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Risk factors for third degree perineal ruptures during delivery

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Objective To determine risk factors for the occurrence of third degree perineal tears during vaginal delivery.

Design A population-based observational study.

Population All 284,783 vaginal deliveries in 1994 and 1995 recorded in the Dutch National Obstetric Database were included in the study.

Methods Third degree perineal rupture was defined as any rupture involving the anal sphincter muscles. Logistic regression analysis was used to assess risk factors.

Main outcome measures An overall rate of third degree perineal ruptures of 1.94% was found. High fetal birthweight, long duration of the second stage of delivery and primiparity were associated with an elevated risk of anal sphincter damage. Mediolateral episiotomy appeared to protect strongly against damage to the anal sphincter complex during delivery (OR: 0.21, 95% CI: 0.20–0.23). All types of assisted vaginal delivery were associated with third degree perineal ruptures, with forceps delivery (OR: 3.33, 95%-CI: 2.97–3.74) carrying the largest risk of all assisted vaginal deliveries. Use of forceps combined with other types of assisted vaginal delivery appeared to increase the risk even further.

Conclusions Mediolateral episiotomy protects strongly against the occurrence of third degree perineal ruptures and may thus serve as a primary method of prevention of faecal incontinence. Forceps delivery is a stronger risk factor for third degree perineal tears than vacuum extraction. If the obstetric situation permits use of either instrument, the vacuum extractor should be the instrument of choice with respect to the prevention of faecal incontinence.

INTRODUCTION

Traumatic vaginal delivery is considered the most important risk factor for faecal incontinence in women[1]. Faecal incontinence may happen after recognised third degree ruptures, but can also occur after apparently non-traumatic vaginal delivery[2–8]. Studies using endo-anal ultrasonography have shown that faecal incontinence is mainly caused by persisting sphincter defects and not, as was previously believed, by neurological damage[4,5,7,8]. After third degree ruptures, up to 85% of women have persistent sphincter defects and up to 50% have anorectal complaints, despite apparently adequate repair[2,5–8]. Therefore, assessment of risk factors for the occurrence of third degree perineal ruptures is essential in order to allow primary prevention.

Randomised trials showed no prophylactic effect of the routine use of episiotomy[9,10]. Previous case–controll studies on risk factors and putative preventive interventions concerned small groups of women or groups with a small number of third degree lacerations, which may limit the significance of the results[11,12]. Other studies dealt with risk factors for third degree perineal ruptures in particular clinical conditions, such as instrumental compared with spontaneous vaginal delivery[13–18].

The existence of the Dutch National Obstetric Database (LVR) allows population-based studies on a variety of clinical variables associated with pregnancy, labour and delivery[18,19]. The present study was designed to analyse risk factors for the occurrence of third degree perineal ruptures using the LVR database.

METHODS

In the Netherlands the independent midwife and general practitioner are responsible for providing primary obstetric care of healthy pregnant women and for identifying pathology during pregnancy or delivery. If risks or pathology are identified, the obstetrician/gynaecologist is consulted and the patient may be referred to secondary care, if considered necessary.

Deliveries performed in primary and secondary care are registered separately in the LVR. All deliveries beyond 16 weeks of gestation, including stillbirths and terminations of pregnancy remote from term, are entered into the database on a voluntary basis. The validity of the data is assessed by the Stichting Informatiecentrum voor de Gezondheidszorg (SIG) (Dutch Centre for Health Care Information) using a plausibility program based on obstetric knowledge. For our study we combined both parts of the database to make the population comparable to populations in other countries. In 1994 and 1995 the years

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included in this study, 82.5% of all deliveries in the Netherlands were recorded in the LVR. The study was approved by the Privacy Committee of the SIG, according to the LVR privacy regulations.

The total LVR database of 1994 and 1995 contained 321 726 deliveries, 125 851 (39.1%) in primary care and 195,875 (60.9%) in secondary care. All 32 148 (10.0%) deliveries by caesarean section were excluded, after which 289 578 vaginal deliveries remained. Of those, 829 (0.26%) were excluded because of incomplete data, and 3966 (1.23%) were excluded because of obvious erroneous data, (e.g. birthweight of less than 100 grams, term vaginal delivery with transverse lie, negative duration of second stage, second stage duration of more than three hours). The remaining database with complete data contained 284,783 deliveries, with 238,503 spontaneous and 46,280 assisted vaginal deliveries. In all deliveries, characteristics of pregnancy and labour such as parity, induction of labour, duration of second stage, interventions during delivery and fetal characteristics were analysed as potential risk factors for third degree perineal tears. In case of multifetal pregnancies, the characteristics of the first infant were used for analysis. A third degree perineal tear was defined as any tear involving the anal sphincter muscles, with or without rupture of the anal mucosa.

Statistical analysis

We calculated incidences of third degree perineal ruptures for each potential risk factor, known from previous studies on this subject and available in the LVR-database. Where possible, factors were grouped: parity, fetal presentation, episiotomy, induction of labour and assisted vaginal delivery. The incidence of third degree ruptures for each risk factor was compared with the incidence of the most frequently occurring physiological condition in each group (e.g. occipito-posterior *versus* occipito-anterior presentation or no episiotomy *versus* mediolateral episiotomy). We have expressed this as the relative risk of the occurrence of third degree ruptures for these specific risk factors. Adjusted odds ratios (OR) with 95%-confidence intervals (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 7.0 was used for the statistical calculations.

RESULTS

The overall risk of third degree perineal ruptures in the study group was 1.94% (5528/284,783). The various risk

Table 1. Analysis of potential risk factors for the occurrence of third degree perineal ruptures ($n =$ 284,783). Present is defined as number of women with 3rd degree rupture/total number of women. Adj. OR = adjusted odds ratio.

Risk factor	Present	%	Relative risk (%)	Logistic regression Adj. OR (95% CI)	
Parity					
Multiparity	2173/159903	1.35	1		
Primiparity	3355/124880	2.69	1.99	2.39	(2.24–2.56)
Fetal presentation					
Occipito-anterior	5082/264426	1.92	1		
Occipitoposterior	250/7624	3.28	1.71	1.73	(1.52–1.98)
Breech presentation	103/9842	1.05	0.54	1.00	(0.78–1.26)
Other presentation	93/2891	3.21	1.67	1.59	(1.28–1.98)
Episiotomy					
No episiotomy	4185/183919	2.28	1		
Mediolateral episiotomy	1234/97250	1.27	0.56	0.21	(0.19–0.23)
Median episiotomy	109/3614	3.02	1.33	0.81	(0.66–0.98)
Induction of labour					
No induction	4556/238383	1.91	1		
Induced labour	972/46400	2.09	1.10	1.19	(1.11–1.28)
Assisted vaginal delivery					
No intervention	4052/238503	1.70	1		
Fundal expression[a]	191/9176	2.08	1.23	1.83	(1.57–2.14)
Fundal expr. + vacuum	74/2661	2.78	1.64	1.78	(1.40–2.28)
Fundal expr. + forceps	27/522	5.17	3.04	4.62	(3.09–6.89)
Vacuum extraction[a]	646/21254	3.03	1.79	1.68	(1.52–1.86)
Vacuum. + forceps	51/656	7.77	4.58	4.74	(3.49–6.45)
Forceps delivery[a]	348/7478	4.65	2.73	3.53	(3.11–4.02)
Intervention: for shoulder dystocia[a]	46/1180	3.89	2.29	2.03	(1.49–2.74)
Breech extraction[a]	27/1284	2.10	1.24	2.91	(1.88–4.51)

[a] Applied with exclusion of any other type of assisted vaginal delivery.

factors analysed and their association with third degree perineal tears are summarised in Table 1. Primiparity was found to be significantly associated with an increased risk of third degree ruptures. Higher parity appeared to be a protecting factor for third degree perineal ruptures; the odds halved for each following delivery, up to a maximum of 6 (OR: 0.52, 95% CI: 0.50–0.55). Fetal occipito-posterior position increased the risk of third degree ruptures significantly. Breech presentation was associated with fewer sphincter injuries than occipito-anterior position, but after regression analysis the association disappeared. Separate analysis of complete and incomplete breech showed no relationship with third degree ruptures. Other presentations (e.g. brow or face presentations) increased the risk significantly.

The total episiotomy rate was 35.4%, with a mediolateral episiotomy in 34.1%, and a median episiotomy in 1.3% of cases. The use of median episiotomies was significantly associated with multiparity ($P < 0.01$) and spontaneous deliveries ($P < 0.01$). Mediolateral episiotomy appeared to be strongly protective for third degree perineal ruptures, whereas median episiotomy showed a weak protective effect. After separate logistic regression analysis of all spontaneous deliveries mediolateral episiotomy was still strongly associated with a reduced risk of third degree perineal ruptures (OR: 0.34, 95% CI: 0.31–0.37). Induction of labour was found to be weakly associated with the occurrence of third degree ruptures.

All types of assisted vaginal delivery were associated with an increase in the risk of third degree ruptures. Uterine fundal expression, to expedite delivery, was applied in 4.6% of all vaginal deliveries, either alone or in combination with other types of intervention, and appeared to be significantly associated with an increased risk of anal sphincter damage.

Vacuum extraction was also significantly associated with anal sphincter tears, but carried a lower risk. Forceps delivery, of all forms of assisted vaginal delivery, appeared to carry the strongest risk for the occurrence of third degree perineal tears. Combined use of different types of assisted vaginal delivery appeared to increase the risk for third degree perineal ruptures in comparison with the exclusive use of one type.

Birthweight was found to be significantly associated with third degree perineal tears, with an odds ratio per increase of birthweight by 500 grams of 1.47 (95% CI: 1.43–1.51) (Fig. 1). Also duration of the second stage of labour appeared to be significantly associated with anal sphincter tears, with an odds ratio of 1.12 (95%-CI: 1.10–1.14) per 15 minutes (Fig. 2).

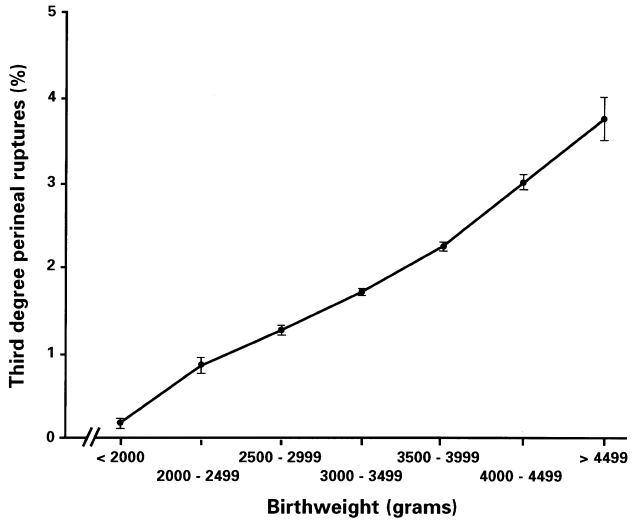

Fig. 1. Risk of third degree perineal ruptures per 500 grams birth weight.

DISCUSSION

To our knowledge this is the largest study concerning risk factors for the occurrence of third degree ruptures of the perineum published to date. The study comprises the majority of all deliveries in the Netherlands over a period of two years and contains a sufficient number of deliveries and third degree ruptures to draw firm conclusions. By using a national obstetric database, potential selection bias in data from single institutions is avoided. In the database only obstetric data are registered, which does not allow analysis of associated clinical problems such as faecal incontinence.

The overall risk of third degree ruptures of the perineum in our study, defined as any rupture of the perineum involving anal sphincter muscle, is 1.94%. This incidence is higher than that in some European reports[2,5,13,15], comparable to that in other studies from the continent[6,14], but much lower than the incidence reported from the United States[11,12,16,17].

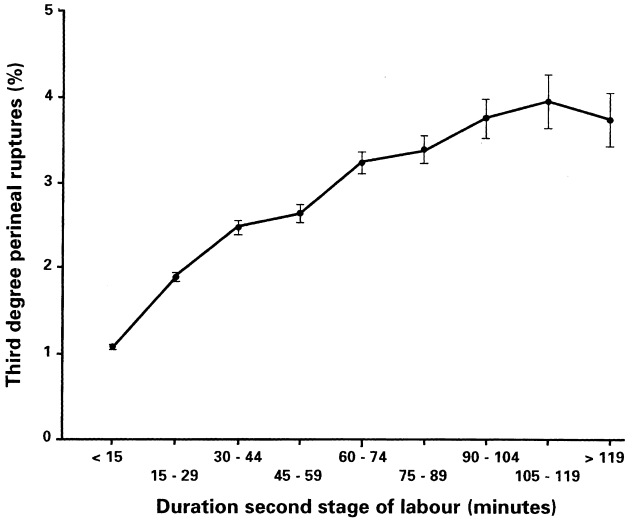

Fig. 2. Risk of third degree perineal ruptures per 15 minutes duration of second stage of labour.

Our observation of an elevated risk in primiparae, which may be due to relative inelasticity of the perineum, and a reduction in risk with increasing parity is in line with earlier reports[5,11,13,14,17].

Fetal presentation appears to be an important discriminating factor for the occurrence of third degree perineal ruptures. As previously reported, a persisting occipitoposterior position of the fetal head increases the risk of anal sphincter damage[13,14]. After logistic regression the risk of anal sphincter damage in breech deliveries appeared to be comparable with that in cephalic occipito-anterior deliveries. This may be explained by selection before and during breech delivery, in which expected obstetric problems are avoided by performing a caesarean section resulting in a elevated caesarean section rate in breech deliveries of 41.6% versus. 10.0% overall. In the group of other presentations, such as brow or face presentations, the risk of sphincter damage was also significantly elevated, but the number of deliveries and third degree ruptures in that group is too small to draw firm conclusions.

Our study shows a strong protective effect of mediolateral episiotomy against the occurrence of third degree perineal ruptures in spontaneous and assisted vaginal deliveries, which was not influenced by parity. In contrast to results of earlier studies, median episiotomy was not found to increase the risk of anal sphincter tears. This may be explained by the fact that median episiotomies were almost exclusively used in spontaneous deliveries, and were strongly associated with multiparity. Our results confirm the results of Anthony *et al.*[18], who found a similar protective effect in uncomplicated vertex deliveries. Other studies have questioned the beneficial effect of mediolateral episiotomies to prevent third degree perineal tears. Møller Bek and Laurberg reported that the liberal use of mediolateral episiotomies increased the risk of anal sphincter damage[13]. Two randomised trials showed no protective effect of routine mediolateral episiotomy[9,10], but because of very small numbers the statistical power of one of these[9] was too low to allow firm conclusions. The episiotomy rate in our study group was much lower than that in the group with third degree tears in the study of Møller Bek and Laurberg (34.1% versus 84.9%) and comparable to the rate in the group with selective use in the Argentinean trial (34.1 % versus 30.1%)[10,13]. A protective effect of selective use of mediolateral episiotomy cannot be ruled out on the basis of these previous studies, and is strongly supported by the results of our study, and mediolateral episiotomy may thus protect against resulting faecal incontinence.

Induction of labour was found to be associated with a slightly increased risk of anal sphincter damage, which confirms the results of Poen *et al.*[14]. Indications for induction of labour are not included in the LVR and can therefore not be analysed. The mechanism by which induction of labour results in a higher risk of anal sphincter damage remains unclear and needs further study.

All types of assisted vaginal delivery were found to be associated with an increased risk of anal sphincter lacerations. Our study showed a marked increase in the risk when vacuum extraction was performed. The fact that earlier studies showed no independent effect of vacuum extraction can be explained by the small number of third degree ruptures and small study groups[5,13,14]. Forceps delivery appeared to be the strongest risk factor, which is in line with results of earlier studies[5,13,14]. With respect to the prevention of anal sphincter damage, vacuum extraction is to be preferred over forceps delivery, if the situation permits use of either instrument. The combined use of forceps with fundal expression or vacuum extraction appeared to increase the risk for the occurrence of third degree ruptures even further, and should therefore be avoided, whenever possible. Interventions used to resolve shoulder dystocia were also associated with an increased risk of anal sphincter damage, which confirms the results of Møller Bek and Laurberg[13].

Our results show a significant positive correlation between birthweight and the occurrence of third degree perineal ruptures. Shiono *et al.* reported a significant odds ratio of 1.10 per 100 increase in birthweight[16], and other studies have shown an elevated risk with fetal birthweight exceeding 4000 [5,14].

Although earlier studies failed to show a relationship between the duration of the second stage of labour and anal sphincter damage[13,14,17], our study shows a significant increase in the risk of third degree perineal tears with increasing duration of the second stage. Stretching of the perineum for a longer period of time may lead to ischaemia, which may increase the risk of ruptures of the perineum. Whether the use of upper time limits for the duration of second stage will lower the risk of anal sphincter damage remains doubtful, as this will lead to an increase in operative vaginal deliveries with an even greater risk of sphincter injuries.

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