ELSEVIER

Women's health 18 years after rupture of the anal sphincter during childbirth: I. Fecal incontinence

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Objective: We studied the long-term outcome after an anal sphincter tear.
Study design: From a cohort of 4569 women who gave birth in 1982 to 1983, we identified 445 (9.7%) who sustained a sphincter tear and 445 controls. Eighteen years after the delivery, we mailed them a questionnaire and graded fecal incontinence with the Wexner score, a summary of incontinence to flatus, liquid, or solid stools; need to wear a pad; and lifestyle alterations. We predefined severe incontinence as a score above 4 of 20.
Results: Five hundred forty of 890 women (61%) returned the questionnaire. Severe fecal incontinence was reported by 34 of 259 women (13.1%) after a sphincter tear and 22 of 281 controls (7.8%) (risk ratio 1.7, 95% confidence interval 1.0 to 2.8). Only 6.4% of the reports of fecal incontinence were attributable to a sphincter tear.
Conclusion: Fecal incontinence is frequently reported, even by women who have not sustained an anal sphincter tear. Only a small fraction of fecal incontinence can be attributed to sphincter tears.
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Women with an anal sphincter laceration during vaginal delivery have an increased risk of fecal incontinence later in life despite primary repair.[1-3] Cohort studies of women who suffered this complication of childbirth have reported a prevalence of fecal incontinence varying between 15% and 59%.[3] However, these studies had either short follow-up, small sample size, or no control cohort.

Two studies had follow-up longer than 5 years and a control cohort.[4,5] In one study of 41 women who sustained an anal sphincter laceration during childbirth and 38 controls questioned 20 years postpartum, flatus incontinence was reported by 22% of the women with an anal sphincter tear and 3% of controls (risk ratio 8.3, P = .01).[5] Incontinence to solid feces was reported by 3 of 41 (7%) women with an anal sphincter tear and no controls (P = .09). Another study including 29 women with a sphincter tear, 89 women with an episiotomy without sphincter tear, and 33 women who delivered by cesarean

section with a follow-up time of 30 years found contradictory results.[4] Frequent flatus and fecal incontinence were less frequently reported by women who had sustained an anal sphincter tear than by those with an episiotomy only. Bothersome flatus incontinence was more frequently reported after an anal sphincter tear, whereas bothersome fecal soiling or feces leakage were equally reported by women with and without an anal sphincter tear.

Perineal trauma and its long-term effect are perceived by an increasing number of consumers and health providers as an important complication of childbirth. Because hypothetical preventive strategies including elective cesarean delivery are debated, we sought to clarify the association between anal sphincter laceration and subsequent fecal incontinence.

Material and methods

We compared the prevalence of fecal incontinence 18 years after delivery in a cohort of women who were exposed to an anal sphincter tear and a concurrent cohort of women who were not exposed.

The study was conducted at the maternity department of the Geneva university hospital, Switzerland. Between January 1, 1982, and December 31, 1983, 4569 women delivered and 445 (9.7%) suffered an anal sphincter tear. These years were chosen because they were the first when the computerized obstetrical database was functional. Midline episiotomies were liberally used, and mediolateral episiotomies were used mostly for operative deliveries. After vaginal delivery, the obstetrician on duty, certified residents, or staff obstetricians assessed the perineum and repaired sphincter tears end to end.

The severity of the perineal tear was classified at the time of delivery according to the 9th International Classification of diseases: a third-degree perineal tear was defined as a partial or complete anal sphincter rupture without involvement of the anal mucosa and a fourth-degree tear as a rupture involving the anal sphincter and mucosa. The obstetrician entered the details of the delivery in a computerized database.

More sphincter tears occurred in primiparous women (primiparous women had a risk of 350 of 2408 [14.5%] of sustaining a sphincter tear, whereas in multiparous women the risk was 95 of 2161 [4.4%], $P < .0001$).

We randomly selected a sample of women who were not exposed to an anal sphincter tear frequency matched for parity to obtain a concurrent cohort with the same proportion of primiparous and multiparous women in both groups.

Outcome

We traced the women's current home address with the telephone directory and the state of Geneva administration. All women who could be located were contacted

by telephone by an investigator not aware of their history who explained the study. We then sent a questionnaire to women who had consented to participate, together with a prepaid response envelope. Care was taken not to mention the focus on anal sphincter tears. The protocol for this study was approved by the institutional ethics committee.

Fecal incontinence was graded with the Wexner fecal incontinence scale.[6] This scale is a composite measure of incontinence to flatus, liquid, and solid stools; need to wear a pad; and lifestyle alterations caused by fecal incontinence. For each of these 5 items, numerical values are assigned to the frequency of occurrence (0, absent; 1, less than 1 a month; 2, less than once a week; 3, less than once a day; 4, daily) and summed to obtain the score. Higher scores indicate more severe dysfunction. After pretesting, we considered that the questions concerning symptoms present less than once a month were of little relevance, and they were deleted from the questionnaire. In a previous study, we found a good agreement between responses to the questionnaire and responses obtained during an interview conducted by a colorectal surgeon/proctologist (kappa 0.73).[7]

We expected that most women would have no or minor symptoms. To avoid reporting very skewed distributions, we dichotomized ordinal outcomes. Before analyzing the data, we defined severe fecal incontinence, our main outcome, as a Wexner score above 4. This required a positive answer for at least 2 symptoms at least once a week or 3 symptoms. Scores of 1 to 4 were defined as minor incontinence, and scores above 8 as very severe incontinence.

The impact of fecal incontinence on the quality of life was assessed with the Fecal Incontinence Quality of Life Scale. This 29-point scale covers 4 main areas: lifestyle (10 items), coping and behavior (9 items), depression and self-perception (7 items), and embarrassment (3 items).[8]

Sample size

Taking into account the prevalence of fecal incontinence of 14% in women with an anal sphincter tear in our previous study and expecting a 75% response rate, a sample size of 445 women in each cohort gave a power of 81% to show a risk ratio of fecal incontinence of 2 in women with a previous anal sphincter tear, with a risk of type I error of 5% (2 tailed).[9]

Statistical methods

We performed data management with EpiInfo 6 (Centers for Disease Control and Prevention, Atlanta, GA) and analysis with Stata 8 (Stata Corporation, College Station, TX). The effect of the exposure on binary outcomes was estimated by the risk ratio with 95% confidence intervals and significance was tested with the

Table I Obstetrical characteristics

	Sphincter tear n = 445	Control n = 445	P
Multiparous, n (%)*	350 (21.3)	350 (21.3)	—
Operative vaginal delivery, n (%)	153 (34.4)	86 (19.3)	<.0001
Cesarean delivery, n (%)	0	58 (13.0)	<.0001
Episiotomy, n (%)	425 (95.5)	311 (69.9)	<.0001
Birth weight (kg), mean $\pm$ SD	3.4 $\pm$ 0.4	3.2 (0.5)	<.0001
Labor induction, n (%)	57 (12.8)	60 (13.5)	.77
Epidural analgesia, n (%)	198 (44.5)	208 (46.7)	.50

 * Groups were frequency matched for parity.

Table II Fecal incontinence symptoms

	Sphincter tear				Control				
Symptom	Never	Rarely	Weekly	Daily	Never	Rarely	Weekly	Daily	P
Involuntary passage of flatus	142 (54.4)	88 (33.7)	27 (10.3)	4 (1.5)	176 (62.6)	82 (29.2)	20 (7.1)	3 (1.1)	.04
Involuntary passage of liquid stools (diarrhea)	234 (89.3)	26 (9.9)	2 (0.8)	0	269 (95.4)	13 (4.6)	0	0	.007
Involuntary passage of solid stools	256 (97.3)	6 (2.3)	1 (0.4)	0	281 (99.3)	2 (0.7)	0	0	.07
Wear pads for fecal incontinence	239 (91.2)	7 (2.7)	4 (1.5)	12 (4.6)	268 (94.7)	5 (1.8)	2 (0.7)	8 (2.8)	.11
Lifestyle alterations caused by fecal incontinence	227 (86.0)	29 (11.0)	6 (2.3)	2 (0.8)	257 (90.2)	20 (7.0)	6 (2.1)	2 (0.7)	.14

χ^2 test. We tested the null hypothesis of no association between the exposure and ordinal and nonnormally distributed continuous outcomes with the 2-sample Wilcoxon rank-sum test. Normally distributed continuous outcomes were compared with the 2-sample Student *t* test. Potential interaction between risk factors for fecal incontinence was explored by stratified analysis and risk ratio across strata, compared with the Mantel-Haenszel test of homogeneity.

We calculated the fraction of fecal incontinence attributable to sphincter tears with the formula population attributable fraction, $PAF = p*(\theta - 1)/[p*(\theta - 1)+1]$, where p is the proportion of subjects exposed to a sphincter tear and θ their risk ratio of fecal incontinence.

Results

From our study population of 890 women (445 with an anal sphincter tear and 445 unexposed), we located 701 women (78.8%), among which 540 (77.0%) completed the questionnaire, 7 (1.0%) returned incomplete questionnaires, 14 had died (2.0%), and 138 declined participation (19.7%). The mean time between delivery and response to the questionnaire was 19.1 years, (SD 0.67).

The questionnaire was returned by 259 of 445 women (58%) from the sphincter tear group and 281 of 445 (63%) from the control group (risk ratio 0.9, 95% confidence interval 0.8 to 1.0). The obstetrical characteristics of responders were similar to those of nonresponders (data not shown). Women from the sphincter tear group were slightly older than controls (47.0 versus 46.1 years, P = .02). The proportion of menopausal women was not different between groups (25% in women with an anal sphincter tear and 20% in controls, P = .18). Women having sustained an anal sphincter tear were more likely to have had a vaginal operative delivery, an episiotomy, and a heavier baby, whereas there was no difference in the proportion of epidural use or labor induction (Table I).

After an anal sphincter tear, women were more likely to pass involuntarily flatus and liquid stools and also (with borderline significant differences) solid stools (Table II). The need to wear a pad for fecal incontinence and lifestyle alterations caused by fecal incontinence were also greater after an anal sphincter tear, but this did not reach statistical significance.

When symptoms were summarized with the Wexner fecal incontinence score, 132 women (51.0%) after an anal sphincter tear reported at least 1 symptom (Wexner score above 0), compared with 113 controls (40.2%) (risk ratio 1.27, 95% confidence interval 1.05 to 1.53, P = .01). Severe incontinence (Wexner score above 4) was reported by 34 women (13.1%) after a sphincter tear and 22 controls (7.8%) (risk ratio 1.68, 95% confidence interval 1.01 to 2.79, risk difference of 5.3%, 95% confidence interval 0.1% to 10.5%, P = .04). Very severe symptoms (Wexner score above 8) were reported by 10 women (3.9%) after a sphincter tear and 3 controls (1.1%) (risk ratio 3.62, 95% confidence interval 1.01 to 13.0, P = .03).

Table III Risk factors for severe fecal incontinence (defined as a Wexner score above 4)

Variable	Category	Continent n (%)	Incontinent n (%)	Risk ratio (95% CI)	P
Anal sphincter tear	No	259 (92.2)	22 (7.8)	1	
	Yes	225 (86.9)	34 (13.1)	1.7 (1.0-2.8)	.04
Age at follow-up, y	<45	193 (92.3)	16 (7.7)	1	
	45-50	193 (90.6)	20 (9.4)	1.23 (0.65-2.30)	.52
	>50	98 (83.1)	20 (17.0)	2.21 (1.19-4.10)	.01
Operative vaginal delivery	No	365 (91.5)	34 (8.5)	1	
	Yes	119 (84.4)	22 (15.6)	1.83 (1.11-3.02)	.02
Parity	Primiparous	388 (90.0)	45 (10.4)	1	
	Multiparous	96 (89.7)	11 (10.3)	0.99 (0.53-1.85)	.97
Cesarean delivery	No	455 (94.0)	29 (6.0)	1	
	Yes	54 (96.4)	2 (3.6)	0.61 (0.16-2.38)	.46
Episiotomy	No	75 (91.5)	7 (8.5)	1	
	Yes	409 (89.3)	49 (10.7)	1.04 (0.93-1.15)	.55
Birth weight (kg)	<3000	102 (87.9)	14 (12.1)	1	
	3000-3499	214 (91.1)	21 (8.9)	0.74 (0.39-1.40)	.36
	3500-3999	139 (89.7)	16 (10.3)	0.86 (0.44-1.68)	.65
	≥4000	29 (85.3)	5 (14.7)	1.21 (0.47-3.14)	.68

The impact of fecal incontinence on quality of life was similar in women having sustained an anal sphincter tear and in controls (fecal incontinence quality of life score: mean 3.5 SD 0.6 in both groups, $P = .70$).

The prevalence of fecal incontinence was increased in older women and women who had an instrumental delivery (Table III). Multiparity at the time of the index delivery, episiotomy, and the infant's birth weight were not associated with fecal incontinence (Table III).

Further deliveries after the index delivery were reported by 47% of the women in both groups and did not increase the risk of incontinence in women with a sphincter tear (risk ratio 0.7, 95% confidence interval 0.4 to 1.3) or in controls (risk ratio 0.9, 95% confidence interval 0.4 to 2.1) (Mantel-Haenzel test of homogeneity of risk ratios between groups, $P = .57$).

The comparison of women who sustained an anal sphincter tear without extension to the anal mucosa (third-degree perineal tear) with women with sphincter tears with extension to the anal mucosa (fourth-degree perineal tear) revealed an increased risk of minor symptoms from 46.8% to 62.0% (risk ratio 1.32, 95% confidence interval 1.04 to 1.68), but no increase in the risk of severe fecal incontinence (Wexner score above 4, risk ratio 0.79, 95% confidence interval 0.34 to 1.84).

Responses were available for 31 women who had delivered by cesarean section at the index delivery. Cesarean section was associated with a statistically non-significant reduction of the risk of severe fecal incontinence (Wexner score above 4) from 10.6% to 6.4% (risk ratio 0.61, 95% confidence interval 0.16 to 2.38, $P = .56$). No woman with a cesarean section had very severe fecal incontinence (Wexner score above 8) (0 of 31, 95% confidence interval 0 to 11.2%).

The risk of fecal incontinence after a sphincter tear was greater for multiparous than primiparous women (Mantel-Haenszel test of homogeneity of risk ratio, $P = .06$): if the sphincter tear occurred at the first delivery, the risk of fecal incontinence was not significantly increased, from 9.0% to 11.8% (risk ratio 1.30, 95% confidence interval 0.75 to 2.27, difference of 2.7%, 95% confidence interval −3.0 to 8.5%, $P = .35$). If the woman was multiparous at the time of the sphincter tear, her risk of fecal incontinence was greatly increased if she sustained a sphincter tear, from 3.3% to 19.1% (risk ratio 5.74, 95% confidence interval 1.30 to 25.3, difference of 15.8%, 95% confidence interval 3.7 to 27.9%, $P = .008$).

Recollection of an anal sphincter injury was reported by 68 of 251 of the women from the anal sphincter tear group (27%) and 32 of 269 from the control group (11.9%). Women who recalled having sustained an anal sphincter injury reported more fecal incontinence (23 of 98, 23.5%) than those who did not (32 of 415, 7.7%) (risk ratio 3.0, 95% confidence interval 1.9 to 5.0). When restricting the analysis to women who did not recall a tear, 18 of 180 (10.0%) from the sphincter tear group reported fecal incontinence, compared with 14 of 235 controls (6.0%) (risk ratio 1.7, 95% confidence interval 0.9 to 3.3, $P = .13$).

Only 16 of 56 (29%) of the women who reported severe fecal incontinence had sought medical advice for their condition. Three women reported having had surgery for fecal incontinence, and 2 were still symptomatic.

For women who were primiparous at the time of delivery, among whom 14% suffered an anal sphincter tear and had a risk ratio of fecal incontinence of 1.3, the proportion of severe fecal incontinence attributable to an anal sphincter tear was 4%. For multiparous women,

among whom 4% suffered an anal sphincter tear and had a risk ratio of fecal incontinence of 5.7, the proportion of severe fecal incontinence attributable to an anal sphincter tear was 14%.

For primiparous women, elective cesarean delivery to avoid the risk of fecal incontinence from a sphincter tears could potentially reduce the risk of fecal incontinence from 9.4% to 9.0% (250 cesarean deliveries to prevent 1 case of incontinence). In multiparous women, the risk of incontinence would have been reduced from 3.9% to 3.3% (167 cesarean deliveries to prevent 1 case).

Comment

Our data show that women who sustained an anal sphincter tear during childbirth have a slightly increased risk of fecal incontinence 18 years later. Age and operative vaginal delivery also independently increased the risk of anal incontinence.

Our results contradict the belief that many cases of fecal incontinence are attributed to an obstetrical sphincter laceration but are not surprising. Asymptomatic lacerations of the anal sphincter are common, and secondary repair of an anal sphincter tear frequently fail to restore full continence.[10,11] Fecal incontinence among women delivered by cesarean section and in men strongly suggest that factors other than vaginal delivery and anal sphincter tears play a major role.[2,12,13]

Misclassification of the exposure (anal sphincter tear) could have reduced the strength of the association with subsequent incontinence. Postpartum sonographic studies of the anal sphincter have shown that clinically occult anal sphincter tears are present in about a third of women after their first delivery.[10]

Classification of the outcome, fecal incontinence, is also prone to imprecision and bias. Using different definitions may lead to important differences in the prevalence of the condition or in associations with risk factors or treatments.[3] We predefined our main and secondary outcomes before the analysis and chose a widely used measure of fecal incontinence with predetermined cut-offs to increase the validity of the results. The sample size limited the power of the study to explore the association between infrequent symptoms and sphincter tears and to explore fully potential confounding and interaction.

In conclusion, fecal incontinence is frequently reported by women, but only a minority can be attributed to anal sphincter tears during childbirth. Women who suffer an anal sphincter tear during delivery should be reassured and offered practical advice and investigations in case of future symptoms.

It is likely that obstetrical interventions to reduce the risk of fecal incontinence after childbirth, including elective caesarean section, will have only a limited long-term impact and should be carefully evaluated in studies with adequate sample size to demonstrate small benefits.

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