of study were noted: observational studies only, variable episiotomy use and technique and variable OASIS diagnostic criteria.

In contrast, a systematic review and meta-analysis undertaken by Sagi-Dain and Sagi evaluated morbidity associated with episiotomy in vacuum delivery [35]. This review included both midline and mediolateral/lateral episiotomy methods. The review included 15 studies and 350,764 vacuum deliveries. The rate of episiotomy was 64.3% (28.7–86.0%) and the OASIS rate was 7.5%. For nulliparous women, the review found that the risk of OASIS was not significant (although tended towards decrease) with mediolateral episiotomy (OR 0.68, 95% CI 0.43–1.07, six studies), decreased with lateral episiotomy (OR 0.59, 95% CI 0.49–0.70, one study) and increased with midline episiotomy (OR 5.11, 95% CI 3.23–8.08, one study). For multiparous women, the review found that the risk of OASIS was increased with mediolateral episiotomy (OR 1.27, 95% CI 1.05–1.53, two studies) and increased with midline episiotomy (OR 89.4, 95% CI 11.8–667.1, one study). Again, limitations similar to Lund's review were noted.

There are two main conclusions from these reviews for practitioners. First, if an episiotomy is performed, then a mediolateral/lateral episiotomy is less likely to result in OASIS than a midline episiotomy for women undergoing a vacuum delivery (both nulliparous and multiparous). Second, it is probable that episiotomy decreases the risk of OASIS compared to no episiotomy for nulliparous women undergoing a vacuum delivery. The latter conclusion is based on a statistically significant reduction in Lund's review (15 studies) and tendency towards reduction in Sagi-Dain's review (six studies). When considering these reviews, there are a number of aspects that require consideration. First, the rates, indications and techniques of episiotomy varied widely suggesting diverse policies in relation to episiotomy in the context of OVD. Second, the reviews only focused on vacuum delivery and not forceps delivery, arguably the type of OVD with greatest risk. Third, the quality of evidence is low, and the need for RCTs is acknowledged by both reviews.

A number of further studies have been reported since the publication of these reviews. All are retrospective cohort studies and conclude that mediolateral episiotomy reduces the risk of OASIS for nulliparous women undergoing vacuum delivery.

- The first and largest is a retrospective population-based cohort study published by van Bavel et al. evaluating all births from the Netherlands over a 10-year period (2000–2010) [36]. The study included 170,969 primiparous and multiparous women who had an OVD (from a total of 1,534,850 women who delivered vaginally). The study excluded women who had a midline episiotomy (only 0.8% of episiotomies). For vacuum delivery, the review found that the risk of OASIS was decreased with mediolateral episiotomy for nulliparous women (OR 0.14, 95% CI 0.13–0.15) and multiparous

women (OR 0.23, 95% CI 0.21–0.27). For forceps delivery, the review found that the risk of OASIS was also decreased with mediolateral episiotomy for nulliparous women (OR 0.09, 95% CI 0.07–0.11) and multiparous women (OR 0.13, 95% CI 0.08–0.22). The review concluded that the use of a mediolateral episiotomy during both vacuum and forceps delivery is associated with a five to tenfold reduction in OASIS in primiparous and multiparous women.

- The second is a retrospective cohort study by Bodner-Adler et al. evaluating 572 nulliparous women who underwent a vacuum delivery (with and without an episiotomy) using the Kiwi Omnicup at an Austrian hospital over a five-year period (2010–2015) [37]. The study found that a mediolateral episiotomy was performed in 65% (372 women) and reduced the risk of OASIS.
- The third is a retrospective cohort study by Boujenah et al. evaluating 1342 women who underwent an OVD at a French hospital over a four-year period (2014–2017) [38]. The study found that episiotomy reduced OASIS overall for nulliparous women who underwent an OVD but a non-significant trend toward OASIS reduction for nulliparous women who underwent a vacuum delivery with episiotomy compared to without episiotomy. However, this study should be interpreted with caution as the type of episiotomy was not defined.

Forceps delivery

The role of episiotomy in forceps delivery to prevent OASIS has received less attention by recent literature, which is unsurprising given the general decline in the use of forceps for OVD internationally. However, this question should be considered, as it is still part of the obstetric armoury for many practitioners and OASIS is particularly associated with forceps (as opposed to vacuum) delivery. The two previously cited systematic reviews of episiotomy use in OVD focused on vacuum delivery only, and a similar review of forceps delivery has not been published. The purpose of this section is to examine the existing literature regarding OASIS and mediolateral episiotomy use for forceps delivery.

Six studies were identified that examined the relationship between mediolateral episiotomy and OASIS at forceps delivery, which are outlined in Table 3 [36,38–42]. No study comparing lateral episiotomy to no episiotomy at forceps delivery was identified. Midline episiotomy was specifically excluded, as past evidence strongly indicates that it increases the risk of OASIS to the extent that recent studies have not included it as part of their study protocols. The studies differed widely in the number of women (from 316 to 11,629). Although most studies did not specifically state whether there was a policy of routine or selective episiotomy, the episiotomy rate was high and broadly similar (from 83.6% to 95.8%). Four of the six studies found that mediolateral episiotomy reduced the risk of OASIS at forceps delivery including the two largest studies (both from the Netherlands). The remaining two studies found no difference in OASIS between forceps delivery with and without mediolateral episiotomy. Notably, these two studies were conducted in the same institutions and had a rate of OASIS almost double that found in the other studies (8.9% and 11.6% compared to 0.3%–4.9%). In conclusion, the evidence of benefit, when present, is strong but not universal amongst all studies. Further studies are therefore required, but this will become more challenging given the ongoing decline in the use of forceps.

Routine versus selective (restricted) episiotomy practice

As noted previously, it is difficult to make conclusions from the observational studies examining the use of episiotomy in OVD, as the practice adopted by units within these studies is unclear. However, a study that specifically compared routine versus selective episiotomy practice (and the only RCT addressing the role of episiotomy policy in OVD) was undertaken by Murphy et al. in two urban maternity units in Scotland over a two-year period (2004–2006) [43]. The study included 200 women with 175 women who underwent an OVD: 128 who had a forceps delivery (61 in routine category and 67 in selective category) and 47 who had a vacuum delivery (24 in routine category and 23 in selective category). The episiotomy rate was 53.2% for women who delivered by vacuum (87.5% in routine category and 17.4% in selective category) and 78.9% for women who delivered by forceps (95.1% in routine category and 64.2% in selective category). They found no significant difference in the OASIS rate between routine and selective episiotomy, although the incidence was slightly low in the selective

Table 3
Studies evaluating the role of mediolateral (MLE) or lateral – no study – episiotomy in forceps delivery.

Year	Author	Country	Reference Year	Type of Study	Number of women who had forceps delivery	MLE Rate/ OASIS Rate	Findings
2005	Youssef et al. [39]	UK	1998–2002	Retrospective cohort	1505 women: 1441 MLE, 64, no MLE	95.8%/8.9%	No difference in OASIS between MLE (9.1%, n = 131) and no MLE (4.7%, n = 3) (OR 1.88 (95% CI 0.58–6.11))
2008	De Leeuw et al. [40]	Netherlands	1994–1995	Retrospective cohort	7478 women: 6657 MLE, 739 no MLE	89.0%/4.7%	MLE reduced OASIS rate: 22.7% (n = 168/ 739) to 2.6% (n = 173/ 6657), OR 0.08, 95% CI 0.07–0.11
2008	Macleod et al. [42]	UK	2004–2006	Prospective cohort	904 nulliparous women: 810 MLE, 94 no MLE	89.6%/11.6%	No difference in OASIS between MLE (11.7%, n = 95) and no MLE (10.6%, n = 10) (OR 1.12 (95% CI 0.56–2.22))
2012	De Vogel et al. [41]	USA	2001–2009	Retrospective cohort	316 women: 295 MLE, 21 no MLE	93.4%/0.3%	MLE reduced OASIS rate: 20.6% (n = 6/21) to 1.4%% (n = 4/295), OR 0.03, 95% CI 0.00–0.14
2018	Van Bavel et al. [36]	Netherlands	2000–2010	Retrospective Cohort	11,629 women: 10,674 MLE, 955 no MLE	91.8%/4.9%	MLE reduced OASIS rate: 22.7% (n = 217/ 955) to 3.3% (n = 352/ 10,674), aOR 0.09, 95% CI 0.07–0.11 for nulliparous and 0.13, 95% CI 0.08–0.22 for multiparous
2019	Boujenah et al. [38]	France	2014–2017	Retrospective Cohort	948 nulliparous women (forceps and spatula): 793 MLE, 155 no MLE	83.6%/3.3%	MLE reduced OASIS rate: 7.7% (n = 19/793) to 2.4% (n = 12/155), $p < 0.05$

group (8.1% versus 10.9%, OR 0.72, 95% CI 0.28–1.87). They concluded that it did not provide conclusive evidence that a policy of routine episiotomy is better or worse than a restrictive policy.

Recommendations from professional bodies

A summary of the recommendations from the main English-speaking professional bodies is provided in Table 4 [14,44–46]. All bodies recommend against routine episiotomy. The RCOG and

Table 4
Summary of recommendations from professional bodies regarding the use of episiotomy at OVD.

Professional Body	Recommendation
Royal College of Obstetricians and Gynaecologists (2011) [14]	'In the absence of robust evidence to support routine use of episiotomy in operative vaginal delivery, restrictive use of episiotomy, using the operator's individual judgement, is supported.'
American College of Obstetricians and Gynaecologists (2015) [44]	'Routine episiotomy with operative vaginal delivery is not recommended because poor healing and prolonged discomfort has been reported with mediolateral episiotomy and because of the association of midline episiotomies with increased risk of injury to the anal sphincter and extension into the rectum.'
Society of Obstetricians and Gynaecologists of Canada (2018) [46]	'Routine episiotomy is not necessary for an assisted vaginal birth.'
Royal Australian and New Zealand College of Obstetricians and Gynaecologists (2016) [45]	'In the absence of robust evidence to support routine use of episiotomy in operative vaginal delivery, selective use of episiotomy based on the judgement of the operator is supported.'

RANZCOG specifically support a policy of selective episiotomy. The ACOG and SOGC do not explicitly make reference selective episiotomy as part of OVD.

In conclusion, there is evidence that mediolateral/lateral episiotomy as part of OVD reduces OASIS. However, it does not appear that a policy of routine episiotomy provides any additional benefit over selective episiotomy.

How should future pregnancies following OVD and OASIS be managed?

Most attention has focused on women who have suffered OASIS embarking on a subsequent pregnancy. The management of future pregnancies for women who suffer OASIS following an OVD is particularly challenging as two events have occurred: OVD and OASIS. For women who have experienced an OVD, guidelines recommend that they should be encouraged to aim for a SVD given the high likelihood of success [14]. For women who have experienced OASIS, guidelines recommend that the option of an elective caesarean delivery following OASIS should be considered following OASIS if there symptoms or abnormal endoanal ultrasound and/or manometry, noting the low recurrence risk (5–7%) [3]. Jha and Parker, in a systematic review and meta-analysis including eight studies, found that the risk of recurrent OASIS was 6.3% (compared to 5.7% in the first pregnancy) [47]. The risk was increased further by forceps delivery (OR 3.12, 95% CI 2.42–4.01) or vacuum delivery (OR 2.44, 95% CI 1.83–3.25). They concluded that intrapartum decisions could be 'based upon the requirement for an instrumental delivery'. Therefore, the management of future pregnancies following an OVD with OASIS should be considered on an individual case basis with particular consideration of the woman's wishes in relation to the use of OVD.

Summary

There is evidence of an increased risk of OASIS with OVD, particularly forceps delivery. OASIS appears to be associated with an increased risk of long-term faecal incontinence. However, there does not appear to be any difference in long-term bowel or pelvic floor symptoms between women who have an OVD and women who do not have an OVD (either SVD or CS). A measured approach is recommended when selecting the instrument for OVD that considers the risks of vacuum delivery notably failure. There is evidence that mediolateral/lateral episiotomy as part of OVD reduces OASIS. However, it does not appear that a policy of routine episiotomy provides any additional reduction over selective episiotomy.

Practice points

- OVD increases the risk of OASIS particularly the use of forceps. However, when selecting an instrument to undertake an OVD (vacuum or forceps), practitioners should select the most appropriate instrument given the increased risk of failure (and need for sequential instruments) associated with vacuum delivery.
- Episiotomy as part of OVD may decrease the risk of OASIS. However, practitioners should perform episiotomy selectively (restricted) rather than routinely.
- If a practitioner performs an episiotomy as part of an OVD, then it should be a mediolateral or lateral episiotomy (rather than a midline episiotomy).
- For women embarking on future pregnancies following an OVD complicated by OASIS, practitioners should carefully establish the woman's wishes in relation to a further OVD.

Research agenda

- Exploration of routine versus selective episiotomy policies at OVD in the form of an RCT.
- Comparison of OVD outcomes with other modes of delivery with reference to antenatal pelvic floor symptomatology.
- Comparison of OVD with second-stage caesarean section outcomes.

Conflict of interest

The author has no conflict of interest to declare.

Multiple Choice Questions

1. Obstetric anal sphincter injury

A. Is classified as 3a if <50% of the external anal sphincter is torn
B. Occurs only if an operative vaginal delivery is performed
C. Occurs consistently in <5% of operative vaginal deliveries
D. Occurs more frequently during 'out-of-hours' deliveries
E. Occurs more frequently with rotational forceps delivery compared to manual rotation followed by direct forceps delivery

Answers:
1: A: T, B: F, C: F, D: F, E: F
OASIS is classified as 3a if <50%, 3b if >50% of the external sphincter is torn and 3c if both internal and external sphincters are torn. OASIS can occur in any type of vaginal delivery and even potentially following a failed attempt at operative vaginal delivery resulting in caesarean section. There are wide variations in rates of OASIS during OVD from 2% up to 30%. There is evidence that rates are similar during day and night hours and between rotational and direct forceps delivery.

2. Mediolateral episiotomy

A. Should be performed in preference to a midline episiotomy for OASIS prevention
B. Is defined as an episiotomy that is directed at least 45° away from the midline
C. Reduces the risk of OASIS during operative vaginal delivery
D. Should be performed routinely rather than selectively during operative vaginal delivery
E. Should be performed routinely rather than selectively during operative vaginal delivery in a woman with a prior history of OASIS

A: T, B: F, C: T, D: F, E: F
Mediolateral episiotomy is associated with less risk of OASIS than midline episiotomy and is recommended. The angle recommended is directed at least 60° from the midline. There is evidence that mediolateral episiotomy reduces the risk of OASIS but does not extend to a recommendation to perform episiotomy routinely but rather selectively. There is no evidence that this recommendation should be altered in the case of women with a prior history of OASIS undergoing an OVD in a subsequent pregnancy.

3. In terms of long-term pelvic floor problems following operative vaginal delivery

A. OASIS is associated with faecal incontinence
B. OVD is more likely to result in faecal incontinence if the delivery was operative rather than spontaneous
C. OVD has similar rates of dyspareunia compared to spontaneous vaginal delivery
D. OVD results in poorer sexual functioning compared to spontaneous vaginal delivery
E. OVD results in delayed resumption of sexual intercourse compared to spontaneous vaginal delivery

A: T, B: F, C: T, D: T, E: F.
There is good evidence that a woman who experiences OASIS is at an increased risk of faecal incontinence in later life. However, it appears that this risk is similar regardless of mode of vaginal delivery (spontaneous or operative). There is evidence that dyspareunia/pelvic pain rates are similar regardless of mode of vaginal delivery (spontaneous or operative). OVD results in poorer sexual functioning but no delay in the time to resumption of sexual intercourse than spontaneous vaginal delivery.

References

*[1] Gurol-Urganci I, Cromwell DA, Edozien LC, Mahmood TA, Adams EJ, Richmond DH, et al. Third- and fourth-degree perineal tears among primiparous women in England between 2000 and 2012: time trends and risk factors. BJOG 2013 Nov;120(12):1516–25.

*[2] Kalis V, Laine K, de Leeuw J, Ismail K, Tincello D. Classification of episiotomy: towards a standardisation of terminology: international classification of episiotomy. BJOG An Int J Obstet Gynaecol 2012 Apr;119(5):522–6.

[3] Royal College of Obstetricians and Gynaecologists. The management of third- and fourth-degree perineal tears. 2015 [cited 2019 May 1]; Available from: https://www.rcog.org.uk/globalassets/documents/guidelines/gtg-29.pdf.

*[4] O'Mahony F, Hofmeyr GJ, Menon V, Cochrane Pregnancy and Childbirth Group. Choice of instruments for assisted vaginal delivery. Cochrane Database Syst Rev 2010 Nov 10;(11):CD005455. Available from: http://doi.wiley.com/10.1002/14651858.CD005455.pub2.

[5] Pergialiotis V, Vlachos D, Protopapas A, Pappa K, Vlachos G. Risk factors for severe perineal lacerations during childbirth. Int J Gynaecol Obstet 2014 Apr;125(1):6–14.

[6] Committee on Practice Bulletins-Obstetrics. ACOG practice bulletin No. 198: prevention and management of obstetric lacerations at vaginal delivery. Obstet Gynecol 2018;132(3):e87–102.

[7] Harvey M-A, Pierce M, Alter J-EW, Chou Q, Diamond P, Epp A, et al. Obstetrical anal sphincter injuries (OASIS): prevention, recognition, and repair. J Obstet Gynaecol Can 2015 Dec;37(12):1131–48.

[8] Friedman AM, Ananth CV, Prendergast E, D'Alton ME, Wright JD. Evaluation of third-degree and fourth-degree laceration rates as quality indicators. Obstet Gynecol 2015 Apr;125(4):927–37.

[9] Bahl R, Van de Venne M, Macleod M, Strachan B, Murphy DJ. Maternal and neonatal morbidity in relation to the instrument used for mid-cavity rotational operative vaginal delivery: a prospective cohort study. BJOG 2013 Nov;120(12):1526–32.

[10] Gauthaman N, Henry D, Ster IC, Khunda A, Doumouchtsis SK. Kielland's forceps: does it increase the risk of anal sphincter injuries? An observational study. Int UrogynEcol J 2015 Oct;26(10):1525–32.

[11] O'Brien S, Day F, Lenguerrand E, Cornthwaite K, Edwards S, Siassakos D. Rotational forceps versus manual rotation and direct forceps: a retrospective cohort study. Eur J Obstet Gynecol Reprod Biol 2017 May;212:119–25.

[12] Murphy DJ, Macleod M, Bahl R, Strachan B. A cohort study of maternal and neonatal morbidity in relation to use of sequential instruments at operative vaginal delivery. Eur J Obstet Gynecol Reprod Biol 2011 May;156(1):41–5.

[13] Fong A, Wu E, Pan D, Chung JH, Ogunyemi DA. Temporal trends and morbidities of vacuum, forceps, and combined use of both. J Matern Fetal Neonatal Med 2014 Dec;27(18):1886–91.

[14] Royal College of Obstetricians and Gynaecologists. Operative vaginal delivery. 2011.

[15] LaCross A, Groff M, Smaldone A. Obstetric anal sphincter injury and anal incontinence following vaginal birth: a systematic review and meta-analysis. J Midwifery Wom Health 2015 Feb;60(1):37–47.

*[16] Halle TK, Salvesen KÅ, Volløyhaug I. Obstetric anal sphincter injury and incontinence 15-23 years after vaginal delivery. Acta Obstet Gynecol Scand 2016 Aug;95(8):941–7.

[17] Davé BA, Leader-Cramer A, Mueller M, Johnson LL, Kenton K, Lewicky-Gaupp C. Anal sphincter injuries after operative vaginal versus spontaneous delivery-is there a difference in postpartum symptoms? Female Pelvic Med Reconstr Surg 2016 Aug;22(4):194–8.

[18] Parant O, Simon-Toulza C, Cristini C, Vayssiere C, Arnaud C, Reme J-M. Faecal incontinence after first instrumental vaginal delivery using Thierry's spatulas. Int UrogynEcol J 2010 Oct;21(10):1195–203.

*[19] Fitzpatrick M, Behan M, O'Connell PR, O'Herlihy C. Randomised clinical trial to assess anal sphincter function following forceps or vacuum assisted vaginal delivery. BJOG An Int J Obstet Gynaecol 2003 Apr;110(4):424–9.

[20] Handa VL, Blomquist JL, McDermott KC, Friedman S, Muñoz A. Pelvic floor disorders after vaginal birth: effect of episiotomy, perineal laceration, and operative birth. Obstet Gynecol 2012 Feb;119(2 Pt 1):233–9.

[21] Johanson RB, Heycock E, Carter J, Sultan AH, Walklate K, Jones PW. Maternal and child health after assisted vaginal delivery: five-year follow up of a randomised controlled study comparing forceps and ventouse. Br J Obstet Gynaecol 1999 Jun;106(6):544–9.

[22] Crane AK, Geller EJ, Bane H, Ju R, Myers E, Matthews CA. Evaluation of pelvic floor symptoms and sexual function in primiparous women who underwent operative vaginal delivery versus cesarean delivery for second-stage arrest. Female Pelvic Med Reconstr Surg 2013 Feb;19(1):13–6.

*[23] Macleod M, Goyder K, Howarth L, Bahl R, Strachan B, Murphy D. Morbidity experienced by women before and after operative vaginal delivery: prospective cohort study nested within a two-centre randomised controlled trial of restrictive versus routine use of episiotomy. BJOG An Int J Obstet Gynaecol 2013 Jul;120(8):1020–7.

[24] Blomquist JL, McDermott K, Handa VL. Pelvic pain and mode of delivery. Am J Obstet Gynecol 2014 May;210(5):423.e1–6.

[25] McDonald EA, Gartland D, Small R, Brown SJ. Dyspareunia and childbirth: a prospective cohort study. BJOG 2015 Apr;122(5):672–9.

[26] Kainu JP, Halmesmäki E, Korttila KT, Sarvela PJ. Persistent pain after cesarean delivery and vaginal delivery: a prospective cohort study. Anesth Analg 2016;123(6):1535–45.

[27] Adams SS, Eberhard-Gran M, Sandvik ÅR, Eskild A. Mode of delivery and postpartum emotional distress: a cohort study of 55,814 women. BJOG 2012 Feb;119(3):298–305.

[28] Barbara G, Pifarotti P, Facchin F, Cortinovis I, Dridi D, Ronchetti C, et al. Impact of mode of delivery on female postpartum sexual functioning: spontaneous vaginal delivery and operative vaginal delivery vs. Cesarean section. J Sex Med 2016 Mar;13(3):393–401.

[29] Ducarme G, Hamel J-F, Brun S, Madar H, Merlot B, Sentilhes L. Sexual function and postpartum depression 6 months after attempted operative vaginal delivery according to fetal head station: a prospective population-based cohort studyBrown S, editor. PLoS One 2017 Jun 7;12(6):e0178915.

[30] Combs CA, Robertson PA, Laros RK. Risk factors for third-degree and fourth-degree perineal lacerations in forceps and vacuum deliveries. Am J Obstet Gynecol 1990 Jul;163(1 Pt 1):100–4.

[31] Helwig JT, Thorp JM, Bowes WA. Does midline episiotomy increase the risk of third- and fourth-degree lacerations in operative vaginal deliveries? Obstet Gynecol 1993 Aug;82(2):276–9.
[32] Ecker JL, Tan WM, Bansal RK, Bishop JT, Kilpatrick SJ. Is there a benefit to episiotomy at operative vaginal delivery? Observations over ten years in a stable population. Am J Obstet Gynecol 1997 Feb;176(2):411–4.
[33] Robinson JN, Norwitz ER, Cohen AP, McElrath TF, Lieberman ES. Episiotomy, operative vaginal delivery, and significant perinatal trauma in nulliparous women. Am J Obstet Gynecol 1999 Nov;181(5 Pt 1):1180–4.
*[34] Lund NS, Persson LKG, Jangö H, Gommesen D, Westergaard HB. 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 Dec;207:193–9.
*[35] Sagi-Dain L, Sagi S. Morbidity associated with episiotomy in vacuum delivery: a systematic review and meta-analysis. BJOG 2015 Jul;122(8):1073–81.
*[36] van Bavel J, Hukkelhoven CWPM, de Vries C, Papatsonis DNM, de Vogel J, Roovers J-PWR, 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(3):407–13.
[37] Bodner-Adler B, Kimberger O, Käfer A, Husslein P, Bodner K. Management of the perineum during delivery with the Kiwi Omnicup: effects of mediolateral episiotomy on anal sphincter tears in nulliparous women. Gynecol Obstet Investig 2018;83(2):171–8.
[38] Boujenah J, Tigaizin A, Fermaut M, Murtada R, Benbara A, Benchimol M, et al. Is episiotomy worthwile to prevent obstetric anal sphincter injury during operative vaginal delivery in nulliparous women? Eur J Obstet Gynecol Reprod Biol 2019 Jan;232:60–4.
[39] Youssef R, Ramalingam U, Macleod M, Murphy DJ. Cohort study of maternal and neonatal morbidity in relation to use of episiotomy at instrumental vaginal delivery. BJOG 2005 Jul;112(7):941–5.
[40] de Leeuw JW, de Wit C, Kuijken JPJA, Bruinse HW. Mediolateral episiotomy reduces the risk for anal sphincter injury during operative vaginal delivery. BJOG 2008 Jan;115(1):104–8.
[41] de Vogel J, van der Leeuw-van Beek A, Gietelink D, Vujkovic M, de Leeuw JW, van Bavel J, et al. The effect of a mediolateral episiotomy during operative vaginal delivery on the risk of developing obstetrical anal sphincter injuries. Am J Obstet Gynecol 2012 May;206(5):404.e1–5.
[42] Macleod M, Strachan B, Bahl R, Howarth L, Goyder K, Van de Venne M, et al. A prospective cohort study of maternal and neonatal morbidity in relation to use of episiotomy at operative vaginal delivery. BJOG 2008 Dec;115(13):1688–94.
*[43] Murphy D, Macleod M, Bahl R, Goyder K, Howarth L, Strachan B. A randomised controlled trial of routine versus restrictive use of episiotomy at operative vaginal delivery: a multicentre pilot study. BJOG An Int J Obstet Gynaecol 2008 Dec;115(13):1695–703.
[44] ACOG. Practice bulletin No. 154: operative vaginal delivery. Obstet Gynecol 2015 Nov;126(5):e56–65.
[45] Royal Australian and New Zealand College of Obstetricians and Gynaecologists. Instrumental vaginal birth. 2016.
[46] Cargill YM, MacKinnon CJ. No. 148-Guidelines for operative vaginal birth. J Obstet Gynaecol Can 2018 Feb;40(2):e74–80.
[47] Jha S, Parker V. Risk factors for recurrent obstetric anal sphincter injury (rOASI): a systematic review and meta-analysis. Int UrogynEcol J 2016 Jun;27(6):849–57.