——————— ORIGINAL ARTICLE ———————

Anal sphincter damage after vaginal delivery: functional outcome and risk factors for fecal incontinence

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Objective. To assess the role of anal sphincter damage following delivery in the development of anorectal complaints and urinary incontinence, and to identify obstetric factors associated with subsequent fecal incontinence.
Methods. The retrospective cohort study with matched controls used a postal questionnaire and analysis of delivery and operation records from all women who underwent primary repair of a third or fourth degree perineal rupture in our hospital between 1971 and 1991, and their controls, matched for date and parity. Frequencies of complaints were compared using the Mantel-Haenszel common odds ratio [OR] for matched-control studies. Obstetric risk factors for fecal incontinence were assessed with multivariate logistic regression analysis.
Results. In the period studied, 171 women underwent a primary repair. One hundred and forty-seven of which returned the questionnaire (86%), compared with 131 of the controls (73%). Analysis was performed on 125 matched pairs with a median follow-up of 14 years. Fecal incontinence was reported by 39 patients and 16 controls (OR: 3.09; 95% confidence interval: 1.57–6.10). Urinary incontinence was reported by 65 cases and 52 controls (OR:1.46; 95% CI: 0.91–2.37). Among women with anal sphincter damage, the extent of anal sphincter damage was an independent risk factor for fecal incontinence. (OR: 2.54; 95% CI: 1.45–4.45). Subsequent vaginal delivery was not associated with the development of fecal incontinence (OR: 2.32; 95% CI: 0.85–6.33). In primiparous women mediolateral episiotomy protected for fecal incontinence after anal sphincter damage (OR: 0.17; 95% CI: 0.05–0.60).
Conclusions. Anal sphincter damage following delivery is significantly associated with subsequent anorectal complaints, but not with urinary incontinence. The extent of sphincter damage is an independent risk factor for the development of fecal incontinence. Mediolateral episiotomy protects for fecal incontinence in primiparous women.

Key words: anal sphincter; anorectal complaints; fecal incontinence; urinary incontinence

Background

Rupture of the anal sphincters during vaginal delivery is a known but relatively rare complication of vaginal delivery. Sequelae as perineal pain, sexual dysfunction, and fecal incontinence, urgency or soiling may develop.

Abbreviation:
OR: : odds ratio.

The incidence of third and fourth degree perineal ruptures appears to vary in reports from different countries. European studies report incidences between 0.5 and 3%, whereas studies from the United States show rates up to 25% (1, 2). Studies on the functional outcome of primary repair of third and fourth degree ruptures have shown that fecal incontinence may develop in up to 57% of women. Most of these studies, however, contain small numbers of patients (3–7), lack con-

trol groups (7–10) or a sufficient follow-up period (3–5, 9) which hampers a reliable interpretation of these results.

We present the results of a large retrospective cohort study, with a median follow-up of 14 years. The aim of our study was to assess the functional outcome after primary repair of third and fourth degree perineal ruptures in comparison with the outcome in controls with a vaginal delivery without anal sphincter damage, and to analyze obstetric risk factors for the development of anorectal complaints after anal sphincter damage complicating vaginal delivery.

Methods

The study was designed as a retrospective cohort study with matched controls and was approved by the Medical Ethics Committee of the Ikazia Hospital, Rotterdam. All 171 women who underwent primary repair of a third and fourth degree perineal rupture between January 1st 1971 and December 31st 1990 in the Ikazia Hospital were included in the study. This group comprised women who were delivered in the hospital attended by the obstetrician-gynecologist, as well as women referred (73%) after home delivery under supervision of an independent midwife or general practitioner. The first woman after the index case, matched for parity, who had a vaginal delivery without anal sphincter damage in our hospital was selected as a control. All relevant data were obtained from the hospital records. Anal sphincter damage was classified in three groups: Partial rupture of the anal sphincters (grade-IIIa), complete rupture of the sphincters with intact anal mucosa (grade-IIIb), and complete rupture of the anal sphincters and mucosa (grade-IV).

In the 20-year period covered by the study, the surgical technique of primary repair remained unchanged. Sphincter muscle ends were approximated end-to-end using interrupted chromic catgut sutures. The anal mucosa was closed separately with interrupted chromic catgut sutures if necessary. A nylon suture through the perineal skin and both sphincter ends was used and left in place for one week, to secure approximation of both sphincter ends. Vaginal mucosa, perineal muscles and skin were repaired as in routine second-degree rupture or episiotomy. All women received prophylactic antibiotic treatment and were treated during the first postoperative week with bedrest, laudanum to reduce bowel movements and lactulose to soften stools.

A questionnaire was sent to all patients and matched controls with questions about the obstetric and medical history, general health, daily defecatory pattern, and complaints of fecal soiling, fecal and urinary incontinence or urgency. If the questionnaire was not returned after three weeks a reminder was sent. Complaints of incontinence were scored positive if they were reported to occur more than once a week during a period of at least one year. The severity of complaints of fecal incontinence was classified according to Parks' classification (11). The frequency of complaints was classified as less than once a week, one to six times per week, one to five times a day or more than five times a day.

Statistical testing of comparisons between index cases and controls regarding general and obstetric characteristics was performed using McNemar's test or Wilcoxon's signed-rank test for qualitative or continuous data. Comparisons of the functional outcomes between both groups were evaluated with the Mantel-Haenzsel common odds ratio estimate for matched case-control studies. Univariate analysis of risk factors for the development of anorectal complaints after anal sphincter damage was performed with calculations of odds-ratios with 95%-confidence intervals. Multiple logistic regression analyses were performed to assess independent risk factors. A two-sided p-value of 0.05 was considered to be the limit of statistical significance. Analyses were done with the Statistical Package for Social Sciences, version 7.0 for Windows (SPSS Inc., Chicago, IL).

Results

Of 171 women with anal sphincter damage, 147 (86%) returned a completed questionnaire; ten women refused participation in the study, and 14 were lost to follow-up. Of 171 controls, 131 (73%) returned a completed questionnaire; 27 refused participation and 13 women were lost to follow-up. Of 147 index cases and 131 controls, 125 matched pairs remained and formed the subject of this study.

In the case group, 67 women (54%) had a grade-IIIa rupture, 36 women (29%) a grade-IIIb rupture, and 22 women (18%) a grade-IV rupture. Table I lists the general characteristics of both groups. All episiotomies were of the mediolateral type. There were no significant differences between the groups except a higher birthweight in the case group and more mediolateral episiotomies in the control group. The median follow-up in both groups was 14 years. Separate analysis comparing responders and nonresponders within both study groups showed no differences.

All forms of fecal incontinence were significantly more common in the group with sphincter damage (Table II). A total of 40% of women in the case

Table I. General characteristics*

	Cases (n=125)	Controls (n=125)
Age at delivery (yrs)	26 (18–41)	28 (19–38)
Age at questionnaire (yrs)	40 (27–59)	41 (24–58)
Duration of follow-up (yrs)	14 (5–24)	14 (5–24)
Gestational age (wks)	39 (36–42)	38 (35–41)
Parity	1 (1–3)	1 (1–4)
Number of subsequent deliveries	1 (0–4)	1 (0–6)
Birthweight (gm)	3620 (2060–5700)	3430 (1870–4380)[†]
Vacuum extraction	7 [5.6]	13 [10.4]
Forceps delivery	2 [1.6]	0
Occipitoposterior presentation	5 [4.0]	1 [0.8]
Breech delivery	4 [3.2]	6 [4.8]
Mediolateral episiotomy	47 [37.6]	70 [56.0][†]

*Values are presented as median (range) or total number [%]. [†]$p<0.05$.

Table II. Prevalence of complaints*

	Cases (n=125)	Controls (n=125)	Mantel-Haenszel Common Odds-ratio [95%-CI]
Anorectal complaints	50 (40)	19 (15)	3.64 [1.87–7.09]
Fecal incontinence	39 (31)	16 (13)	3.09 [1.57–6.10]
Grade-II	28 (22)	14 (11)	
Grade-III	10 (8)	2 (2)	
Grade-IV	1 (1)	0	
Fecal urgency	32 (26)	7 (6)	7.25 [2.55–20.62]
Fecal soiling	12 (10)	1 (1)	12.00 [1.56–92.29]
Urinary incontinence	65 (52)	52 (42)	1.46 [0.91–2.37]
Stress-incontinence	63 (50)	50 (40)	1.46 [0.91–2.37]
Urge-incontinence	32 (26)	28 (22)	1.16 [0.68–1.98]

* Values are presented as *n* (%).

group reported some kind of anorectal problem, compared to 15% of women in the control group.

Separate analysis of women with anorectal complaints showed that in the group of women with sphincter damage these complaints of incontinence started significantly earlier compared to controls. In 69% of cases complaints started in the first three months after delivery, compared to 31% in controls ($p=0.003$). Classified according to Parks' classification, complaints of fecal incontinence were more severe in cases compared to controls ($p<0.001$). Also the rate of occurrence was significantly higher in the case group ($p=0.004$).

In more than 90% of women with anorectal complaints these were still present at the time of the questionnaire. Only a minority underwent earlier treatment for their complaints; 14 were treated conservatively with dietary measures or physiotherapy, whereas two women underwent anterior sphincter repair.

In contrast to anorectal complaints, neither stress- nor urge-incontinence for urine were found to be associated with previous anal sphincter damage during delivery.

Characteristics such as maternal age at delivery and current age, number of subsequent vaginal deliveries, and obstetric factors such as parity, gestational age, mode of delivery, fetal birthweight and presentation, extent of sphincter damage and presence of an episiotomy were tested as potential risk factors for the development of fecal incontinence after anal sphincter damage. Using univariate analysis only, the extent of anal sphincter damage and the presence of a mediolateral episiotomy appeared to be associated with the development of fecal incontinence (Table III). Women with a grade-IIIa rupture reported complaints in 21%, women with a grade-IIIb rupture in 31%, and women with grade-IV-ruptures in 64% of cases.

Stepwise logistic regression analysis confirmed the extent of sphincter damage to be the primary independent risk factor for the development of fecal incontinence. Using the subdivision of grade-IIIa, IIIb and IV ruptures, the odds for the development of fecal incontinence increased more than twofold with each step (Table III).

While univariate analysis suggested that mediolateral episiotomy had a weak protective effect for the development of fecal incontinence, multivariate analysis showed that this effect was only present in primiparae. Of the primiparae without a mediolateral episiotomy and anal sphincter damage, 46% developed fecal incontinence, compared to 12% of the primiparae with anal sphincter damage combined with a mediolateral episiotomy ($p=0.003$). In multiparae these figures were, respectively, 32% and 44% ($p=0.47$). The odds for primiparae with episiotomy in the case group to develop fecal incontinence, adjusted for the extent of sphincter damage, was reduced by 83% ($p=0.005$), compared to other women.

Women who had one or more vaginal deliveries following the delivery with anal sphincter damage reported complaints in 41%, compared to 39% of those who did not deliver vaginally after the delivery in which the sphincter damage occurred. Multivariate analysis showed that fecal incontinence was not significantly positively associated with subsequent vaginal deliveries. In none of the analyses was an association found between fecal incontinence and the age at the moment of delivery or the duration of follow-up, the latter being minimally 5 years.

The group of 16 women with fecal incontinence in the control group was too small to analyze for risk factors.

Discussion

During the last decade the relationship between vaginal delivery and subsequent urinary and fecal

Table III. Univariate and multivariate analysis of various risk factors for fecal incontinence after anal sphincter damage during delivery*

	Univariate analysis		Multivariate analysis	
Extent of perineal damage[†]	2.44 [1.46–4.06]	<0.001	2.54 [1.45–4.45]	0.001
Subsequent vaginal delivery	1.09 [0.50–2.34]	0.83	2.32 [0.85–6.33]	0.10
Primiparity[‡]	0.79 [0.37–1.69]	0.55	1.16[a] [0.41–3.29] 0.78	
			0.15[b] [0.02–0.98] 0.05	
Mediolateral episiotomy[‡]	0.38 [0.15–0.91]	0.03	0.17[c] [0.05–0.61] 0.007	
			1.25[d] [0.27–5.83] 0.78	

*values are presented as odds ratios with [95%-confidence interval] and *p*-values.
[†] per grade: grade-IV *vs*. grade-IIIb *vs*. grade-IIIa.
[‡] significant difference: [a]without episiotomy *vs*. [b]with episiotomy, and [c]primiparity *vs*. [d]multiparity.

incontinence has received increasing interest (12–17), in particular with regard to the contribution of anal sphincter damage (3–10, 18, 19). These studies indicate a significant but variable association between anal sphincter damage following vaginal delivery and subsequent anorectal complaints. The variability in results may be attributed, at least in part, to small study size and short follow-up, or both. Our questionnaire-based study contained large numbers in case and control groups, with high response rates, which makes selection bias unlikely. The extensive period of follow-up allows assessment of long-term consequences of anal sphincter damage during delivery.

The study and control groups were similar regarding their general characteristics, except for a lower median fetal birthweight and a higher incidence of episiotomy in controls (Table I). These differences can be explained by the recruitment of the control group entirely from women who delivered in the hospital under specialist care, with more pregnancies and deliveries at risk than in the case group, 73% of which were delivered at home.

Anal sphincter damage was found to be significantly associated with fecal incontinence, which is in accordance with the results of earlier studies (3–10, 18, 19). The occurrence of fecal urgency in women with anal sphincter damage in our study is similar to that reported by Sultan et al. (4). Our findings with regard to fecal soiling confirm the results of earlier studies in which fecal soiling is reported in 7 to 10 percent of women with anal sphincter damage after delivery (10, 19).

The results of the two previously published studies with a follow-up of more than ten years, with regard to the occurrence of anorectal complaints, are contradictory (6, 19). Nygaard et al. (6) reported no significant difference in the rate of frequent flatus incontinence in women with anal sphincter damage compared to women with episiotomy only, and frequent fecal incontinence was

significantly even more common in the latter group. This may be explained by the high rates for frequent flatus and fecal incontinence in the control group of 30.3% and 18.0%, respectively. A recent study from the United States showed similar high incontinence rates in women after midline episiotomy without visible extension (20). These rates are much higher than those reported in our control group and in control groups of other European studies (4, 5, 18, 19). The differences may be explained by a high incidence of unrecognized sphincter damage after midline episiotomy. This procedure is known to increase the risk of anal sphincter damage which may be difficult to recognize (2, 17). Our study confirms the results of the study of Haadem and Gudmundsson (19) in which anorectal complaints were significantly more often present in women with anal sphincter damage almost two decades after delivery compared to women without anal sphincter damage.

Our study shows that in women with a third and fourth degree perineal tear complaints start significantly earlier after delivery and are more severe than in controls, an issue not addressed in any of the earlier studies. The fact that only a minority of women underwent treatment for their complaints is in line with previous reports and indicates that many women may be reluctant to discuss the problem with their physician, or that their complaints are not taken seriously (6, 19).

Findings with regard to urinary incontinence in our study confirm the results of Nygaard et al. (6) and Haadem and Gudmundsson (19) and support evidence that the development of urinary incontinence after delivery may mainly be due to general damage or denervation of the pelvic floor, which is not significantly affected by rupture of the anal sphincter complex (16).

Knowledge of risk factors for the development of fecal incontinence after anal sphincter damage is needed for adequate counseling of women with previous sphincter damage. Using stepwise logistic

regression analysis we identified the extent of anal sphincter damage as an independent risk factor for the development of fecal incontinence. Tetzschner et al. (18), using a different classification of anal sphincter damage, found no association between the extent of damage and subsequent fecal incontinence. Their classification with a very discrete classification of sphincter damage may be difficult to use in daily practice. Our findings confirm the results of Poen et al. (10) and Haadem et al. (21), who also found an increased risk for development of fecal incontinence after involvement of the anal mucosa.

In contrast to the findings reported by Møller Bek and Laurberg (8), who reported an increased risk of fecal incontinence after subsequent vaginal delivery in women with mild or transient symptoms, and Sangalli et al. (22), who reported an increased risk of fecal incontinence in women with fourth degree tears, our findings showed that subsequent vaginal deliveries were not associated with an increased risk of fecal incontinence after anal sphincter damage during delivery. The observed protective effect of mediolateral episiotomy for the development of fecal incontinence in primiparous women is of note. Only mediolateral episiotomies were performed, as is common practice in The Netherlands. The protective effect may be explained by reduced stretching of the perineum in women with episiotomy, as prolonged stretching of the pelvic floor and the pudendal nerve may aggravate complaints of fecal incontinence (18, 23). Further study is necessary to elucidate the role of mediolateral episiotomy in the development of fecal incontinence after anal sphincter damage during delivery.

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