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ORIGINAL ARTICLE

Risk factors for anal sphincter disruption during child birth

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Abstract
Background and aims The objective of our study was to analyse the risk factors in a cohort of women who suffered anal sphincter disruption (third-degree tear) and compare the results with a similar cohort of women who underwent an uncomplicated vaginal delivery (without a clinically detectable laceration) during the same period.
Materials and methods A retrospective analysis was carried out on 54 women (group 1) who suffered a third-degree tear and 71 women who had undergone uncomplicated vaginal delivery during the same period (group 2). The risk factors considered were forceps delivery, parity, second stage of labour longer than 1 h, episiotomy, birth weight over 4 kg, gestational age and maternal age at delivery. The Cleveland Incontinence Score was completed.
Results Multiple logistic regression analysis of obstetric risk factors for third-degree perineal tear indicated forceps delivery (p=0.0001), primiparity (p=0.004), foetal birth weight over 4 kg (p=0.030) and delay in the second stage of labour (p=0.031) to be significant risk factors for a third-degree tear. Mediolateral episiotomy was shown to be a significant protective factor (p=0.0001). Gestational age and the maternal age at delivery (p=0.340) were not shown to be significant risk factors (p=0.336).
Conclusion Primary prevention and identification of women with risk factors is recommended. In some cases, counselling regarding the potential risks and benefits of both vaginal and caesarean delivery may be appropriate.

Keywords Third-degree perineal tear · Risk factors · Anal sphincter

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Introduction

Anal incontinence is the main complication which occurs as a result of damage to the anal sphincter. In females, third-degree tear (Fig. 1) due to vaginal delivery has now been recognised as its primary cause [1, 2]. However, the onset of symptoms of anal incontinence may occur many years after delivery with maximum incidence in the perimenopausal years [3].

Although injury to the anal sphincter is a recognised complication of vaginal delivery, prior to 2001, classification of postpartum anal sphincter injury was not standardised [4] and did not include the depth of external sphincter rupture or involvement of the internal sphincter. Therefore, to overcome this problem, a classification was introduced in 2001 by the Royal College of Obstetricians and Gynaecologists (RCOG) which are now accepted [5].

Since 1949 to date, there is a wide variation in the figures quoted for third-degree postpartum perineal tear ranging from 0% to 26.9% [6–12]. With the advent of endoanal ultrasound (EAUS) in the diagnosis of postpartum anal sphincter disruption, Sultan et al. [2], for the first time in a prospective study, demonstrated occult sphincter damage in up to 35% of women after the first vaginal delivery and 44% for multiparous women. In this study, the women who delivered by caesarean section (21 primiparous

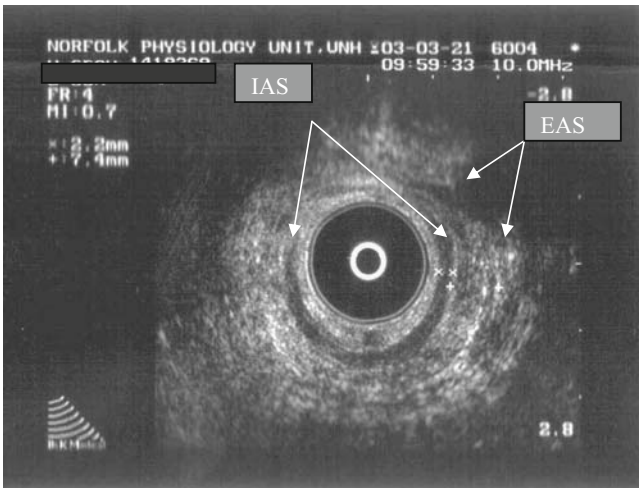

Fig. 1 EAUS picture showing a third-degree tear. *IAS* internal anal sphincter (defect between 9 and 2 o'clock), *EAS* external anal sphincter (defect between 1and 2 o'clock)

and two multiparous) did not develop sphincter defects. A meta-analysis carried out by Oberwalder et al. in 2004 [11] to determine the incidence of postpartum anal sphincter damage, suggested an overall incidence of 26.9% for primiparous women and 8.5% incidence of new sphincter defects in multiparous women.

The objective of our study was to analyse the risk factors in a cohort of women who suffered third-degree tears and compare the results with a similar cohort of women who underwent an uncomplicated vaginal delivery (without a clinically detectable laceration) during the same period.

Materials and methods

This study was approved by the East Norfolk and Waveney Research Governance and Ethics Committee and consists of patients from The Norfolk and Norwich University Hospital and The James Paget Hospital in Great Yarmouth in the UK. All patients who suffered third-degree tears between 1981 and 1993 (group 1) were traced from the delivery records. The very next patient (after the patient who suffered the tear) who underwent an uncomplicated vaginal delivery were included as controls (group 2).

A tear was defined as third degree, if disruption of the anal sphincter was present with or without a breach of the anal epithelium [13]. This was mainly due to the fact that our records did not indicate any fourth-degree tears. This was probably due to the fact that, prior to the guidelines published by the RCOG in 2001, the majority of the obstetricians may have classified both grades as third degree. Obstetric data of the 54 patients who suffered third-degree tears were compared with data from the 71 women who underwent an uncomplicated vaginal delivery during the same period. A retrospective analysis was carried out and the risk factors considered were forceps delivery, parity, second stage of labour longer than 1 h, episiotomy, birth weight over 4 kg, gestational age and maternal age at delivery. All the women who suffered a third-degree tear had the tear repaired primarily by direct approximation.

The Cleveland Incontinence Score was used to quantify the degree of anal incontinence in the two groups [14] (Table 1).

Statistical methods

Summary statistics are expressed as the mean (±SD) or median (range). The associations or trends between groups were analysed using chi-square test. For parametric data, *t* test was used, and for non-parametric data, Mann–Whitney test was used.

Third-degree tear was used as the outcome variable in a logistic regression model to analyse the effect of covariates. Blockwise (hierarchical) entry procedure was performed to enter the covariates depending on the importance of each covariate as shown in previously conducted studies. The results are given as odds ratios and 95% confidence intervals. Covariate factors considered in the final logistic regression model were forceps delivery, foetal birth weight over 4 kg, parity, prolonged second stage of labour (over 1 h), gestational age, use of episiotomy and maternal age at delivery. Hosmer and Lemeshow's goodness-of-fit test was used to determine how well the model fits our observed data.

All significance levels were set at the <0.05 level (two-tailed). Analysis was performed using SPSS version 11.5 (SPSS, Chicago, IL, USA) and Instat Version 3 (GraphPad Software, San Diego, CA, USA).

Results

The mean (range) follow-up time for both groups was 14.8 years (10–23 years) and 14.2 years (10–23 years),

Table 1 Cleveland clinic incontinence scoring system [14]

Type of incontinence	Never	Rarely	Sometimes	Usually	Always
Solid	0	1	2	3	4
Liquid	0	1	2	3	4
Gas (flatus)	0	1	2	3	4
Wears pad	0	1	2	3	4
Life style alteration	0	1	2	3	4

Score of 0=perfect continence, score of 20=complete incontinence
Never 0, *Rarely* <1 per month, *Sometimes* <1 per week but >1 per month, *Usually* <1 per day but >1 per week, *Always* daily or worse

respectively (p=0.69). The mean (range) maternal age of both groups at the time of delivery was 26.9 years (17–40 years) and 27.8 years (18–38 years), respectively (p=0.25). Therefore, the mean follow-up time and the maternal age at the time of delivery in both groups were comparable.

Demographic characteristics

The mean (SD, range) maternal age of the two groups at the time of delivery was 26.9 years (±5.2, 17–40 years) and 27.8 years (±4.7, 18–38 years), respectively. It showed comparable ages (p=NS).

Reproductive history and obstetric data

A detailed analysis of the reproductive history and obstetric data is given in Table 2. This shows that, at the time of sustaining the obstetric sphincter injury, the median parity of group 1 was 0 (range, 0–2) compared to the median parity in group 2 which was 1 (range, 0–4), indicating that the majority of women who suffered a third-degree tear were primiparous.

The mean birth weight, the duration of second stage of labour and the incidence of foetal macrosomia (birth weight >4 kg) in group 1 were higher (p<0.05) compared to those in group 2. A significant number of forceps-assisted deliveries (n=25, 47.2%) were seen in group 1 compared to those in the control group (n=5, 7.2%). However, though statistically not significant, a greater number of patients in group 2 (n=41, 59.4%) were seen to have had a mediolateral episiotomy compared to the patients in group 1(n=26, 49.1%).

Obstetric risk factors for third-degree tear

Multiple logistic regression analysis of obstetric risk factors for third-degree perineal tear (Table 3) indicated forceps delivery, primiparity, foetal birth weight over 4 kg and delay in the second stage of labour to be significant risk factors for a third-degree tear (p<0.05). Mediolateral episiotomy was shown to be a significant protective factor (p<0.05). Gestational age and the maternal age at delivery were not shown to be significant risk factors (p>0.05).

Table 3 Multiple logistic regression analysis table of risk factors

Risk factor	p value	Odds ratio	95% confidence interval for the odds ratio	
			Lower	Upper
Forceps	0.0001	15.486	3.647	65.757
Primiparity	0.004	7.255	1.850	28.454
Birth weight >4 kg	0.030	5.367	1.176	24.481
Delay in second stage of labour (>1 h)	0.031	3.592	1.123	11.483
Episiotomy	0.0001	0.083	0.023	0.305
Gestational age	0.336	1.239	0.801	1.915
Maternal age at delivery	0.340	1.063	0.937	1.206

Anal incontinence

Twenty-eight (53%) women in group 1 and 13 (19%) women in group 2 complained of anal incontinence (p≤0.0001). The mean (range) Cleveland Incontinence Score was 3.5 (0–16) for group 1 and 1.3 (0–12) for group 2 (p≤0.0001).

Discussion and conclusion

In our study, we found forceps delivery, nulliparity, foetal birth weight more than 4 kg and a delay in the second stage of labour (p<0.05) to be significant risk factors for a third-degree tear. The gestational age and the maternal age at delivery were not shown to be significant risk factors (p= NS). Similar studies conducted by Sultan et al. [13], Walsh et al. [15] and Fenner et al. [16] have also demonstrated forceps delivery, primiparity, foetal birth weight over 4 kg and delay in the second stage of labour to be risk factors. In addition, Sultan et al. [13], in their study, demonstrated that persistent occipitoposterior position to be a significant risk factor. In keeping with other studies, forceps delivery [17] and nulliparity [13] were also the main risk factors for a third-degree tear in our study. The relative rigidity/inelas-

Table 2 Obstetric data of the two groups, the values are given as mean (±SD), median (range) or number (percent), as appropriate

	Group 1 (n=54)	Group 2 (n=71)	p value
Parity (at the index delivery), median (range)	0 (0–2)	1 (0–4)	0.009
Parity now, median (range)	2 (1–5)	2 (1–5)	0.157
Gestational age (months), mean (SD, range)	40.0 (±1.1, 37–42)	39.6 (±1.3, 36–42)	0.103
Infant birth weight (kg), mean (SD, range)	3.7 (±0.5, 2.8–4.6)	3.4 (±0.5, 2.2–4.3)	<0.0001
No. of babies with birth weight >4 kg, n (%)	16 (30.2)	6 (8.7)	0.004
Forceps-assisted deliveries, n (%)	25 (47.2)	5 (7.2)	<0.0001
Episiotomy, n (%)	26 (49.1)	41 (59.4)	0.366
Delay in second stage of labour (>1 h), n (%)	29 (54.7)	12 (17.4)	<0.0001

ticity of the perineum may be the causative factor for a tear in the primipara [13]. However, contrary to our findings, Fenner et al. [16] found higher maternal age at delivery and higher gestational age to be significant risk factors for a third-degree tear.

However, in our study, in group 1, the second stage of labour was prolonged in the majority of the women compared to women in group 2, and therefore, acts as a confounding factor. This factor may, therefore, have lead to possible increased use of forceps giving rise to tears (which again may act as a further confounding factor). Therefore, comparison of two groups of purely nulliparous women would have enabled more accurate comparison.

The role of episiotomy in the prevention of a tear is still debatable. In this study, multiple logistic regression analysis of risk factors revealed mediolateral episiotomy to be protective (p=0.0001), and this is also in keeping with findings of de Leeuw et al. [18] and Fenner et al. [16]. However, controlled clinical trials done to date [19, 20] have not shown a significant benefit of an episiotomy in preventing a third-degree tear and, therefore, at present, many now advocate a restricted episiotomy policy. All the patients in our study who had been subjected to an episiotomy underwent a mediolateral episiotomy.

In the literature, long-term anal incontinence following primary repair of a third-degree tear varies between 15% and 61% [21, 22]. In our study, 53% of the women who suffered a third-degree tear (compared to 19% in the control group) complained of anal incontinence. None of the women in either group complained of anal incontinence or anal trauma prior to the index delivery. This highlights the fact that, in spite of primary repair, anal incontinence is a serious long-term complication of a third-degree perineal tear.

Third-degree obstetric tear/anal sphincter rupture is a serious injury that leads to long-term anorectal complaints of which anal incontinence is the most distressing and disabling consequence. Therefore, it emphasises the importance of primary prevention and preventing further damage to those who have already suffered an injury. In addition, counselling of those who are at high risk for a potential tear (e.g. primipara with a large foetus) and educating women regarding potential risks and benefits of both vaginal and caesarean delivery and getting them to participate in the decision-making may be advisable [23].

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