DOI 10.1515/jpm-2013-0269 — J. Perinat. Med. 2014; 42(6): 761–767

Veluppillai Vathanan*, Oliparambil Ashokkumar and Trixie McAree

Obstetric anal sphincter injury risk reduction: a retrospective observational analysis

Abstract

Objective: To identify the risks of sustaining obstetric anal sphincter injury (OASI) during childbirth.

Methods: Data were analysed from 12,612 vaginal deliveries recorded at Northwick Park District General Hospital, London, from 1 January 2006 to 30 November 2009.

Results: A total of 85.6% were spontaneous deliveries and 14.2% were instrument deliveries. The majority (64.5%) sustained some form of perineal damage, 3.7% being OASI. Logistic regression analyses revealed the risk factors for OASI to be Asian ethnicity [odds ratio (OR) 4.798, 95% confidence interval (CI) 2.998–7.679], a maternal age of >40 years (OR 2.722, 95% CI 1.315–5.636), higher foetal birth weight (>4500 g; OR 6.228, 95% CI 2.695–14.392), lower parity (para 0; OR 16.803, 95% CI 7.697–36.685), and instrumental delivery. Forceps delivery posed the greatest risk (OR 8.4, 95% CI 5.822–12.151). Not having an episiotomy increased the risk of OASI by five times compared with having one.

Conclusions: Risk factors for OASI include maternal age >40 years, higher foetal birth weight, lower parity, instrumental delivery, and Asian ethnicity. Mediolateral episiotomy appears to reduce the risk of OASI. Specific variables have been identified for incorporation into a risk-reduction strategy that could be introduced antenatally to evaluate and assess OASI risk.

Keywords: Episiotomy; instrumental delivery; obstetric anal sphincter injury; perineal trauma.

***Corresponding author: Veluppillai Vathanan,** MRCOG, Department of Obstetrics and Gynaecology, Northwick Park Hospital, Watford Road, Harrow, HA1 3UJ, London, UK, Tel.: +44 0787 6024485, E-mail: vathananv@gmail.com

Veluppillai Vathanan: North West London Hospitals NHS Trust, Watford Road, Harrow, HA1 3UJ, London, UK

Oliparambil Ashokkumar and Trixie McAree: North West London Hospitals NHS Trust, Watford Road, Harrow, HA1 3UJ, London, UK

Introduction

Around 85% of mothers sustain a perineal tear as a consequence of vaginal child birth [1]. Obstetric anal sphincter injury (OASI) occurs from third- or fourth-degree perineal tears [9, 24]. It can sometimes lead to serious, unpleasant complications like faecal incontinence symptoms. Symptoms can range from faecal urgency to gross passive or urge faecal incontinence [17]. They are also more likely to develop stress urinary incontinence later [23]. Despite primary repair, up to 60% of mothers can develop symptoms of faecal incontinence following anal sphincter injury [18, 24]. Anal incontinence affects approximately 40,000 of mothers in the UK each year, with OASI being a primary cause of this [8].

There is a wide variation in the reported incidence of OASI in the literature [5]. While the Royal College of Obstetrician and Gynaecologists green top guideline states that the overall risk is around 1% following all vaginal deliveries [22], a systematic review showed that the true incidence is likely to be around 11% [5]. Risk also varies with different delivering techniques. An intervention programme showed a reduction in the incidence of OASI due to interventions at the time of delivery [11]. It is claimed that OASI occurs in 0.6%–9% of vaginal deliveries where mediolateral episiotomy is performed [25].

Studies have shown increased incidence in OASI over the years [19, 20]. This could partly be due to increased detection of OASI due to improved awareness and training and to the introduction of imaging techniques [22]. However, some studies argue that this is due to change in obstetric practices over the years [16, 17]. At the same time, there are some intervention studies that showed a reduction in OASI incidence. An intervention programme (with manual assistance during the final part of the second stage of labour) in Norway showed a significant decrease in the incidence of OASI, from 4.5% to 1.2%, during the study period [11]. OASI and its associated morbidity pose both psychological and physical implications, severely impacting quality of life [15]. Along with the high cumulative costs of treating OASI [7], the impact of OASI on women's physical, psychological, and social quality of life cannot be underestimated. Therefore there is a clear need

to identify the risk factors for OASI. This would facilitate the development of risk reduction strategies to prevent them.

Design and methodology

A retrospective observational study was conducted at Northwick Park District General Hospital (DGH), London, which has a delivery rate of 5000–5500 per annum and serves a multi-ethnic population. Departmental Audit committee approval was obtained for the audit. Pregnancy and delivery details were collected on all vaginal deliveries from 1 January 2006 to 30 November 2009, including age; parity; ethnicity; labour details; mode of delivery [normal vs. instrumental (forceps – low and outlet; ventouse – Kiwi, metal, and silastic cups); foetal birth weight; episiotomy; and incidence of perineal tears, as classified using the RCOG criteria [22]. Perineal tears were classified by the attending clinician (specialist registrar, staff grade, or consultant) who was trained in assessing and repairing OASI. Women were excluded if there was incomplete data entry or the birth weight was less than 500 g.

Data analysis

A logistic regression forward stepwise model was performed with SPSS version 18 (SPSS Inc., Chicago, IL, USA). Univariate and multivariate analyses and adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to assess the significance of individual variables on causing OASI. Where variables were found to be significantly associated with OASI, a number-needed-to-treat (NNT) calculation was performed.

Results

Of 14,105 vaginal deliveries during this time, 12,612 cases were included for analysis (see Figure 1). All deliveries were conducted by consultants, trained doctors, doctors in training (specialist registrar), trained midwife, or midwife in training supervised by a qualified midwife. All instrumental deliveries were conducted by doctors. Episiotomy, if performed, was by the mediolateral method. There was no recommended practice with regard to hands-on or hands-off approach in the department. Fundal pressure during delivery was not practised and was discouraged. However, these details were not documented to analyse the outcome. The effect of occipito-posterior position, prolonged second stage, epidural analgesia, and induction of labour was not analysed owing to unavailable or incomplete data or to the small numbers of complete entries.

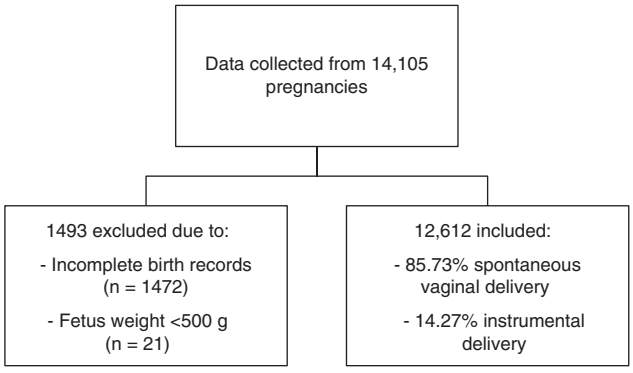

Figure 1 Data collection.

A total of 85.73% of mothers delivered spontaneously vaginally and 14.27% delivered instrumentally. Caesarean section rate during this period was 26.14%. A total of 3.7% of women sustained OASI (Table 1). Perineal outcome for the deliveries is shown in Figure 2. The majority (64.5%) sustained some degree of perineal damage, 41.4% of which were only first- or second-degree tears. An episiotomy was performed in 22.2% of cases, and it was found that 0.9% sustained OASI despite having episiotomy.

Results of the multivariate logistic regression model with OR and 95% CIs for each variable are shown in Table 2.

Demographics

OASI rates were lower among Black African and Caribbean women (1.5%). Incidence was also low (2%) in Caucasian mothers, whereas it was increasing for mothers of Oriental ethnicity 3.29% (Table 3). Incidence was highest among Asian mothers, reaching 4.52%; Asian ethnicity was associated with the highest odds of OASI (OR 4.798, 95% CI 2.998–7.679) (Table 2).

A maternal age of >40 years was associated with the highest odds of OASI in the maternal age group (OR 2.722, 95% CI 1.315–5.636). Higher foetal birth weight (>4500 g; OR 6.228, 95% CI 2.695–14.392) and lower parity were also associated with increased odds of OASI (para 0; OR 16.803, 95% CI 7.697–36.685).

Gestational age at delivery, BMI of the mother, and sex of the baby were not significantly associated with

Table 1 Pregnancy and delivery characteristics.

	Number	Percentage
1		
Mode of delivery		
Spontaneous vaginal	10,794	85.59
Ventouse	1340	10.62
Forceps	460	3.65
Breech	18	0.14
2		
OASI		
No tear	12,149	96.33
Tear	463	3.67
3		
Birth weight (g)		
501–1499	110	0.87
1500–2499	679	5.38
2500–3499	7943	62.98
3500–4499	3781	29.98
>4500	99	0.78
4		
Gestational age		
<36+6	594	4.71
37–39+6	5397	42.79
40–42	6590	52.25
>42	31	0.25
5		
Sex		
Male	6267	49.69
Female	6345	50.31
6		
BMI		
<18.4	570	4.52
18.4–24.9	6042	47.91
25–30	4475	35.48
30.1–34.9	974	7.72
35–40	439	3.48
>40	112	0.89
7		
Age group		
<20	584	4.63
20–24	2709	21.48
25–29	4261	33.79
30–34	3199	25.36
35–39	1544	12.24
>40	315	2.5
8		
Ethnicity		
White British	1314	10.42
African	1203	9.54
Asian	5184	41.1
Black Caribbean	566	4.49
Black other	510	4.04
Mediterranean	71	0.56
Oriental	214	1.7
White other	2289	18.15
Mixed	177	1.4
Any other	896	7.1
Not stated	188	1.49
9		
Parity		
0	5773	45.77
1	1303	10.33
2	3862	30.62
>2	1597	12.66
Not stated	77	0.61

OASI on multivariate analysis; however, pre-term delivery was associated with lower OASI, possibly due to low birth weight of the babies.

Mode of delivery

Perineal outcome was associated with mode of delivery (Table 4): 59.5% of normal vaginal delivery (NVD) consisted of some degree of perineal trauma, even with episiotomy. A mediolateral episiotomy was associated with 0.21 times the odds (95% CI 0.16–0.29) of OASI when compared with deliveries with no episiotomy; not having an episiotomy increased the risk of OASI by five times compared with having an episiotomy. Incidence of perineal trauma was increased in ventouse (94.6%) and forceps deliveries (98.1%). A total of 2.8% of NVD, 6.8% of ventouse, and 16.1% of forceps deliveries sustained OASI. OASI incidence was slightly higher for low forceps (16.9%) than for outlet forceps (16%). At the same time, we did not find any difference in the OASI incidence between Kiwi cup delivery and other ventouse deliveries (silastic and metal cup). Overall episiotomy rate was 22.2% (NVD 12.9%, ventouse 76.3%, forceps 85.7%). Instrumental delivery was associated with increased odds of OASI, with increased risk being greatest for forceps delivery (OR 8.4, 95% CI 5.822–12.151).

Number needed to treat (Table 5)

Instrumental deliveries increase the risk of OASI. However, a total of 29 ventouse deliveries need to be avoided to prevent one OASI, compared to only eight forceps deliveries. Episiotomy seems to protect perineum from OASI. Without episiotomy, OASI occurs in every 15 vaginal deliveries (both spontaneous and instrumental). However, in the episiotomy group, OASI occurred

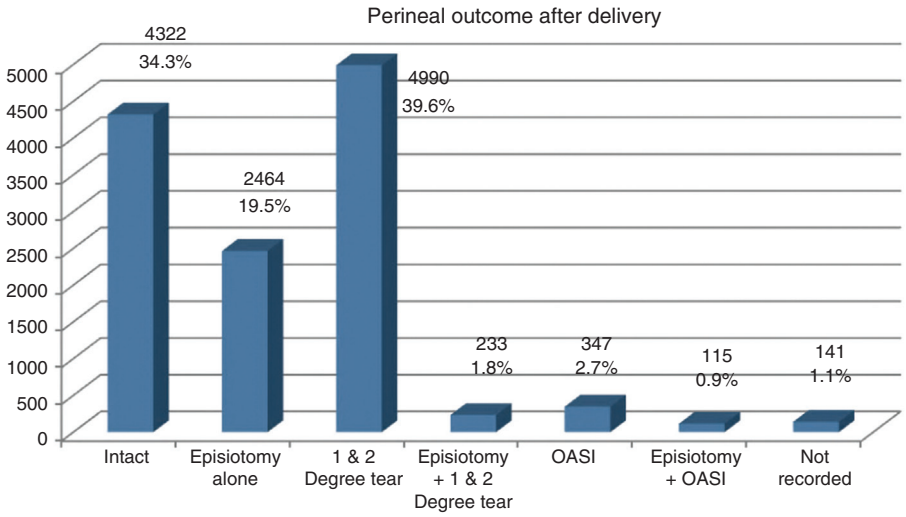

Figure 2 Perineal outcome of the deliveries.

in only every 187 vaginal deliveries. Higher birth weight was associated with OASI. Six vaginal deliveries of birth weight of >5 kg need to be avoided to prevent one OASI due to high birth weight. Asian ethnicity carries more risk for OASI. Twenty-four caesarean sections are needed to prevent 1 OASI in Asian women.

Table 2 Multivariate logistic regression (forward stepwise method).

Variable	OR	P-value	95%	CI
Mode of delivery (compared to spontaneous vaginal)				
Ventouse	3.1327	0	2.3304	4.2113
Forceps	8.411	0	5.8219	12.151
Episiotomy				
Episiotomy	0.2147	0	0.1599	0.2881
Birth weight, g (compared to 2500–3499 g)				
<1499	0.000	0.996		
1500–2499	0.510	0.011	0.304	0.856
3500–4499	2.102	0.000	1.695	2.608
≥4500	6.228	0.000	2.695	14.392
Age of the mother, years (compared to 25–29 years)				
<20	0.495	0.029	0.263	0.932
20–24	0.818	0.126	0.631	1.059
30–34	1.298	0.037	1.015	1.659
35–39	1.026	0.903	0.677	1.554
>40	2.722	0.007	1.315	5.636
Ethnicity of mother (compared to White British)				
White other	1.215	0.469	0.717	2.061
Black Caribbean	0.612	0.377	0.206	1.816
Black African	1.543	0.187	0.810	2.936
Black other	2.620	0.016	1.197	5.736
Asian	4.798	0.000	2.998	7.679
Mixed	0.406	0.382	0.054	3.067
Mediterranean	0.802	0.832	0.105	6.150
Oriental	1.913	0.151	0.788	4.641
Any other	2.094	0.20	1.124	3.904
Parity (compared to P3 or more)				
P0	16.803	0.000	7.697	36.685
P1	4.859	0.000	2.200	10.732
P2	1.209	0.704	0.455	3.213

Table 3 Perineal outcome compared with ethnicity.

Ethnicity	Intact perineum	Episiotomy	First- and second-degree tear	EPI+first-- and second-degree tear	OASI	Episiotomy+OASI	
Caucasian	n=1338	748	1351	54	55	18	
	37.54%	20.99%	37.90%	1.51%	1.54%	0.50%	
Black (African	n=1091	286	808	29	28	5	
and Caribbean)	48.55%	12.73%	35.96%	1.29%	1.25%	0.22%	
Asian	n=1236	1191	2264	125	232	84	
	24.08%	23.21%	44.11%	2.43%	4.52%	1.64%	
Oriental	N=53	43	103	6	7	1	
	24.88%	20.19%	48.36%	2.82%	3.29%	0.47%	
Others	n=515	153	354	12	18	5	
	48.72%	14.47%	33.49%	1.13%	1.70%	0.47%	
Not recorded	n=65	29	78	7	7	1	0
	34.76%	15.51%	41.75	3.74%	3.74%	0.53%	

Table 4 Perineal outcome in numbers and percentages compared with mode of delivery.

Intact	Episiotomy	First- and second-degree tear	Episiotomy+first- and second-degree tear	OASI	Episiotomy+OASI
NVD					
n=4249	1208	4775	141	259	38
39.%	11.32%	44.75%	1.32%	2.4%	0.35%
Ventouse					
n=63	924	195	57	50	41
4.8%	71.68%	15.13%	4.42%	3.8%	3.18%
Forceps					
n=2	323	19	35	38	36
0.4%	71.3%	4.19%	7.72%	8.3%	7.94%
Breech					
n=8	9	2	0	0	0
42%	47.37%	10.52%	0.00%	0.0%	0.00%

Discussion

This study is one of the largest studies examining perineal outcome after vaginal childbirth. A logistic regression model with multivariate analysis facilitates the identification of variables associated with OASI. To our knowledge, this is the first and largest study to determine the number needed to prevent OASI with regard to risk factors. This provides a simple and meaningful interpretation of risk associated with each variable to help clinicians and women to make informed choices regarding intervention during delivery.

Table 5 Number needed to prevent OASI.

Category	Number needed to prevent OASI
Ventouse	28.64
Forceps	7.89
>3.5 kg	97.47
>4.5 kg	29.1
>5 kg	6.07
Asian	24.29

Data from our study support previous findings within the literature, including the incidence rates of OASI [16, 20] and the finding that forceps delivery tends to cause more perineal trauma than ventouse [3, 6, 20]. Johanson and Menon [14] showed ventouse to be associated with higher risk of failed instrumental delivery compared to forceps. Despite this, ventouse has not shown to be associated with more caesarean sections than forceps delivery [14, 21]. Even though failure rate is high with ventouse, the need for caesarean section remains the same. Our study shows that forceps delivery increased the risk

of OASI by 2.3 times compared to ventouse. In this study, every 6th forceps and every 14th ventouse delivery caused OASI; therefore we recommend ventouse as the preferred option for instrumental delivery to reduce the risk of maternal perineal trauma, unless there are contraindications for its use.

A number of risk factors for OASI were identified, including increased birth weight, which was an independent risk factor. Where babies weigh >4.5 kg, 29 caesarean sections are needed to prevent 1 OASI. In contrast, only 6 caesarean sections are required to prevent 1 OASI when birth weight is >5 kg. Therefore, elective caesareans may be justified where estimated birth weight exceeds 5 kg. In contrast, >14% error rate has been noted in the assessment of pre-delivery foetal weight estimation by ultrasound [6] and, therefore, caution is advised when deciding the mode of delivery based on ultrasound for pre-delivery estimation of foetal weight.

There is conflicting evidence regarding the role of episiotomy and OASI [20]. Carroli and Belizan [2] concluded that there was no significant difference in severe perineal trauma between the restrictive group and the routine episiotomy group. However, other larger studies [4, 20] showed the protective effect of mediolateral episiotomy on perineal trauma. Our study also confirmed that mediolateral episiotomy reduces the risk of OASI. It is recommended to conduct a randomised controlled study on the effect of episiotomy on OASI to clarify this situation. It is, however, recommended that episiotomy be considered for women with multiple risk factors for OASI. These risk factors, according to this study, include an estimated foetal weight of >4.5 kg, instrumental delivery (particularly with forceps), primiparity, and Asian ethnicity.

One of the interesting findings of the study was the association between Asian ethnicity and OASI. The odds of Asian women sustaining an OASI is 4.8 compared to White British women. Some other studies [10, 12, 13] have also shown ethnic differences in perineal trauma. One study [12] showed that Filipino and other Asian women were at slightly increased risk of vaginal lacerations and that Filipino and Chinese women were at greatest risk for third- and four-degree perineal tear, possibly due to perineal anatomic variations. This raises the argument as to whether ethnicity should be taken into account when planning the mode of delivery, especially in women with other risk factors for OASI. However, until a causal association is proven by randomised trials, it is unwise to recommend that interventions should be based on ethnicity alone. However, Asian ethnicity should be considered as a risk factor for OASI when deciding on delivery options.

The primary limitation of this study is the design. A retrospective observational study does not provide level 1 evidence, which is deemed to provide the highest evidence. As the study was conducted in a single suburban DGH, the findings should be interpreted with caution, especially when being generalised to a different ethnic mix. Furthermore, other known risk factors for OASI were beyond the scope of this study, including occipito-posterior position, prolonged second stage, epidural analgesia, induction of labour, type of perineal support, and type of episiotomy [22].

Conclusion

Despite any limitations, as this study is one of the largest studies of its kind, the findings offer huge potential for facilitating interventions to reduce OASI risk. Indeed, specific variables have been identified for incorporation into a risk-reduction strategy. A scoring system that includes risk factors including ethnicity could be introduced antenatally to evaluate and assess risk. Scores could then be used to help women and practitioners make informed decisions on the mode of delivery and possible labour interventions.

A multicentre randomised controlled trial involving these specific variables is advisable before implementing this into wider practice.

Acknowledgements: We are grateful to Mr Spence Jones, FRCOG, consultant obstetrician and gynaecologist, for his valuable comments on the manuscript. We are also grateful to Ms Elizabeth Wiredu, medical statistician, Data Solutions, for her input into the statistical analysis.

Conflict of interest statement

Authors' conflict of interest disclosure: None.
Contribution to authorship: VV contributed to the conception, planning, carrying out, analysing, and writing up of this study. OA provided expert advice, writing up, and critical revision of the manuscript. TM identified, extracted the data for analysis, and critically revised the manuscript. All authors reviewed and approved the final version.
Funding: None.

Received October 2, 2013. Accepted March 6, 2014. Previously published online April 1, 2014.

References

[1] Bick DE, Kettle C, Macdonald S, Thomas PW, Hills RK, Ismail KMK. PErineal Assessment and Repair Longitudinal Study (PEARLS): protocol for a matched pair cluster trial. BMC Pregnancy Childbirth 2010;10:10.

[2] Carroli G, Belizan J. Episiotomy for vaginal birth. Cochrane Database Syst Rev. 2009;CD000081.

[3] Christiansen LM, Bovbjerg VE, McDavitt EC, Hullfish KL. Risk factors for perineal injury during delivery. Am J Obstet Gynecol. 2003;189:255–60.

[4] de Leeuw JW, Struijk PC, Vierhout ME, Wallenburg HC. Risk factors for third degree perineal ruptures during delivery. BJOG 2001;108:383–7.

[5] Dudding TC, Vaizey CJ, Kamm MA. Obstetric anal sphincter injury incidence, risk factors, and management. Ann Surg. 2008;247:224–37.

[6] Dudley NJ. A systematic review of the ultrasound estimation of fetal weight. Ultrasound Obst Gynecol. 2005;25:80–89.

[7] Fernando RJ, Sultan AH, Kettle C, Thakar R, Radley S. Methods of repair for obstetric anal sphincter injury (review). Cochrane Database of Systematic Reviews. 2006;19:1–29.

[8] Fernando RJ, Sultan AH, Radley S, Jones PW, Johanson RB. Management of obstetric anal sphincter injury: a systematic review & national practice survey. BMC Health Serv Res. 2002;2:1–10.

[9] Fowler GE. Obstetric anal sphincter injury. J Assoc Chart Physiother Womens Health 2009;104:12–9.

[10] Goldberg J, Hyslop T, Tolosa JE, Sultana C. Racial differences in severe perineal lacerations after vaginal delivery. Am J Obstet Gynecol. 2003;188:1063–7.

[11] Hals E, Oian P, Pirhonen T, Gissler M, Hjelle S, Nilsen EB, et al. A multicenter interventional program to reduce the incidence of anal sphincter tears. Obstet Gynecol. 2010;116:901–8.

[12] Hopkins LM, Caughey AB, Glidden DV, Laros RK. Racial/ethnic differences in perineal, vaginal and cervical lacerations. Am J Obstet Gynecol. 2005;193:455–9.

[13] Howard D, Davies PS, Delancey JO, Small Y. Differences in perineal lacerations in black and white primiparas. Obstet Gynecol. 2000;96:622–4.

[14] Johanson RB, Menon V. Vacuum extraction versus forceps for assisted vaginal delivery. Cochrane Database Syst Rev. 1999;CD000224.

[15] Kumar R, Ooi C, Nicoll A. Anal incontinence and quality of life following obstetric anal sphincter injury. Arch Gynecol. 2012;285:591–7.

[16] Laine K, Gissler M, Pirhonen J. Changing incidence of anal sphincter tears in four Nordic countries through the last decades. Eur J Obst Gynec Reprod Biol. 2009;146:71–5.

[17] Nazir M, Carlsen E, Nesheim BI. Do occult anal sphincter injuries, vector volume manometry and delivery variables have any predictive value for bowel symptoms after first time vaginal delivery without third and fourth degree rupture? A prospective study. Acta Obstet Gynecol Scand. 2002; 81:720–6.

[18] Pinta TM, Kylanpaa ML, Salmi TK, Teramo KA, Luukkonen PS. Primary sphincter repair: are the results of the operation good enough? Dis. Colon Rectum. 2004;47:18–23.

[19] Räisänen S, Vehviläinen-Julkunen K, Gissler M, Heinonen S. The increased incidence of obstetric anal sphincter rupture – An emerging trend in Finland. Prev Med. 2009;49: 535–40.

[20] Revicky V, Nirmal D, Mukhopadhyay S, Morris EP, Nieto JJ. Could a mediolateral episiotomy prevent obstetric anal sphincter injury? Eur J Obst Gynecol Reprod Biol. 2010;150:142–6.

[21] Royal College of Obstetrics and Gynaecology, RCOG. Operative vaginal delivery. Green Top Guideline No. 26. Jan 2011.

[22] Royal College of Obstetrics and Gynaecology, RCOG. The management of third and fourth degree perineal tears. Green Top Guideline No. 29. 2007.

[23] Scheer I, Andrews V, Thakar R, Sultan A H. Urinary incontinence after obstetric anal sphincter injuries (OASIS)—is there a relationship? Int Urogynecol J. 2008;19:179–83.

[24] Sultan AH, Kamm MA, Hudson CN, Bartram CI. Third degree obstetric anal sphincter tears: risk factors and outcome of primary repair. Br Med J. 1994;308:887–91.

[25] Thacker SB, Banta HD. Benefits and risks of episiotomy: an interpretative review of the English language literature, 1860–1980. Obstet Gynaecol Surv. 1983;38:322–38.

The authors stated that there are no conflicts of interest regarding the publication of this article.