



Revisiting the risk factors associated with obstetric anal sphincter injuries

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Abstract

Objective: Revisiting the risk factors associated with obstetric anal sphincter injuries (OASI) and their influence on the mode of delivery, whether spontaneous vaginal delivery (SVD) or operative vaginal delivery, and severity of tears.

Method: Retrospective audit, examining all cases of OASI over a six-month period. Power calculation confirmed adequacy of numbers for all analyses. Data were analysed by non-parametric tests.

Results: The total number of vaginal births was 1504, of which 40 had third degree tears (2.65%) with no fourth degree tears.

None of the women who had SVD (n=28) was given an episiotomy, but all those who had instrumental delivery were given a right medio-lateral episiotomy.

Maternal age did not influence the mode of delivery (p=0.8) or tear severity (p=0.8). The fetal weight (FW) did not influence the mode of delivery (p=0.56) nor did the BMI (p=0.1).

The parity and mode of delivery had no effect on the severity of the tears (p=0.13) nor did the mode of labour initiation (p=0.2). The first stage length did not affect the mode of delivery (p=0.5). The length of second stage did not affect the OASI extent (p=0.41).

Conclusions: Most OASI were in primiparous and in SVD. Maternal age, BMI, FW and first stage length did not affect the mode of delivery. Prolonged second stage increased the risks of instrumental delivery and of worsening OASI degree.

None of the women with SVD had an episiotomy. Furthermore, there was no documentation of the maternal position during SVD or if 'hands on' technique was applied.

Keywords: Obstetric anal sphincter injuries, OASI, incontinence, pelvic floor

Introduction

Third- and fourth-degree tears are injuries which can occur to the perineum during vaginal birth. A third degree tear extends through the anal sphincter muscle complex (1-3). A fourth degree tear extends into the rectal mucosa [1]. Together they are often known as OASIS (Obstetric Anal Sphincter Injuries) [1]. Incidence of such tears appears to be rising with 5.9% of first pregnancies affected in England and Wales in 2012 [2]. Both third and fourth degree tears can cause distressing symptoms such as faecal incontinence [1,3-6] and sexual dysfunction [4-7].

Childbirth following such a tear risks worsening symptoms [3,5,6] and repeat OASIS injury in a subsequent pregnancy [8-10].

Several factors have been identified to increase the risk of OASI, like maternal parity, age and BMI, the length of first or second stage of labour and the method of delivery [11]. Nevertheless, there have been multiple controversies in literature regarding the strength of association of some of these risk factors and the incidence of OASI [2,8,12-15].

This observational study is to revisit the risk factors associated with obstetric anal sphincter injuries (OASI) and their influence

on the mode of delivery, whether spontaneous vaginal delivery (SVD) or operative vaginal delivery (OVD), and severity of tears.

Methods

A retrospective audit, with an ethical exemption, examining all cases of OASI over the six-month period from January the 1st to June the 30th of 2018. The setting was a district general hospital with more than 3500 deliveries per annum. All the OASI were diagnosed by either experienced residents or senior physicians. Data were obtained from the medical notes and Medway Maternity System.

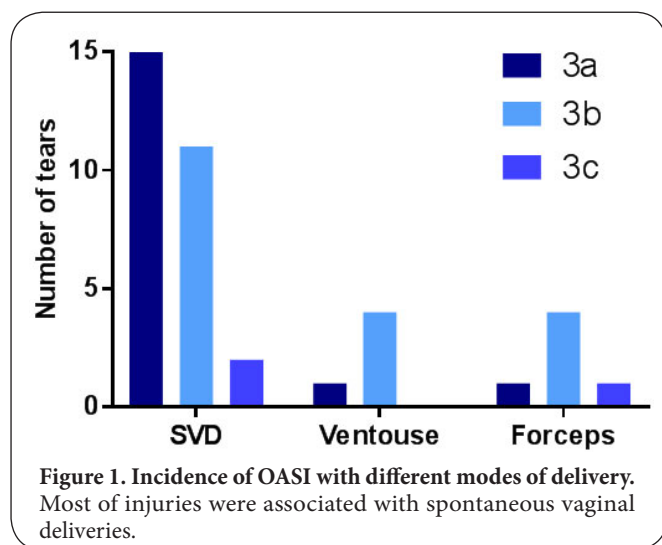
The statistical analyses were performed with Prism 7 software (GraphPad, San Diego, CA, USA). The data were analysed by non-parametric tests, and further post-hoc power/size calculations confirmed adequacy of numbers for all analyses.

As the data were of skewed distribution they were subjected to logarithmic transformation aiming for more articulate results [16]. However, as the results were of similar significance, the authors opted for the non-parametric analyses.

Results

The total number of vaginal births in that six-month period was 1504, of which 40 had third degree tears (2.65%). 18 women had 3a, 19 3b and 3 3c tears. There were no fourth degree tears. 28 women had spontaneous vaginal delivery (SVD), 6 had forceps and 6 ventouse deliveries (Figure 1). 26 women were primiparous, 10 had one previous SVD and four had two or more SVD.

None of the women who had SVD were given an episiotomy, but all 12 women who had OVD were given a right medio-lateral episiotomy.



The mean age was 30 years and it did not influence the mode of delivery (OVDvs SVD; Mann-Whitney test, $p=0.8$) or severity of tear ((3a vs 3b vs 3c; Kruskal-Wallis test, $p=0.8$).

The fetal weight did not influence the mode of delivery (OVDvs SVD, $p=0.56$). The mean BW were 3444gr, 3728, and 3423, in the groups of SVD, forceps and ventouse deliveries respectively and did not show significant difference among these groups (Kruskal-Wallis test, $p=0.17$).

The mean BMI was 25 with that of 21 women being from 20 to 25. The BMI did not affect the mode of delivery (OVDvs SVD; $p=0.1$) or the degree of tear (3a vs 3b vs 3c; Kruskal-Wallis test, $p=0.2$). Parity had no effect on the mode of delivery (Chi-square, $p=0.13$) 24 women had a spontaneous labour and 16 had induction of labour (IOL). The mode of initiation of labour (spontaneous or IOL) did not have an effect on the severity of the tears (Chi-square, $p=0.2$). Four women had epidural analgesia, 2 of them had OVD and 2 SVD (Fisher's exact test, $p=0.5$).

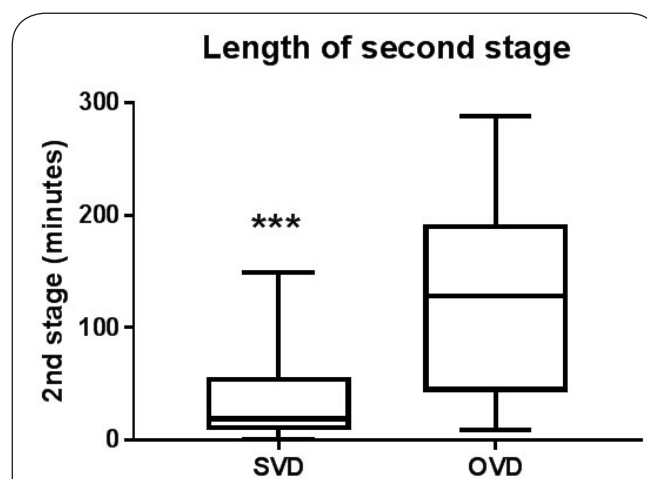
The length of the first and second stages were calculated in minutes. The length of the first stage did not affect the mode of delivery ($p=0.5$) even though it was longer in women who had OVD (SVD: Mean \pm SD 167.6 \pm 21.91, $n=25$; OVD: 316.1 \pm 134.8, $n=8$).

Women who had a SVD had a significant shorter second stage ($p=0.0008$) than those having instrumental delivery (Figure 2). The length of second stage did not affect the extent of tear ($p=0.41$) despite the rising changes among the different groups (Mean \pm SD: 3a: 41.22 \pm 42.46; 3b: 76.89 \pm 82.72; 3c: 98.33 \pm 77.59) (Figure 3).

A mild negative correlation was found between BW and maternal BMI (Spearman's; $p=0.05$ – $r=-0.3$).

Discussion

The incidence of third degree tears was 2.65% which is lower than the national rate. Seventy percent (70%) of patients that had OASI had SVD and 65% were primiparous. Maternal age, BMI, fetal weight and first stage length did not affect the mode



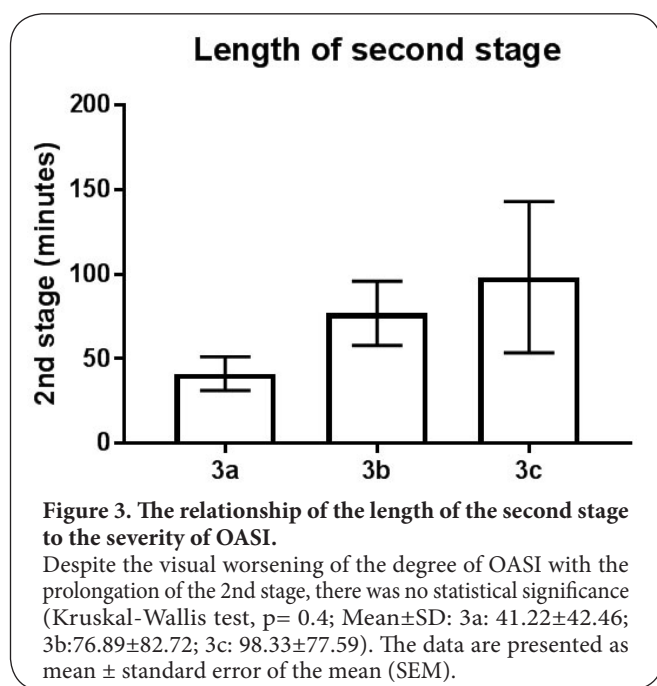


Figure 3. The relationship of the length of the second stage to the severity of OASI.

Despite the visual worsening of the degree of OASI with the prolongation of the 2nd stage, there was no statistical significance (Kruskal-Wallis test, $p=0.4$; Mean \pm SD: 3a: 41.22 \pm 42.46; 3b: 76.89 \pm 82.72; 3c: 98.33 \pm 77.59). The data are presented as mean \pm standard error of the mean (SEM).

of delivery whether that was SVD or instrumental deliveries. Prolonged second stage increased the risks of instrumental delivery and of worsening degree of OASI. Type of delivery and fetal weight did not influence the severity of OASI.

Women who had significantly longer second stage ($n=12$) ended up with instrumental deliveries and OASI. In these cases it should be taken into consideration the additional factors (e.g. fetal malposition) that have contributed in the length of the second stage as they might have contributed in the incidence of OASI.

An interesting observation was the fact that the longer the second stage lasted the worse the severity of OASI got (Figure 3). The lack of statistical significance could be due to the limited number of patients.

Our findings agree in many points with the results in literature regarding the incidence of OASI and certain risk factors affecting its incidence.

In a study by S Gundabattula et al., showed that 2.1% of vaginal births and 1.1% of all deliveries, and major-degree (3c and 4th-degree) tears constituted 20.9% of tears [13]. After adjusted analysis, significant predictors for injury included primiparity, delivery at or beyond 41 weeks of gestation, epidural analgesia, instrumental delivery, shoulder dystocia, birth weight ≥ 4000 g, and head circumference ≥ 35 cm. Episiotomy protected against sphincter injuries, particularly in forceps and ventouse deliveries. In the same study, shoulder dystocia was significantly associated with major-degree tears, while episiotomy appeared to be protective.

Episiotomy reduces six-fold the risk of OASI [12]. However there are many types of episiotomy something that makes the assessment of its protective effect on the anal sphincter

challenging [17]. Even in an agreed type of episiotomy, like mediolateral, there are many different definitions and variations among clinicians [17-21]. Not surprisingly, the evidence of its protective effect has been insufficient.

None of the women in our cohort who had SVD had an episiotomy. Considering that the majority of our women with OASI were spontaneous vaginal labourers and taking into consideration the previous evidence on the protective effect of episiotomy it could be argued if a mediolateral episiotomy could have prevented these tears.

Like episiotomies, there are many variations among clinicians when it comes to instrumental deliveries. There are many different types of ventouse, while the varieties of forceps described in literature exceed the 700 types [22,23]. Instrumental delivery depends on the indication for its use and the clinicians' training and personal preferences [24]. Such variability is difficult to be assessed objectively as there is a wide variety in the rates, types and techniques of instrumental deliveries among different units and countries [25].

Based on meta-analysis of data from 22 studies (651,934 women of whom 15,366 [2.4%] had severe lacerations), the strongest risk factors for OASIS included forceps delivery (OR, 5.50; 95% CI, 3.17-9.55), vacuum-assisted delivery (OR, 3.98; 95% CI, 2.60-6.09), midline episiotomy (OR, 3.82; 95% CI, 1.96-7.42), and increased fetal birth weight (mean difference, 192.88 g; 95% CI, 139.80-245.96 g) [26]. Midline episiotomy combined with forceps delivery substantially increases the risk of third-degree laceration (OR, 5.65; 95% CI, 5.55-5.75) and fourth-degree laceration (OR, 10.55; 95% CI, 10.29-10.81) [27]. The risk of anal sphincter trauma with operative delivery and episiotomy is increased in primigravid women and multigravid women [28].

The same meta-analysis, identified other risk factors for OASIS like primiparity (OR, 3.24; 95% CI, 2.20-4.76), Asian ethnicity (OR, 2.74; 95% CI, 1.31-5.72), labour induction (OR, 1.08; 95% CI, 1.02-1.14), labour augmentation (OR, 1.95; 95% CI, 1.56-2.44), epidural anaesthesia (OR, 1.95; 95% CI, 1.66-2.32), and persistent occiput posterior position (OR, 3.09; 95% CI, 1.81-5.29). Maternal age, pregnancy duration, body mass index, and duration of the second stage of labour were not significantly different between women who sustained OASIS and women who did not [26].

Familial factors also may predispose women to OASIS. In an analysis of the Medical Birth Registry of Norway, OASIS risk was increased if the woman's mother or sister had OASIS during a delivery (adjusted relative risk [RR], 1.9; 95% CI, 1.6-2.3 and RR, 1.7; 95% CI, 1.6-1.7, respectively) [29].

Of course, all these incidents and risk factors do not explore 'occult' sphincter injuries which are not evident clinically and their incidence can range between 19-67% of vaginal deliveries depending the mode of delivery [30,31]. This particular point of 'occult' or clinically missed OASI has been studied extensively in literature [32-34] and the current authors advocate the importance of its comprehensive exploration.

A mild negative correlation was noted in our results between the BW and maternal weight. However, there has never been suggested any similar association in literature. Furthermore, as statistical correlations do not necessarily infer causality [35]. Nonetheless, this could be an interesting subject for a future study related to the fetal BW and maternal habitus.

On a different aspect, there was no documentation of the maternal position during SVD or if 'hands on' technique was applied. 'Hands on' technique is being encouraged by the RCOG and by multiple studies as the evidence suggests it has a protective effect on the perineum [1,36,37]. Despite that, the 'hands-poised' technique is commonly mistaken for 'hands-off' [38] and as a result it is not applied during the second stage, leading to unnecessary perineal tears and OASI. Consequently, the authors agree with the Cochrane review [25] that more focus is warranted in the different perineal techniques that can prevent OASI.

Limitations and Recommendation for research

The main limitation of this study was the number of the patients. The power analyses, on the other hand, suggested that the samplesize was sufficient. A point of strength was the breaking down of tears in the analyses into the appropriate classification.

Nevertheless, a larger cohort in a retrospective multi-centre study can offer a better comparison among the different affected groups with a more comprehensiveand extensive analysis of the different risk factors leading to OASI.

Conclusion

Most OASI were in primiparousand in SVD. Maternal age, BMI, BW and first stage length did not affect the mode of delivery. Prolonged second stage increased the risks of instrumental delivery and of worsening degree of OASI. However, neither the type of delivery nor BW did influence the severity of OASI. None of the women with SVD had an episiotomy. Furthermore, there was no documentation of the maternal position during SVD or if 'hands on' technique was applied.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Authors' contributions	PB	MS	SI	RH	MS
Research concept and design	✓	--	--	--	✓
Collection and/or assembly of data	✓	✓	--	--	--
Data analysis and interpretation	✓	✓	✓	--	--
Writing the article	✓	✓	✓	--	--
Critical revision of the article	--	--	✓	✓	✓
Final approval of article	✓	✓	✓	✓	✓
Statistical analysis	✓	--	--	--	--

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