The prevention of perineal trauma during vaginal birth

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Introduction

Perineal trauma after vaginal birth is common, with approximately 9 of 10 women being affected.[1] To standardize care, the Sultan classification is recommended for grading the severity of perineal trauma (Table 1).[2,3] Second-degree perineal tears are twice as likely to occur in primiparous births, with an incidence of 40%.[1,4] A national survey of 215 maternity units in the United Kingdom found that the incidence of obstetrical anal sphincter injury (OASI) was approximately 3%, with this rate being significantly higher in primiparous women than in multiparous women (6% vs 2%).[5] Similarly, a retrospective database review from 12 maternity units within the United States also found an incidence of OASI of 3% (nulliparous, 6% vs multiparous, 1%).[6] The incidence of OASI was also found to be similar in Nordic countries such as Denmark, Norway, Sweden, and Finland, ranging between 1% and 4%.[7] Unfortunately, all grades of perineal trauma can be associated with significant physical and psychological morbidity in the immediate postpartum period and in the long term. Subsequent perineal pain and dyspareunia, which can last up to 18 months

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Perineal trauma after vaginal birth is common, with approximately 9 of 10 women being affected. Second-degree perineal tears are twice as likely to occur in primiparous births, with a incidence of 40%. The incidence of obstetrical anal sphincter injury is approximately 3%, with a significantly higher rate in primiparous than in multiparous women (6% vs 2%). Obstetrical anal sphincter injury is a significant risk factor for the development of anal incontinence, with approximately 10% of women developing symptoms within a year following vaginal birth. Obstetrical anal sphincter injuries have significant medicolegal implications and contribute greatly to healthcare costs. For example, in 2013 and 2014, the economic burden of obstetrical anal sphincter injuries in the United Kingdom ranged between £3.7 million (with assisted vaginal birth) and £9.8 million (with spontaneous vaginal birth). In the United States, complications associated with trauma to the perineum incurred costs of approximately $83 million between 2007 and 2011. It is therefore crucial to focus on improvements in clinical care to reduce this risk and minimize the development of perineal trauma, particularly obstetrical anal sphincter injuries. Identification of risk factors allows modification of obstetrical practice with the aim of reducing the rate of perineal trauma and its attendant associated morbidity. Risk factors associated with second-degree perineal trauma include increased fetal birthweight, operative vaginal birth, prolonged second stage of labor, maternal birth position, and advanced maternal age. With obstetrical anal sphincter injury, risk factors include induction of labor, augmentation of labor, epidural, increased fetal birthweight, fetal malposition (occiput posterior), midline episiotomy, operative vaginal birth, Asian ethnicity, and primiparity.

Obstetrical practice can be modified both antenatally and intrapartum. The evidence suggests that in the antenatal period, perineal massage can be commenced in the third trimester of pregnancy to increase muscle elasticity and allow stretching of the perineum during birth, thereby reducing the risk of tearing or need for episiotomy. With regard to the intrapartum period, there is a growing body of evidence from the United Kingdom, Norway, and Denmark suggesting that the implementation of quality improvement initiatives including the training of clinicians in manual perineal protection and mediolateral episiotomy can reduce the incidence of obstetrical anal sphincter injury. With episiotomy, the International Federation of Gynecology and Obstetrics recommends restrictive rather than routine use of episiotomy. This is particularly the case with unassisted vaginal births. However, there is a role for episiotomy, specifically mediolateral or lateral, with assisted vaginal births. This is specifically the case with nulliparous vacuum and forceps births, given that the use of mediolateral or lateral episiotomy has been shown to significantly reduce the incidence of obstetrical anal sphincter injury in these groups by 43% and 68%, respectively. However, the complications associated with episiotomy including perineal pain, dyspareunia, and sexual dysfunction should be acknowledged.

Despite considerable research, interventions for reducing the risk of perineal trauma remain a subject of controversy. In this review article, we present the available data on the prevention of perineal trauma by describing the risk factors associated with perineal trauma and interventions that can be implemented to prevent perineal trauma, in particular obstetrical anal sphincter injury.

Key words: assisted vaginal delivery, episiotomy, manual perineal protection, obstetrical anal sphincter injury, operative vaginal birth, perineal laceration, perineal massage, perineal trauma, vaginal delivery

TABLE 1
The Sultan classification of perineal trauma

Degree	Injury
Intact	No visible tear
First	Perineal skin only
Second	Perineal muscles but not involving the anal sphincter
Third	Anal sphincter complex 3a: <50% of the EAS thickness torn 3b: >50% of the EAS thickness torn 3c: both EAS and IAS torn
Fourth	Anal sphincter complex and anal mucosa
Rectal buttonhole	Isolated rectal buttonhole with or without third-degree tear

EAS, external anal sphincter; *IAS*, internal anal sphincter.

Updated from Royal College of Obstetricians and Gynaecologists.[2]

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postpartum, can negatively affect relationships with the newborn, partner, and relatives.[8,9] Morbidity is particularly significant in cases of OASI, which have been shown to be associated with worse perineal pain, dyspareunia, and sexual dysfunction.[10,11] OASI is also a significant risk factor for the development of anal incontinence, with approximately 10% of women developing symptoms within a year following vaginal birth.[12] Moreover, the management of perineal trauma and its sequelae also contribute significantly to healthcare costs owing to resource utilization. In 2013 and 2014, the economic burden of OASI in the UK ranged between £3.7 million (with assisted vaginal birth) and £9.8 million (with spontaneous vaginal birth).[13] In the United States, complications associated with trauma to the perineum incurred costs of approximately $83 million between 2007 and 2011.[14] However, it is important to note that the costs incurred in the United States and the United Kingdom cannot be directly compared because childbirth is midwife-led in the United Kingdom but physician-led in the United States.[15] Given the morbidity associated with perineal trauma, focusing attention on minimizing perineal trauma is warranted.

In this review, we present the available data on the prevention of perineal trauma by describing the risk factors and interventions that can be implemented to prevent perineal trauma.

Risk factors

Strategies to reduce perineal trauma should focus on the identification of modifiable risk factors and actions aimed at mitigating them. Identified modifiable risk factors associated with second-degree perineal trauma include operative vaginal birth and maternal birth positions with increased sacrum flexibility (such as lithotomy, supine, and sitting as opposed to squatting, kneeling, and lateral).[16] Non-modifiable risk factors include increased maternal age, post-term birth, increased fetal birthweight, perineal edema, and a prolonged second stage of labor.[4,16]

With regards to OASI, meta-analyses have been performed previously to identify associated modifiable and non-modifiable risk factors.[17,18] Pergialiotis et al identified 43 studies in the literature including 22,280 women who had sustained an OASI.[18] Table 2 describes the variables found and the results of their quantitative analysis. Non-modifiable risk factors included Asian ethnicity, primiparity, induction of labor, augmentation of labor, fetal malposition (occiput posterior), and fetal birthweight. Modifiable risk factors included epidural, midline episiotomy, and operative vaginal birth. First vaginal birth after cesarean delivery (VBAC) has also been shown to be associated with OASI. Uebergang et al[19] demonstrated in their retrospective cohort study (n=455,000 women) that after controlling for confounding factors including mode of birth, body mass index (BMI), maternal age, infant birthweight, episiotomy, and epidural, VBAC significantly increased the risk of OASI by 21%. Perineal body length is an additional risk factor that has been described in observational studies to increase the risk of severe perineal trauma.[20–22] Aytan et al found that a perineal body length of <3 cm in nulliparous women was significantly associated with OASI, particularly in the presence of midline episiotomy.[22] Similarly, in multiparous women, a perineal body length of <2.5 cm increased the risk of OASI.[20]

Although perineal trauma is more common in a first vaginal birth, the risk of spontaneous tears in the second birth has been shown to increase with the severity of perineal trauma sustained in the first birth.[23] Martin et al[23] found in their retrospective study of 1895 women that after adjusting for confounders (maternal age, birthweight, length of gestation, head circumference, fetal presentation, and mode of birth), the risk of spontaneous perineal trauma (second-degree and OASI) in a second birth increased 3-fold in women with a history of perineal trauma. This risk increased further with the severity of perineal trauma sustained in the first birth. Women with previous OASI are at increased risk of a repeated OASI in a subsequent birth.[24] A systematic review and meta-analysis of 16 studies in the literature including 99,042 women found an average rate of repeated OASI of 6.3% with a range of 2.0% to 13.4%.[25] Preventing recurrent OASI (rOASI) is important because this can potentially predispose women to subsequent anal sphincter dysfunction and incontinence. This was evidenced in a case-controlled study of 84 women undergoing endoanal ultrasound and anal manometry, which found that women with rOASI had significantly larger anal sphincter defects and lower anal manometry pressures at 3-month follow-up.[26] At 5 years, Jangö et al found that the risk of

anal incontinence increased approximately 2-fold with rOASI.[27]

Because of an increasingly diverse population, appreciation of healthcare inequalities and cultural competency is very relevant. Therefore, sociocultural factors should also be considered when appreciating the risk of OASI. A study based in Sweden showed that migrants with short residence and those with a foreign-born partner had an increased risk of OASI.[28] After adjusting for confounding factors including maternal age, education, pre-pregnancy BMI, maternal height, smoking, macrosomia, health region, and year of delivery, the risk of OASI increased by 13% (adjusted odds ratio [aOR], 1.13; 95% confidence interval [CI], 1.04−1.23). This was particularly the case in newly arrived migrants, for example, women from South Asia, for whom the risk of OASI increased 4-fold (aOR, 4.09; 95% CI, 2.82−5.92). In addition, in comparison with nonmigrants (<5 years residency), OASI risk was the highest in women from South Asia (aOR, 2.82; 95% CI, 2.15−3.70); sub-Saharan Africa (aOR, 2.23; 95% CI, 1.74−2.86); Southeast Asia, East Asia, and the Pacific (aOR, 2.08; 95% CI, 1.66−2.06); and North Africa and the Middle East (aOR, 1.53; 95% CI, 1.21−1.95). Potential institutional barriers such as language, cultural practices, and health beliefs can increase OASI risk because of their effects on antenatal education, patient decision-making with regard to care, and communication and relationships with healthcare professionals (particularly in the active phase of labor). To achieve optimal maternity care, it is imperative that maternity staff receive training with regard to the diverse needs of migrant women. Moreover, these subgroups of women need to be identified and empowered antenatally and be provided comprehensible education about maternity services and labor care.[29]

Prediction models

Prediction models have been published in previous literature, which can allow clinicians to take into account nonmodifiable risk factors and also modify obstetrical practice to reduce the risk of OASI.[30−35] Table 3 describes the prediction models published in the literature and their performance. Given that VBAC is a risk factor for OASI, Luchristt at al[35] aimed to develop a predictive model to estimate the risk of OASI in this population, using known antenatal factors (maternal age, BMI at delivery, previous vaginal birth, smoking) and factors generated intrapartum (operative vaginal birth). In their model, factors independently associated with OASI in the context of VBAC included assisted vaginal birth and advanced maternal age, whereas BMI and previous vaginal birth were protective factors. The model was validated internally (concordance index=0.79) and externally (concordance index=0.71) and had good performance.[35] However, to minimize the risk of OASI significantly, the most useful prediction models are those that can be used for counseling in the antenatal period. Webb et al in their retrospective cohort study of 71,469 women (OASI rate of 2.5%) attempted to address this with their prediction model by exclusively including variables known before birth. Advanced maternal age, fetal malposition (occipito-posterior), induction or augmentation of labor, and estimated infant birthweight ≥4000 g were found to be significant predictive factors. In addition, the predictive model

TABLE 2
Risk factors for obstetrical anal sphincter injury

Assessed variable	Number of studies	Parturient number (severe lacerations/controls)	Effect estimate (95% CI)
Asian ethnicity	11	146,584 (6950/139,634)	RR, 1.87 (1.46−2.39)[a]
Primiparity	29	613,989 (13,253/600,736)	RR, 1.59 (1.45−1.75)[a]
Duration of second stage	7	43,095 (1148/41,947)	MD, 28.46 (22.44−34.48)[a]
Induction of labor	15	501,863 (9924/491,939)	RR, 1.05 (0.97−1.15)
Augmentation of labor	13	76,467 (3536/72,931)	RR, 1.46 (1.32−1.62)[a]
Epidural	23	294,373 (8047/286,326)	RR, 1.21 (1.08−1.36)[a]
Occiput posterior	12	369,427 (8013/361,414)	RR, 2.73 (2.08−3.58)[a]
Mediolateral episiotomy	12	564,247 (12,043/552,204)	RR, 1.55 (0.95−2.53)
Midline episiotomy	11	475,545 (13,531/462,014)	RR, 2.88 (1.79−4.65)[a]
Any type of episiotomy	29	659,640 (17,080/642,560)	RR, 1.54 (1.27−1.86)[a]
Vacuum delivery	17	554,580 (10,890/543,690)	RR, 2.60 (1.78−3.79)[a]
Metallic forceps	14	509,398 (13,293/496,105)	RR, 3.15 (1.91−5.19)[a]
Instrumental delivery (any)	25	637,150 (16,128/621,022)	RR, 3.38 (2.21−5.18)[a]
Infant birthweight	13	257,130 (4960/252,170)	MD, 163.71 (115.37−212.06)[a]

MD in duration of second stage of labor in minutes, MD in neonatal birthweight in grams. Reproduced with permission from Pergialiotis et al.[17]

CI, confidence interval; *MD*, mean difference; *RR*, risk ratio.

[a] Significant risk factors.

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TABLE 3
Summary of obstetrical anal sphincter injury prediction models and their performance

Reference	Study design	Factors	AUC[a]
Chill et al,[31] 2021	Retrospective cohort	Nulliparity Low BMI Advanced gestational age	0.76
Luchristt et al,[35] 2021 [b]	Prospective cohort	Advanced maternal age Low BMI No previous vaginal birth Non-smoker Operative vaginal birth	0.79
McPherson et al,[30] 2014	Retrospective cohort	Nulliparity Ethnicity (African-Caribbean) Non-smoker Birth in hospital Water birth Operative vaginal birth	0.64
Meister et al,[34] 2016	Retrospective cohort	Nulliparity Ethnicity (non-African American) Prolonged second stage Non-smoker Infant birthweight ≥3500 g Operative vaginal birth	0.83
Webb et al,[33] 2017	Retrospective cohort	Nulliparity Induction/augmentation of labor Prolonged second stage Prolonged active second stage Head circumference ≥37 cm Increased birthweight (per unit [kg]) Mediolateral episiotomy[c]	0.77
		Prebirth variables Advanced maternal age Fetal malposition (occipito-posterior) Induction/augmentation of labor Infant birthweight ≥4000 g	0.71
Woo et al,[32] 2020	Retrospective cohort	Advanced maternal age Advanced gestational age Ethnicity (Asian) Prolonged second stage Operative vaginal birth Previous OASI	[d]

AUC, area under the curve; *BMI*, body mass index; *OASI*, obstetrical anal sphincter injury.

[a] AUC on receiver operator curve analysis, which represented the percentage of the times that the prediction model would correctly assign a randomly selected patient; [b] Study population=vaginal birth after previous cesarean delivery; [c] Mediolateral episiotomy=protective variable; [d] This study created a probability-based risk stratification tool and did not report the model AUC.

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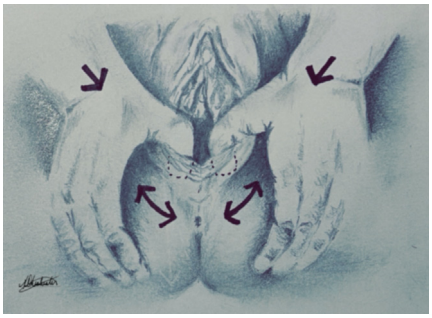
had acceptable performance, indicated by the area under the curve of 0.71 on receiver operator curve analysis, meaning that 71% of the time the prediction model would correctly assign a randomly selected patient. However, it is important to note that this model may not be useful clinically because of its low specificity, which would lead to a high false-positive prediction rate with associated and potentially unnecessary interventions.[33] Therefore, further research is required to create a clinically useful prediction model that can be used to appropriately counsel women in the antenatal period.

Antenatal period

Perineal massage

Women planning a vaginal birth can use methods during pregnancy to reduce the likelihood of perineal trauma. Perineal massage can be commenced in the third trimester of pregnancy to increase muscle elasticity and allow stretching of the perineum during birth, thus reducing the risk of tearing or need for episiotomy.[36] Four published randomized control trials (RCTs) have evaluated the effectiveness of perineal massage using almond oil by the woman or her partner from 34 weeks of gestation (Figure 1)[37–40] in the antenatal period. A

FIGURE 1
Antenatal perineal massage technique



Massage can be perfomed by applying downward pressure in a U-shape (*arrow*).
Illustrated by N.A.O.

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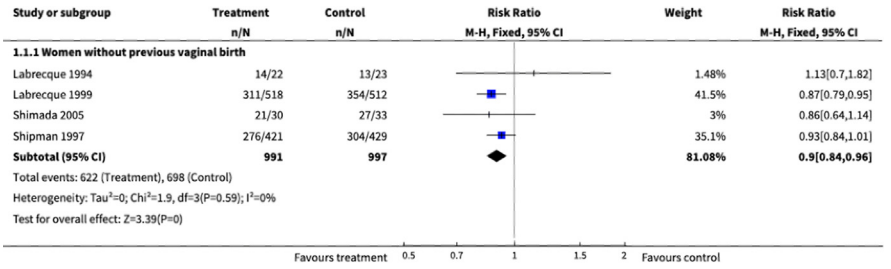
FIGURE 2
Risk of perineal trauma requiring suturing with or without antenatal perineal massage



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2013 Cochrane review pooled the effect estimates from these RCTs and found that perineal massage significantly reduced the incidence of perineal trauma requiring suturing in nulliparous women (n=1988) by 9% (risk ratio [RR], 0.90; 95% CI, 0.84–0.96) (Figure 2). However, the RCT by Labrecque et al[40] was the sole study reporting the outcome in multiparous women (n=492). The authors found that although the incidence of perineal trauma requiring suturing in multiparous women was lower with antenatal perineal massage, this was not of significant benefit.[36,40] The number of nulliparous women needed to treat with antenatal perineal massage to reduce 1 additional case of perineal trauma requiring suturing was 14 (95% CI, 9–32). Perineal massage was also shown to significantly reduce the incidence of episiotomy in nulliparous women by 17% (RR, 0.83; 95% CI, 0.73–0.95) (Figure 3). Again, this was not of significant benefit in multiparous women. The number of nulliparous women needed to treat with antenatal perineal massage to prevent 1 additional episiotomy was 18 (95% CI, 11–70).[36] With regard to the incidence of OASI, the 2013 Cochrane review found that there was no significant benefit when antenatal perineal massage was performed. However, a recent meta-analysis published in 2020 included 7 RCTs, which evaluated the effect of perineal massage in reducing OASI incidence.[37–43] This meta-analysis demonstrated that perineal massage significantly reduced the incidence of OASI by 64% (RR, 0.36; 95% CI, 0.14–0.89).[44] Unlike the Cochrane review,[36] no subgroup analysis based on parity was performed.[44] In addition, there was significant heterogeneity across the studies and evidence of publication bias. Therefore, these findings should be interpreted with caution.[44]

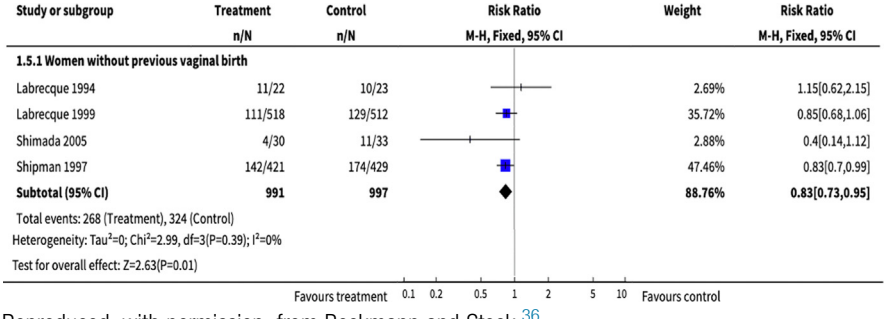
Intrapartum

During the labor process, there are several interventions described in the literature that can be implemented at different stages to reduce the risk of perineal trauma.

Maternal position during labor and birth

Although there have been studies reviewing the optimum position to allow fetal head descent during the second stage of labor, the ideal position for delivery of the fetal head to prevent perineal trauma is unclear, and there is no consensus on the protective effect of certain maternal positions in reducing perineal trauma. The upright birthing position has become increasingly popular over time because it is considered a traditional method of birthing.[45] However, in the developed world, although these positions tend to occur most commonly in home births, women in birth facilities are more likely to adopt a supine position in a labor bed because of several factors, including cultural norms.[46–48] A population-based survey

FIGURE 3
Incidence of episiotomy with or without antenatal perineal massage



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of 2400 women who delivered in the United States found that over two-thirds of women had adopted a supine position in a bed during their birth, whereas one-third were in a semirecumbent position.[46] A plausible explanation for this is that it provides healthcare professionals easier access to the maternal abdomen to monitor the fetal heart rate, and it is the common position for conducting delivery, including assisted vaginal birth.[48]

Two systematic reviews have been performed previously to investigate optimal birthing positions with regard to perineal trauma prevention[49,50] Eason et al[50] identified 7 RCTs that evaluated the effect of an upright birth position using supporting furniture in comparison with a recumbent (supine or lateral) position. Although upright birthing positions were associated with fewer episiotomies, there was an increased incidence of perineal trauma requiring suturing. The weighted risk difference was small (2%; 95% CI, −5% to 9%), with evidence of significant heterogeneity between the included studies, which makes it difficult to interpret the true effect of birth position from this review.[50] Lodge et al[49] identified an additional RCT and 6 cohort studies that reviewed natural or upright birth positions and their effect on perineal trauma. In comparison with the review by Eason et al,[50] their systematic review excluded birthing positions such as lithotomy, supine or dorsal, lateral, and Trendelenburg position. Their review included the RCT by Altman et al,[51] which included 106 women in a kneeling position, leaning toward the head of the delivery bed or cushion, and 112 women in a seated position in the delivery bed. This study found no significant difference between the 2 birthing positions in the prevention of all grades of perineal trauma and of OASI in subgroup analysis.[51] However, it is important to appreciate that sustaining perineal trauma is multifactorial, and maternal positions during labor can potentially affect risk factors such as length of the second stage of labor and rate of assisted vaginal birth. Upright and lateral positions allow flexibility in the pelvis and increase the size of the pelvic outlet.[52] A Cochrane review that identified 30 relevant RCTs in the literature found that in women without epidural anesthesia, an upright position significantly reduced the length of the second stage of labor by 6 minutes and reduced the incidence of assisted vaginal birth by 25%.[48] The effect of an upright vs recumbent birth position in women with an epidural has also been reviewed in a Cochrane review; however, no clear benefit was found.[53]

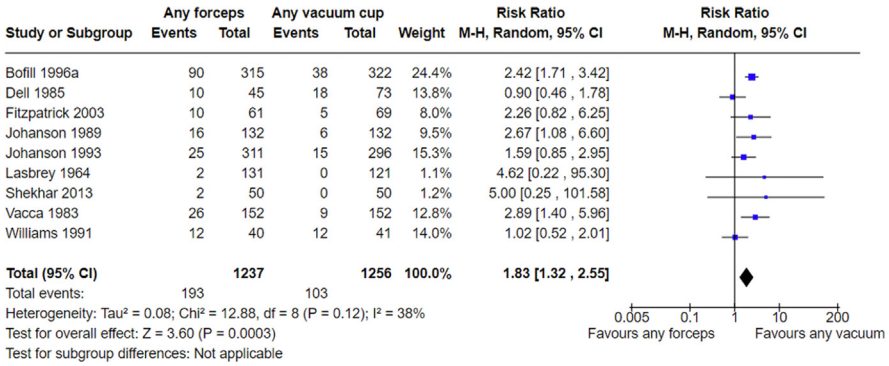
Assisted vaginal birth

Assisted vaginal birth, if required, can be achieved with forceps or vacuum extraction. However, the incidence of OASI is increased with assisted vaginal birth, in particular with forceps extraction. Gurol-Urganci et al[54] demonstrated in their large retrospective cohort study conducted in the United Kingdom that the incidence of OASI was increased 7-fold when a forceps delivery was performed. This finding concurs with a Cochrane review including 10 studies (n=2810 women) that demonstrated that undergoing forceps delivery was associated with a 2-fold increased risk of anal sphincter trauma (RR, 1.83; 95% CI, 1.32−2.55) (Figure 4).[55] Although there is a place for the use of both forceps and vacuum in clinical practice, this supports the progressive global shift away from the preferred use of forceps in favor of vacuum extraction.[56]

In the United States, from 1990 to 2015, the rate of forceps use reduced from 5.1% to 0.6%, and the rate of vacuum use reduced from 3.9% to 2.6%.[57] There is variation in assisted vaginal birth rates in the United States, which have been shown to range between 1% and 23%, with Western regions having a higher rate (mean, 8.9%; standard deviation [SD], 3.6) than the East Coast (mean, 6.1%; SD, 2.5).[58] In the United Kingdom, the rate of assisted vaginal birth ranges between 10% and 15%.[59] However, some institutions in the United Kingdom have now reported increased forceps use over time. A rise in forceps rate will not only increase the rate of OASIs but also the rate of levator avulsion, which is a significant etiologic factor in the development of female pelvic organ prolapse.[60] Tyagi et al[61] performed a retrospective cohort study in their maternity unit in the United Kingdom, evaluating the incidence of forceps and vacuum births over 10 years. Although the number of births increased from 4694 to 6387, the rate of forceps-assisted birth increased from 7.7% in 2001 to 9.4% in 2010, whereas the rate of vacuum-assisted birth decreased from 6.6% in 2001 to 3.3% in 2010.

In comparison with vacuum extraction, forceps extraction is 42% less likely to fail in achieving a vaginal birth (RR, 0.58; 95% CI, 0.39−0.88).[55] Moreover, in comparison with rigid (plastic and

FIGURE 4
Incidence of OASI with forceps vs vacuum births



Reproduced, with permission, from Verma et al.[55]

OASI, obstetrical anal sphincter injury.

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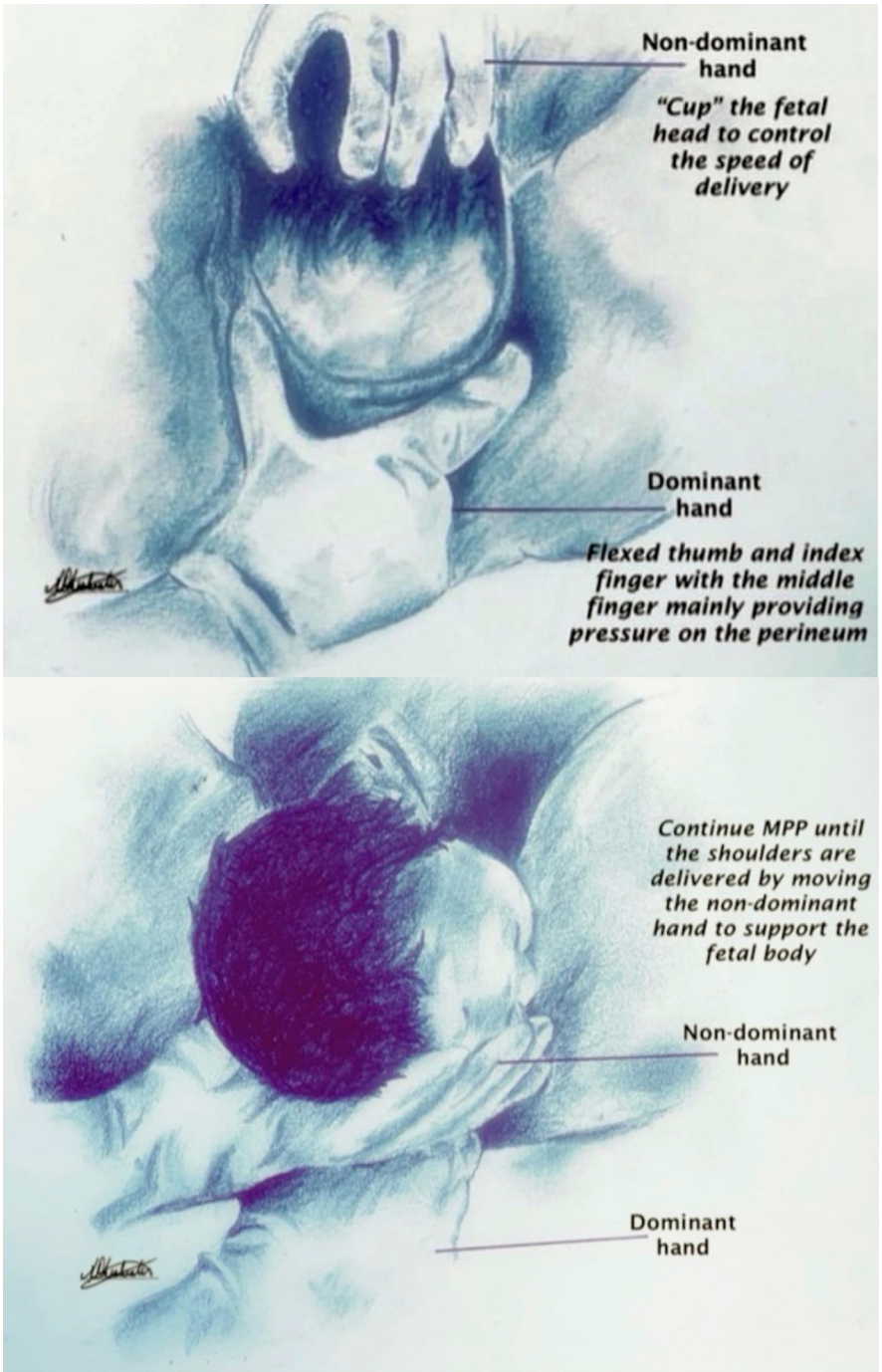
FIGURE 5
Manual perineal protection technique



Illustrated by N.A.O.

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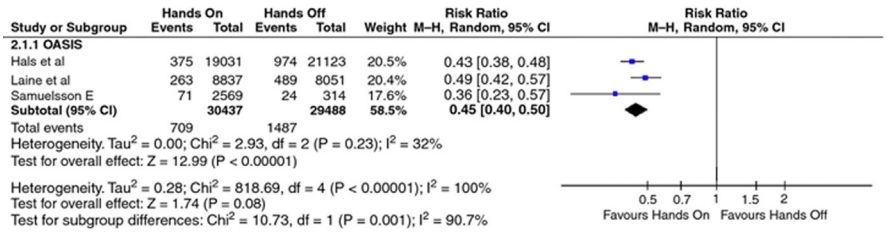
metal) cups, soft (silicone) cups have been associated with a 60% increased failure rate (RR, 1.62; 95% CI, 1.21−2.17), probably owing to the differences in traction forces that can be generated.[55] Interestingly, the incidence of assisted vaginal birth also seems to be related to human factors. A retrospective study performed in Singapore found that more assisted vaginal births were performed during office hours when a senior obstetrician was present, in comparison with second-stage cesarean deliveries.[62] This suggests the reluctance of trainees to perform operative vaginal births outside of these hours, perhaps because of fear of failure and a litigious medicolegal environment surrounding obstetrics, which has been shown to significantly affect obstetrical practice, particularly assisted vaginal birth.[63] Given that vacuum extraction is associated with an increased risk of failed vaginal birth, clinicans in the United Kingdom may prefer to use forceps. It is important that appropriate supervision and further training in vacuum extraction is provided to address this rising rate of forceps use.

Perineal management techniques

When conducting vaginal births, many practitioners promote the maintenance of fetal head flexion during crowning to minimize perineal stretch and trauma because the smallest diameter is achieved when the fetal head is well flexed in an occiput anterior position.[64] However, flexion of the fetal head at crowning may be ineffective because the fetal head must extend slightly to navigate the birth canal, which has a 90° angle.[65] In the Cochrane review evaluating perineal techniques used during the second stage of labor and their effect on perineal trauma, conclusions could not be drawn with regard to the flexion technique, because no studies that specifically used this technique were identified.[66] There is no strong evidence to suggest that the flexion technique reduces the incidence of perineal trauma.

However, controlled delivery of the presenting part by visualization of the perineum throughout and cooperation of the woman has been shown to be protective against perineal trauma.[4] This may often require the presence of a second clinician to provide peer support during the active second stage of labor. The Oneplus multicenter RCT, performed in Sweden, assessed the effect of a strategy called "collegiate assistance," where a second midwife assists with

FIGURE 6
Incidence of OASI with manual perineal protection in non-randomized studies



Reproduced, with permission, from Bulchandani et al.[71]

OASI, obstetrical anal sphincter injury.

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birth and OASI preventative strategies. This study found that collegiate assistance in the active second stage of labor reduced the incidence of OASI by 31% (odds ratio, 0.69; 95% CI, 0.49−0.97).[67]

Manual perineal protection can be used to control the birth velocity of the fetal head, and reduce the presenting diameter and subsequently the stretch on the perineum. This technique is widely practiced in Finland and involves controlling the speed of crowning by exerting pressure on the fetal occiput with the non-dominant hand while supporting the perineum with the thumb and index finger of the dominant hand, with the flexed middle finger, applying pressure on the fetal chin (Figure 5). In addition, the woman is encouraged to stop pushing and to breathe rapidly while the fetal head is guided slowly through the vaginal introitus by the clinician conducting the birth.[68,69] A biomechanical model evaluating the distribution of tension through the posterior perineum during manual perineal protection found that the technique reduced tension by approximately 40% relative to a hands-off approach.[70]

The meta-analysis by Bulchandani et al[71] evaluating the effect of manual perineal protection on OASI incidence found inconsistent results between the RCTs (n=3) and non-RCTs (n=3). The 3 RCTs demonstrated that the technique was not of significant benefit (n=6647 women; RR, 0.63; 95% CI, 0.21−1.89). However, the 3 non-RCTs demonstrated that the pooled incidence of OASIs was 55% lower with manual perineal protection (n=74,744 women; RR, 0.45; 95% CI, 0.40−0.50). Figure 6 shows the pooled estimates of the 3 non-RCTs from the meta-analysis.[71] However, a plausible explanation for this difference is that none of the RCTs were powered to specifically examine the effect of manual perineal protection on OASI. Furthermore, technique compliance, time of perineal protection initiation, and continued perineal support at the time of delivery of the shoulders could not be controlled for.[71]

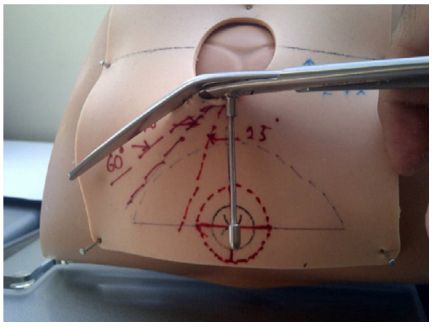
Other perineal management techniques to reduce the rate of OASI can also be considered during labor. This includes perineal massage and the application of a warm compress. A Cochrane review of 5 RCTs evaluating the effect of perineal massage during the second stage of labor on perineal outcomes has been conducted. Clinicians performed perineal massage by inserting 2 fingers into the vagina and applying downward pressure using a rotating and gentle sweeping motion onto the perineum with a variety of lubricants (different oils, jelly, Vaseline, or water). Perineal massage was shown to reduce the risk of OASI by 51% (RR, 0.49; 95% CI, 0.25−0.94; n=2477 women). However, its effect on other grades of perineal tears and the incidence of episiotomy was uncertain. The use of a warm compress applied to the perineum to reduce the rate of OASI was also covered in a Cochrane review that included 4 RCTs (RR, 0.46; 95% CI, 0.27−0.79; n=1799 women). Again, its effect on other grades of perineal tears and the incidence of episiotomy was uncertain.[66] The RCT by Dahlen et al[72] performed in Australia was the sole study to report the technique for preparing the warm compress. A sterile pad was soaked in boiled tap water (between 45°C and 59°C), then wrung out and gently placed on the perineum during contractions. The pad was then resoaked to maintain warmth (38°C−44°C). The water in the jug was replaced every 15 minutes (45.4°C−59.7°C).[72] However, the controlled application of this procedure could prove difficult.

Episiotomy

Episiotomy has been promoted as an intervention to expedite birth and minimize serious perineal laceration. The type of episiotomy can vary, with the midline episiotomy traditionally being preferred in the United States and mediolateral episiotomy in the United Kingdom and Europe.[73,74] Mediolateral episiotomies are performed at a lateral angle of 60° from the midline at crowning of the fetal head.[75] Lateral episiotomies are performed 2 cm away from the midline, and midline episiotomies are performed in the midline through the central tendon of the perineal body.[74]

The direction of an episiotomy is important in reducing trauma to the anal sphincter. Eogan et al[76] measured the angle of episiotomy scars 3 months following delivery (100 primiparous women) and found that the incidence of OASI reduced by 50% for every 6° of the episiotomy suture angle away from the midline. Following this, Kalis et al[75] performed a prospective cohort study of 60 women requiring an episiotomy, and the incision angle of episiotomy (defined as 60°) was measured before episiotomy, after repair, and after 6 months. They demonstrated that an incision angle of a mediolateral episiotomy of 60° from the midline results in a postdelivery angle of 45°. Furthermore, lateral episiotomy did not differ significantly from mediolateral episiotomy with respect to OASI incidence.[74,75] Further research controlling for

FIGURE 7
EPISCISSORS-60 used on a birth simulation model



From Sawant and Kumar D.[77]

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episiotomy angle is therefore required. To address this, scissors angled at 60° to a marker guide limb pointing toward the anus have been devised, called the EPISCISSORS-60 (Medinvent Ltd, Gosport, United Kingdom) (Figure 7).[78] A meta-analysis evaluating the incidence of OASI before and after the implementation of this device in 6 observational studies (n=14,027 women) demonstrated a 2% risk difference [RD] (RD, −0.02; 95% CI, −0.03 to 0.00) in OASI incidence.[79]

Potential risks associated with routine episiotomy include blood loss, perineal pain, dyspareunia, and pelvic floor dysfunction.[80] The International Federation of Gynecology and Obstetrics recommends restrictive rather than routine use of episiotomy.[81] This is particularly relevant in the case of unassisted vaginal births, for which a Cochrane meta-analysis demonstrated that a policy of selective episiotomy reduced the incidence of OASI by 30% (RR, 0.70; 95% CI, 0.52−0.94; n=6177 women). It is important to note that this also included 2 studies using midline episiotomy (n=1143 women), and there were no subgroup differences found between the studies using midline and those using mediolateral episiotomy.[82] According to these findings, there was a sharp decline in the use of episiotomy in the United States from 60.9% in 1979 to 9.4% in 2011.[83,84] This reduction was also observed with forceps-assisted births, where episiotomy use declined by 72%, whereas it increased by 37% with vacuum-assisted births[83] However, the incidence of OASI following assisted vaginal birth increased from 7.7% in 1979 to 15.3% in 2004.[83] Although the use of episiotomy declined in this time period, the rise in OASI incidence may have been because of a number of additional factors.

With regard to assisted vaginal births, 3 meta-analyses evaluated the effect of mediolateral and lateral episiotomy on OASI incidence.[85−87] The most up-to-date meta-analyses performed by Okeahialam et al[87] studied the use of mediolateral and lateral episiotomy with vacuum and forceps deliveries on the basis of a sample of 703,977 women, as shown in Table 4. Figure 8 shows the findings from the pooled estimates from the meta-analysis for vacuum deliveries.[87] We found that in nulliparous women there was a significant reduction in the rate of OASI of 49% when a mediolateral or lateral episiotomy was performed with a vacuum-assisted birth. This equated to a number needed to treat to prevent 1 additional OASI of 28 women. With forceps deliveries in nulliparous women, we demonstrated that there was a significant reduction in the rate of OASI of 68% when a mediolateral or lateral episiotomy was performed (Figure 9). This finding was associated with a number needed to treat of 8 women to prevent 1 additional OASI. However, with multiparous women, although a reduction was also observed with forceps and vacuum-assisted births, this was not significant. It is important to note that all 3 meta-analyses included non-randomized studies, with the presence of significant heterogeneity and a high risk of bias across studies, and therefore their results should be interpreted with caution. To address this, Okeahialam et al[87] performed sensitivity analyses by removing high-to-critical−bias studies to assess methodological heterogeneity. They found that there was no significant

TABLE 4
A comparison of the 3 meta-analyses evaluating incidence of obstetrical anal sphincter injury with mediolateral or lateral episiotomy and assisted vaginal birth

Author (number of studies)	Instrument	Parity	OR (95% CI)	NNT
Okeahialam et al,[87] 2022 (n=31)	Forceps	Nulliparous	0.32 (0.22−0.46)[a]	8
		Multiparous	0.48 (0.18−1.25)	n/a
	Vacuum	Nulliparous	0.51 (0.35−0.73)[a]	28
		Multiparous	0.58 (0.26−1.27)	n/a
Lund et al,[86] 2016 (n=15)	Vacuum	Nulliparous	0.53 (0.47−0.77)[a]	18
Sagi-Dain et al,[85] 2015 (n=15)	Vacuum	Nulliparous	0.68 (0.43−1.07)	n/a
		Multiparous	1.27 (1.05−1.53)[a]	n/a

CI, confidence interval; *n/a*, not applicable; *NNT*, number needed to treat; *OR*, odds ratio.

[a] Significant findings.

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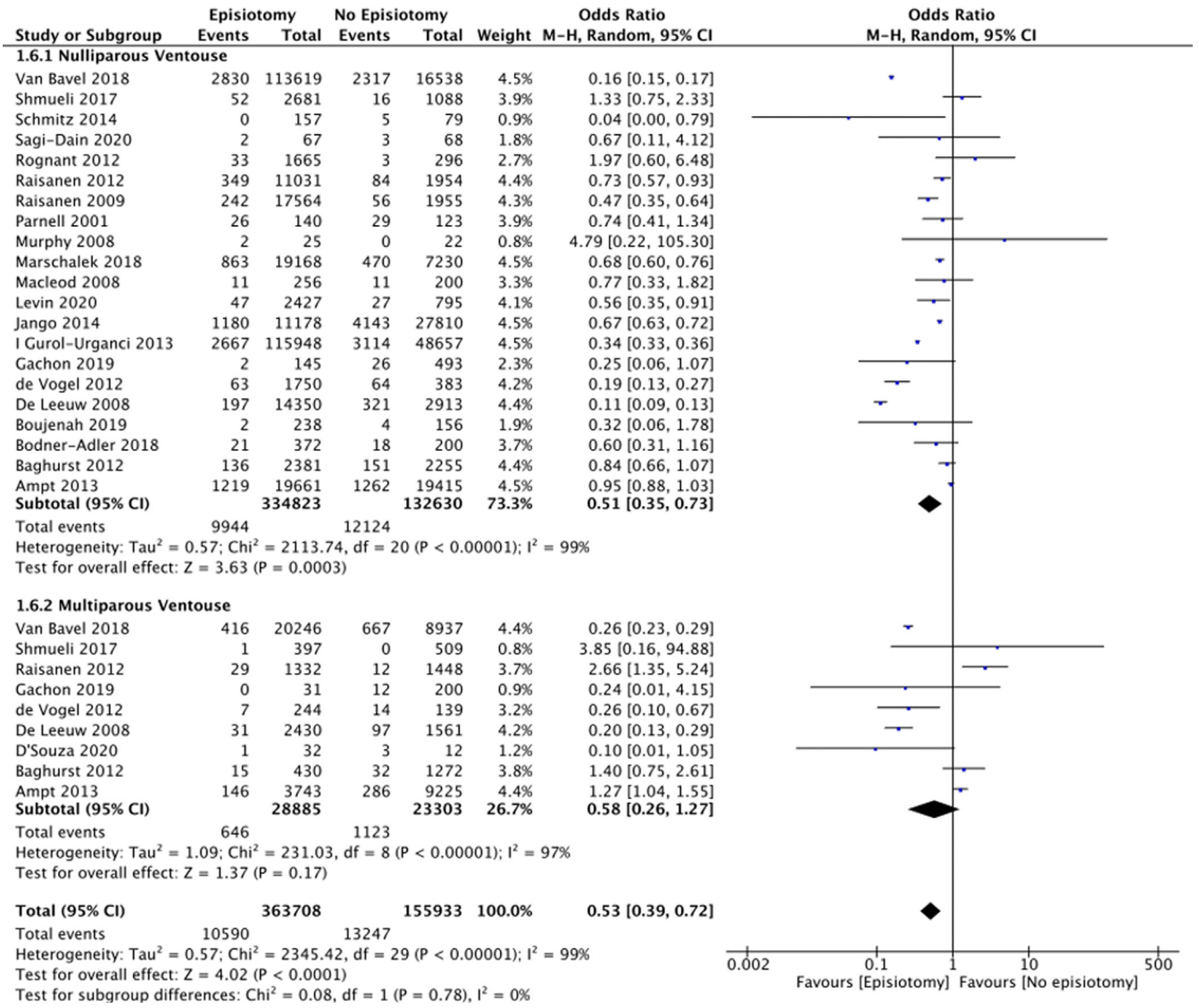
FIGURE 8

OASI incidence with mediolateral or lateral episiotomy and vacuum-assisted births in nulliparous and multiparous women



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OASI, obstetrical anal sphincter injury.

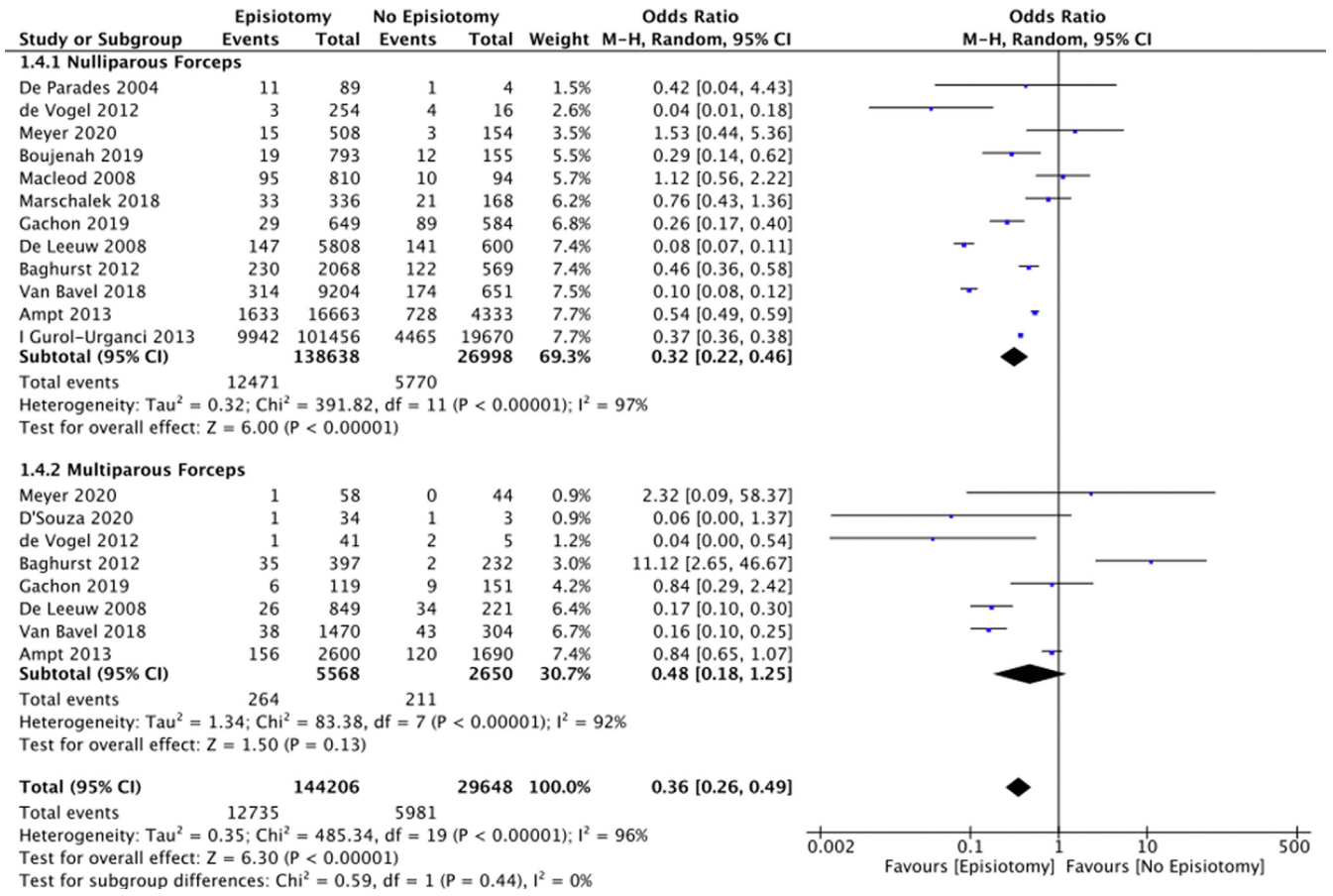
Okeahialam. The prevention of perineal trauma during vaginal birth. Am J Obstet Gynecol 2022.

difference between the studies of low to moderate risk of bias and those of high to critical risk of bias.[87] However, it is clear that larger, higher-quality studies are required to provide concise evidence-based data to inform future policy. Nevertheless, performing a RCT with episiotomy as the intervention may prove difficult because the decision to perform is based on clinical judgment.[88]

Quality improvement initiatives

There is a growing body of evidence from the United Kingdom, Norway, and Denmark that the implementation of quality improvement initiatives including the training of clinicians in manual perineal protection and mediolateral episiotomy can reduce the incidence of OASI.[89–91] For example, in 2018 the Royal College of Obstetricians and Gynaecologists and the Royal College of Midwives supported the implementation and evaluation of the OASI Care Bundle project in 16 maternity units across the United Kingdom. Figure 10 describes the 4 elements of this project, which include antenatal education, manual perineal protection and mediolateral episiotomy if clinically indicated, and systemic per vaginal and rectal examination to assess for anal sphincter injury. The implementation of

FIGURE 9
OASI incidence with mediolateral or lateral episiotomy and forceps-assisted births in nulliparous and multiparous women



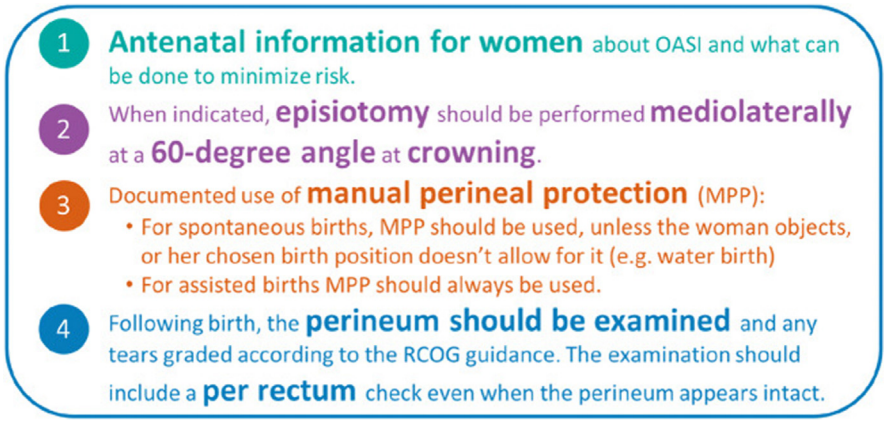
Reproduced with permission from Okeahialam et al.[87]

OASI, obstetrical anal sphincter injury.

Okeahialam. The prevention of perineal trauma during vaginal birth. Am J Obstet Gynecol 2022.

this initiative was found to significantly reduce the risk of OASI by 20% (aOR, 0.80; 95% CI, 0.65−0.98), with no effect on cesarean delivery or episiotomy rates. Potential confounding factors accounted for the included time period and risk factors including age, ethnicity, body mass index, parity, birthweight, and mode of birth.[91] Other perineal care bundles have been implemented following this, including the Women's Health Care Australasia Clinical Excellence Commission perineal care bundle in Australia, which also advocates for the use of warm perineal compress.[92] The self-reported experiences of women during the application of perineal care bundles in labor were encouraging. Women reported that they felt supported and empowered, particularly when clinicians communicated well. Furthermore, most women did not have a negative experience with manual perineal protection or mediolateral episiotomy.[93] It is also important for clinicians to feel empowered to advocate for a change in clinical practice. The STOMP (Stop Traumatic OASI Morbidity Project) quality improvement project in the United Kingdom aimed to reduce OASI incidence by promoting the slowing down of the delivery of the vertex and shoulders by encouraging women to stop pushing during crowning, by applying 1 hand to manually control delivery speed, and by encouraging birthing positions other than the semirecumbent position, particularly the upright position. They recruited clinical champions who routinely engaged with staff to improve motivation. Women-centered care is of utmost importance, and clinicians felt encouraged to engage and reduce the risk of OASI when informed about the potential long-term implications.[94] There is great scope for the implementation of care bundles that encompass different preventative measures to reduce the rate of OASI. However, it is important that this be implemented and sustained effectively. To evaluate the feasibility of this, the OASI2, a randomized hybrid

FIGURE 10
Elements of the OASI Care Bundle



Reproduced, with permission, from Gurol-Urganci et al.[91]

OASI, obstetrical anal sphincter injury.

Okeahialam. The prevention of perineal trauma during vaginal birth. Am J Obstet Gynecol 2022.

effectiveness implementation trial, is being performed.[95]

In conclusion, the prevention of perineal trauma and its sequelae, including perineal pain, dyspareunia, pelvic organ prolapse, and incontinence, is an important outcome for women. Appreciation of the modifiable and nonmodifiable risk factors in the antepartum and intrapartum period is important because it allows clinicians to appropriately counsel women at risk and modify obstetrical care. The application of quality improvement initiatives in maternity services to prevent perineal trauma holds great potential to effectively reduce the incidence of severe perineal trauma. Research should continue to expand on the strengths and applications of these interventions to allow a global consensus with regard to the prevention of perineal trauma within maternity services. ■

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