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Mediolateral episiotomy reduces the risk for anal sphincter injury during operative vaginal delivery

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Objective To determine the risk factors for anal sphincter injuries during operative vaginal delivery.

Setting and design A population-based observational study.

Population All 21 254 women delivered with vacuum extraction and 7478 women delivered with forceps, derived from the previously validated Dutch National Obstetric Database from the years 1994 to 1995.

Methods Anal sphincter injury was defined as any injury, partial or complete, of the anal sphincters. Risk factors were determined with multivariate logistic regression analysis.

Main outcome measures Individual obstetric factors, e.g. fetal birthweights, duration of second stage, etc.

Results Anal sphincter injury occurred in 3.0% of vacuum extractions and in 4.7% of forceps deliveries. Primiparity, occipitoposterior position and fetal birthweight were associated with an increased risk for anal sphincter injury in both types of operative vaginal delivery, whereas duration of second stage was associated with an increased risk only in vacuum extractions. Mediolateral episiotomy protected significantly for anal sphincter damage in both vacuum extraction (OR 0.11, 95% CI 0.09–0.13) and forceps delivery (OR 0.08, 95% CI 0.07–0.11). The number of mediolateral episiotomies needed to prevent one sphincter injury in vacuum extractions was 12, whereas 5 mediolateral episiotomies could prevent one sphincter injury in forceps deliveries.

Conclusions Primiparity and occipitoposterior presentation are strong risk factors for the occurrence of anal sphincter injury during operative vaginal delivery. The highly significant protective effect of mediolateral episiotomies in both types of operative vaginal delivery warrants the conclusions that this type of episiotomy should be used routinely during these interventions to protect the anal sphincters.

Keywords Anal sphincter, episiotomy, forceps delivery, vacuum extraction.

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Introduction

Anal sphincter injury during delivery is considered to be one of the major risk factors for faecal incontinence in women.[1] After anal sphincter injury, up to 50% women have complaints of faecal incontinence mainly because of persisting sphincter defects.[2–4]

Knowledge of possible risk factors for the occurrence of anal sphincter injuries may therefore reduce the likelihood of faecal incontinence. Operative vaginal delivery has been shown to be a significant contributor to the number of anal sphincter injuries.[5–8] In daily obstetric practice, the use of operative vaginal deliveries is inevitable in case of fetal distress or prolonged second stage of labour. Knowledge and modification of attributive risk factors may help reduce the number of anal sphincter injuries during operative vaginal delivery.

Episiotomy is the most commonly performed obstetric operation and was traditionally thought to decrease the risk for major perineal trauma and pelvic floor dysfunction in later life. These claims were critically reviewed and questioned in two large reviews.[8,9] Randomised controlled trials comparing the liberal use with the restricted use of mediolateral episiotomies showed no beneficial effect of liberal over restrictive use with regard to the prevention of anal sphincter damage.[10,11] However, these trials were, because of their study design, unable to establish the possible protective effect of a mediolateral episiotomy itself.

In a large population-based observational study, an 80% risk reduction for the occurrence of anal sphincter injuries was associated with the restrictive use of mediolateral episiotomy.[5] In the literature, only few studies addressing the effect of episiotomy on anal sphincter damage in operative vaginal delivery have been published, and most have dealt with one specific instrument or considered the use of midline episiotomies only.[12–22]

The Dutch National Obstetric Database (LVR) allows population-based studies on a variety of clinical variables

associated with pregnancy, labour and delivery and has been used before to analyse risk factors for the occurrence of anal sphincter injury during vaginal delivery.[5]

The present study was designed to analyse the effect of the mediolateral episiotomy and to establish the presence of attributive risk factors on the occurrence of anal sphincter injury in instrumental vaginal delivery using the data from this database.

Methods

Study population

The data of the 321 726 deliveries used in this study were derived from the Dutch National Obstetric Database from the years 1994 to 1995 and has been validated in a previous study on the risk factors for sphincter damage during vaginal delivery.[5] During these years, approximately 93% of all Dutch hospitals registered their deliveries with this database.

In 24 863 deliveries, the vacuum extractor was used, and in 8730 deliveries, the forceps was used to deliver the infant. All deliveries in which a combination of interventions during second stage was used, for example 656 deliveries with combined use of forceps and vacuum extraction, were excluded from the analysis to make it possible to establish the effect of other obstetric variables when the specific instrument was used. Final analysis was therefore performed on 21 254 deliveries with the vacuum extractor and 7478 forceps deliveries.

All characteristics known from the literature as possible risk factor, and available from the database, were analysed in this study as potential attributing factors for anal sphincter injury in assisted vaginal deliveries. These factors were: parity, induction of labour, duration of second stage, episiotomy, fetal birthweight and position. In cases of multiple pregnancies, only data pertaining to the first infant were used for analysis. Anal sphincter injury was defined as any rupture involving the anal sphincter muscles with or without rupture of the anal mucosa. The study was approved by the Privacy Committee of the Dutch National Obstetric Database according to the LVR privacy regulations.

Statistical analysis

We calculated incidences of anal sphincter injuries in assisted vaginal deliveries for each potential risk factor, known from previous studies on this subject and available in the LVR database. The incidence of anal sphincter injuries for each risk factor was compared with that of the most corresponding physiological condition in each group, for example occipitoposterior versus occipitoanterior position or no episiotomy versus mediolateral episiotomy. We have expressed this as the 'relative risk' of the occurrence of anal sphincter injury for these specific risk factors. Adjusted odds ratios with 95% CI were calculated for all factors, by modelling the data to control for possible confounding variables, using multiple logistic regression analysis. SPSS for Windows version 11.0 (SPSS Inc., Chicago, IL, USA) was used for the statistical calculations.

Results

General

Anal sphincter injury occurred in 646 out of 21 254 women (3.0%) who were delivered with a vacuum extraction, whereas 348 out of 7478 women (4.7%) who were delivered with forceps sustained a third- or fourth-degree perineal rupture. Maternal and fetal characteristics are listed in Table 1.

Table 1. General characteristics

Risk factor	Vacuum extraction (n = 21 254)	Forceps delivery (n = 7478)	Significance (P)
Anal sphincter injury	646 (3.0)	348 (4.7)	<0.001
Fetal birthweight (g)	3480 [522.2]	3386 [554.3]	<0.001
Duration of second stage (minutes)	70 [35.6]	64 [36.5]	<0.001
Primiparity	17 263 (81.2)	6408 (85.7)	<0.001
Multiparity	3991 (18.8)	1070 (14.3)	
Occipitoanterior position	18 852 (88.7)	6893 (92.2)	<0.001
Occipitoposterior position	1612 (7.6)	354 (4.7)	<0.001
Other position	790 (3.7)	231 (3.1)	<0.05
Spontaneous onset of labour	16 765 (78.9)	5914 (79.1)	NS
Induction of labour	4489 (21.1)	1564 (20.9)	
No episiotomy	4340 (20.4)	739 (9.9)	<0.001
Mediolateral episiotomy	16 780 (78.9)	6657 (89.0)	<0.001
Median episiotomy	134 (0.6)	82 (1.1)	<0.001

NS, not significant.
Figures are presented as n (%) or [SD].

Table 2. Risk factors for anal sphincter injury during vacuum extraction

Risk factor	Present	%	Relative risk	Logistic regression Adjusted OR (95% CI)
Fetal birthweight per 500 g increase				1.47 (1.35–1.59)
Duration of second stage per 15 minutes increase				1.05 (1.02–1.09)
Parity				
Multiparity	128/3991	3.21	1	
Primiparity	518/17 263	3.00	0.94	1.94 (1.56–2.41)
Fetal position				
Occipitoanterior	543/18 852	2.88	1	
Occipitoposterior	69/1612	4.28	1.49	2.01 (1.54–2.62)
Other position	34/790	4.33	1.50	1.85 (1.28–2.67)
Induction of labour				
No induction	515/16 765	3.25	1	
Induced labour	131/4489	2.91	0.90	NS
Episiotomy				
No episiotomy	408/4340	9.40	1	
Mediolateral	228/16 780	1.36	0.11	0.11 (0.09–0.13)
Midline	10/134	7.46	0.75	NS

NS, not significant.

Vacuum extractions

The risk factors for anal sphincter injury during delivery with a vacuum extraction were primiparity, fetal birthweight, occipitoposterior position and duration of second stage.

The relative risks and adjusted odds ratios (95% CI) for these variables for the prediction of anal sphincter injury are shown in Table 2. Induction of labour was not associated with an increased risk for anal sphincter injury during vacuum extraction. A highly protective effect was shown for mediolateral episiotomy during vacuum extraction. The use of this type of episiotomy reduced the risk for third-degree perineal tears with almost 90% (OR 0.11, 95% CI 0.09–0.13). The calculated absolute risk reduction was 0.08 (95% CI 0.07–0.09). The number of mediolateral episiotomies to be performed during vacuum-assisted deliveries to prevent one sphincter injury was 12.43 (95% CI 11.00–13.59).

Forceps deliveries

For forceps delivery, primiparity, occipitoposterior position and fetal birthweight were significant risk factors for anal sphincter damage. The relative risks and adjusted odds ratios (95% CI) for these variables are listed in Table 3. In contrast to vacuum extraction, duration of second stage of labour was not significantly associated with the occurrence of anal sphincter lesions during forceps delivery. As in vacuum extractions, induced labour was not associated with anal sphincter injury during forceps delivery. Mediolateral episiotomy was again associated with a strong reduction of the risk for anal sphincter damage (OR 0.08, 95% CI 0.07–0.11). With a calculated absolute risk reduction of 0.20 (95% CI 0.18–0.23), the number of mediolateral episiotomies necessary to prevent one sphincter injury during forceps deliveries was 4.98 (95% CI 4.42–5.68).

Discussion

Anal sphincter injury during delivery occurred in 3.0% of vacuum extractions and in 4.7% of forceps deliveries. Primiparity, fetal birthweight and occipitoposterior position were associated with a significantly increased risk for anal sphincter injury during both vacuum extractions and forceps deliveries. Duration of second stage was only associated with anal sphincter damage during vacuum extractions, whereas induction of labour showed no association with anal sphincter lesions in neither vacuum extraction nor forceps delivery. The use of a mediolateral episiotomy had a highly protective effect on the occurrence of anal sphincter injuries during both vacuum extraction and forceps delivery.

Anal sphincter damage during delivery may lead to faecal incontinence in up to 50% women, mainly due to persisting sphincter defects after primary repair.[2–4] Studies on risk factors for anal sphincter damage have pointed out that instrumental deliveries are an important contributor to these injuries, with obstetric forceps known to carry a higher risk than vacuum extraction.[5,7] In daily obstetric practice, the use of instrumental deliveries is inevitable. Knowledge of potentially modifiable risk factors for anal sphincter lesions may therefore contribute to the prevention of faecal incontinence.

In both vacuum extractions and forceps deliveries, increasing fetal birthweight was associated with an increased risk for

Table 3. Risk factors for anal sphincter lesions during forceps deliveries

Risk factor	Present	%	Relative risk	Logistic regression Adjusted OR (95% CI)
Fetal birthweight per 500 g increase				1.26 (1.11–1.40)
Duration of second stage per 15 minutes increase				NS
Parity				
Multiparity	60/1070	5.60	1	
Primiparity	288/6408	4.49	0.80	1.43 (1.05–1.96)
Fetal position				
Occipitoanterior	289/6893	4.19	1	
Occipitoposterior	38/354	10.73	2.56	3.06 (2.08–4.50)
Other positions	21/231	8.79	2.10	2.44 (1.44–4.14)
Induction of labour				
No induction	283/5914	5.06	1	
Induced labour	65/1564	4.49	0.89	NS
Episiotomy				
No episiotomy	168/739	22.73	1	
Mediolateral	173/6657	2.60	0.12	0.08 (0.07–0.11)
Midline	7/82	8.54	0.42	0.28 (0.13–0.63)

NS, not significant.

anal sphincter injuries. This confirms the results of previous studies on this subject.[20,21] Hudelist *et al.* found a similar association of increasing birthweight with anal sphincter lesions in their cohort of women delivered with forceps. Although increasing fetal head circumference may seem to be a logical explanation for this association, no association of fetal head circumference with anal sphincter injuries during forceps deliveries was found in this study.

In vacuum extractions, duration of second stage was weakly associated with an increased risk for anal sphincter damage, whereas in forceps deliveries, no association was found. This is in contrast with two earlier studies in which a significant association of the duration of second stage was found in forceps deliveries but not in vacuum extractions.[20,22] Comparison of the obstetric characteristics in these studies shows that the population described differs largely from the Dutch situation, with a much higher rate of induction of labour and epidural anaesthesia, which may have a significant effect on the duration of second stage. In both studies, the mean duration of second stage was significantly longer than in our study.

Whether the mildly elevated risk associated with an increased duration of second stage, as found in our study, plays a role in the prevention of anal sphincter lesions remains doubtful.

Our results on the risk increasing effect of primiparity in both vacuum extractions and forceps deliveries corroborate the results of Combs *et al.*[12] on this subject. However, in this study, no distinction was made between vacuum and forceps deliveries. Our results show that primiparity itself carries a larger risk in vacuum extractions than in forceps deliveries. The exact mechanism for this phenomenon remains unclear.

The position of the fetal vertex appears to be an important factor in the occurrence of sphincter lesions in operative vaginal deliveries. In vacuum extractions with occipitoposterior position, this risk was doubled, whereas this risk was tripled in forceps deliveries. These results support previous studies of Wu *et al.*[20] and Benavides *et al.*[22] in which similar risks were reported. The relative increase of fetal head circumference when the fetal head passes through the birth canal in occipitoposterior position and the more dorsally directed extraction towards the anal sphincter complex, necessary during vacuum extraction and forceps delivery, may explain this association.

Studies on the role of midline episiotomies in operative vaginal deliveries from the USA show that this type of episiotomy is strongly associated with an increased risk for the occurrence of third- and fourth-degree perineal tears.[13,15,16,20,22] However, the role of mediolateral episiotomies in operative vaginal deliveries is debated. Youssef *et al.*[17] reported a risk increasing effect of the use of episiotomies in operative vaginal deliveries, but after subdivision in vacuum extractions and forceps deliveries, this risk was no longer present. Bodner-Adler *et al.*[18] reported a protective effect of mediolateral episiotomies in forceps deliveries, and Aukee *et al.*[19] reported a similar effect in vacuum extractions. Combs *et al.*[12] showed a strong protective effect of mediolateral episiotomies in operative vaginal delivery without distinction between forceps and vacuum deliveries. In our study, the vast majority of all episiotomies were mediolateral episiotomies. In both vacuum extractions and forceps deliveries, this type of episiotomy had a strongly protective effect for the occurrence of sphincter lesions.

The strength of this study compared with other studies is the large number of forceps and vacuum deliveries, allowing

the determination of the impact of other obstetric factors and minimising the risk of unknown confounders. The weakness of this study is that it is retrospective and not randomised. A randomised trial to establish the effect of a mediolateral episiotomy will be very difficult to perform because it will require a large number of cases against the background of all variables associated with sphincter injuries during delivery.

In conclusion, risk factors for anal sphincter injury during operative vaginal delivery with either vacuum extraction or forceps are primiparity, increasing fetal weight and occipito-posterior position. Duration of second stage is only weakly associated with sphincter injuries in vacuum extraction. A mediolateral episiotomy appears to be highly protective for these injuries in operative vaginal delivery. Twelve mediolateral episiotomies are required to avoid one case of anal sphincter injury during vacuum extraction and only five in forceps delivery. In view of the persisting high morbidity after anal sphincter injury during delivery, liberal use of a mediolateral episiotomy during operative vaginal delivery is advocated. ■

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