

A prospective observational study on tears during vaginal delivery: occurrences and risk factors

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Background. To ascertain the occurrence and distribution of various types of I-IV degree tears, during childbirth, and analyze risk factors for perineal II degree tears.

Materials and methods. A total of 2883 consecutive vaginal deliveries, during 1995–97 at Sahlgrenska University Hospital in Göteborg Sweden, were included. All tears were classified according to an especially designed protocol, and risk factors for II degree tears were evaluated by use of univariate and logistic regression analysis.

Results. Only 6.6% of nulliparous parturients had no detectable tear as compared to 34.2% in parous women. Almost half of the women suffered from a II degree tear during birth, and a higher proportion of nulliparous (16.6%) than parous (9.4%) women had extensive perineal lacerations. In addition, nulliparous were more likely than parous parturients to be subjected to a perineotomy (18.1% versus 5.6%). Stepwise logistic regression analysis revealed that the following factors remained independently associated with II degree tear: slight perineal edema, high infant weight, excellent visualization of perineum, increasing age of the mother, excellent cooperation of the women, protracted second phase (> 60 min) and duration of second phase < 30 min.

Conclusions. The majority of women (78%) undergoing childbirth had a tear and 47.1% suffered from perineal lacerations. Nulliparous women were more likely to have severe perineal lacerations or episiotomies. Similar risk factors were found for II degree tears as previously shown for III/IV degree tears.

Keywords: episiotomy; parity, perineal tear; risk factors

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Previous research has mainly focused on anal sphincter lacerations during delivery (1–5), which are known to be associated with long-term ailments. Much less attention has been paid to other types of tears. It is well known that perineal non-sphincter injuries in connection with episiotomy sometimes cause perineal pain and incontinence (6–8), but there is limited data available on the occurrence and distribution of various types of spontaneous I-II degree lacerations.

Second degree tears include a range of lesions, varying from a small tear that is likely to be of no

harm, to extensive lacerations with involvement of muscles of the pelvic floor which could lead to long-term fecal and urinary incontinence as well as to sexual dysfunction. The frequency and risk factors of such tears, and their long-term consequences are insufficiently analyzed.

Our aims were to characterize all types of tears (I-IV degree), and to analyze them with regard to parity in nulliparous and parous women. Furthermore, the risk factors for perineal II degree tears were evaluated using univariate and stepwise logistic regression analysis.

Materials and methods

In the period 1995–97, all women ($n = 3723$) expecting a vaginal delivery at Sahlgrenska University Hospital in Göteborg were recruited prospectively, including multiple births and breech deliveries. A total of 2883 women were recruited, corresponding to 77.4% of all those admitted dur-

ing the time period. Those who were not included tended to be women for whom detailed information was not completed by the hospital unit, which mainly was related to a shortage of staff during busy hours.

Delivery was assisted by midwives under ordinary circumstances, whereas instrumental deliveries were performed by obstetricians. The midwife

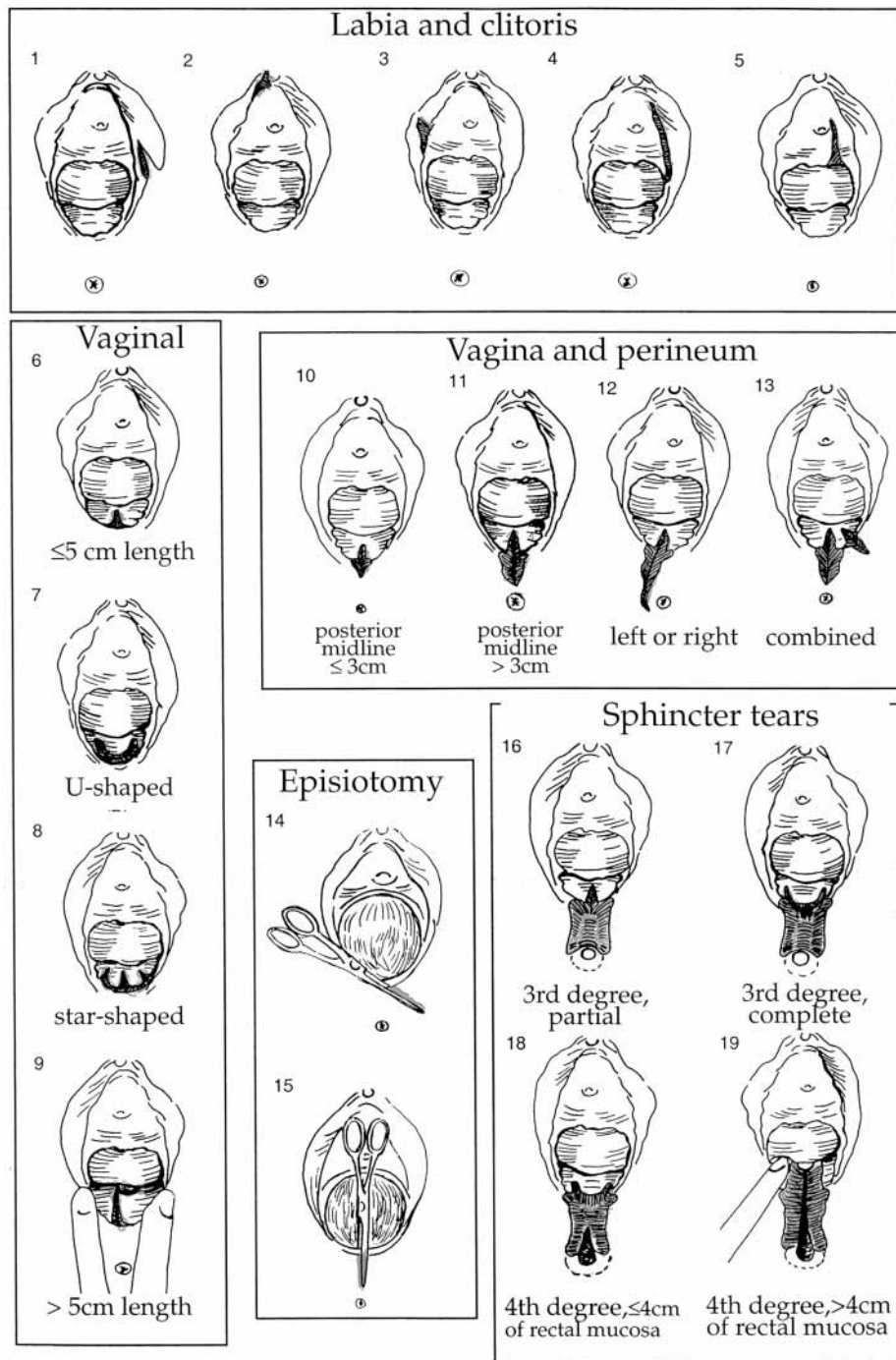


Fig. 1. Sketches demonstrating the classification of first (1–9), second (10–13), third (16, 17) and fourth (18, 19) degree tears, and episiotomies (14, 15) used in the present study.

diagnosed I-II degree tears. In case of a perineal laceration in proximity to the anal sphincter, the midwife consulted the obstetrician for assessment of the extent of injury. Extensive perineal lesion is defined as a grade II tear with a posterior midline rupture >3 cm (type no. 11–13, in Fig. 1) and serious perineal damage (type no. 11–13, 16–19 in Fig. 1), also includes sphincter tears. Rupture of the anal sphincter (partial or complete) was diagnosed as III degree, and a complete tear combined with laceration of the anal canal or rectum as IV degree tear.

The following information was acquired from records and the especially designed protocol: age, parity, interval since previous birth, previous episiotomy, previous sphincter tear, duration of first stage of labor (start of delivery defined as cervix dilated ≥ 3 cm), duration of second stage of labor, duration of bearing down, time from point when the presenting part was visible during contraction to delivery, time from presenting part visible during and between contractions until delivery, number of uterine contractions from passage of the fetal head through perineum to delivery of the infant, delivery position (there were three predetermined positions: lateral, semirecumbent or kneeling), use of manual perineal protection, ocular surveillance of perineum (excellent, partial or no ocular surveillance), degree of perineal edema (slight, moderate or severe), manual assistance during delivery of the fetal head and/or shoulders, year when the midwife graduated, professional experience (counted in years) of the midwife, use of vacuum extraction ($n = 159$) or forceps ($n = 5$), expeditious delivery due to fear of fetal asphyxia, the woman's ability to relax between contractions (acceptable, slight or no relaxation), use of oxytocin during first stage and/or second stage, mode of anesthesia or other methods to relieve pain (epidural, nitrous oxide, acupuncture, pudendal blockade, local anesthesia and/or warm towels placed towards perineum), indication for episiotomy, suture technique, fetal presentation, the infants weight and head circumference. A newly designed skeleton sketch was introduced for classification of I-IV degree tears and episiotomies (Fig. 1). All tears were graphically described and numbered (1–19) by the attending midwife directly after birth.

Data Analysis

The association between the above factors and the occurrence of tears with perineal involvements (II degree tear), was tested with univariate logistic regression, and stepwise logistic regression analysis was used to suggest the predictor variables, which consisted of apparently independent and signifi-

cant predictors of II degree tear. Odds ratios with 95% confidence intervals were calculated.

Results

A II degree tear occurred in 34.8% of nulliparous women (Table I), and in 39.6% of parous women. Only 6.6% (Table I) of nulliparous women underwent delivery without any laceration, whereas 34.2% of parous women remained uninjured. There was generally an increased occurrence of tears amongst nulliparous compared to parous parturients (Table II) except for a small (≤ 3 cm) perineal tear (no. 10; Fig. 1, Table II). Episiotomy was performed 3 times more often among nulliparous than parous women, 18.1% and 5.6%, respec-

Table I. Frequency of I-IV degree lacerations and episiotomy in primiparous and parous women

	Primiparous <i>n</i> % (<i>n</i> = 1296)	Parous <i>n</i> % (<i>n</i> = 1587)
No tear or episiotomy	86 (6.6%)	543 (34.2%)
I degree tear	451 (34.8%)	314 (19.8%)
II degree tear	499 (38.5%)	629 (39.6%)
III degree tear	61 (4.7%)	27 (1.7%)
IV degree tear	5 (0.4%)	2 (0.13%)
Episiotomy	234 (18.1%)	89 (5.6%)

Table II. Frequency and distribution of different types (1–19) of I-IV degree tears and episiotomies, each woman could have more than one type of tear

Tear #	Primiparous (<i>n</i> = 1296) <i>n</i> (%)	Parous (<i>n</i> = 1587) <i>n</i> (%)	Total (<i>n</i> = 2883) <i>n</i> (%)
No tear	86 (6.6)	543 (34.2)	629 (21.8)
I degree tear			
1	49 (3.8)	23 (1.4)	72 (2.5)
2	70 (5.4)	60 (3.8)	130 (4.5)
3	234 (18.1)	103 (6.5)	337 (11.7)
4	122 (9.4)	39 (2.5)	161 (5.6)
5	29 (2.2)	17 (1.1)	46 (1.6)
6	252 (19.4)	210 (13.2)	462 (16.0)
7	57 (4.4)	16 (1.0)	73 (2.5)
8	21 (1.6)	5 (0.3)	26 (0.9)
9	30 (2.3)	3 (0.19)	33 (1.1)
II degree tear			
10	283 (21.8)	479 (30.2)	762 (26.4)
11	169 (13.0)	116 (7.3)	285 (9.9)
12	26 (2.0)	27 (1.7)	53 (1.8)
13	21 (1.6)	7 (0.4)	28 (1.0)
14 + 15 (episiotomy)	234 (18.1)	89 (5.6)	323 (11.2)
III degree tear			
16	50 (3.9)	19 (1.2)	69 (2.4)
17	11 (0.9)	8 (0.5)	19 (0.7)
IV degree tear			
18	4 (0.3)	2 (0.13)	6 (0.2)
19	1 (0.08)	0 (0)	1 (0.03)

Table III. Univariate analyzes of the association between intrapartum variables and II degree tear, values are given as *n/n total (%)*

	II degree tear Incidence	OR (95% CI)		
Parity				
> 1 previous deliveries	155/465 33,3			
1 previous delivery	462/1009 45,8	1.689	1.343	2.124
Nulliparity	475/1012 46,9	1.769	1.407	2.224
Professional experience of the midwife				
Experience < 1 years	185/421 43,9	1.0		
Experience 1–5 years	306/652 46,9	1.128	0.882	1.443
Experience > 5 years	601/1413 42,5	0.944	0.758	1.176
Infant weight (kg)				
< 3000	102/359 28,4	1.0		
3000–4000	763/1703 44,8	2.045	1.595	2.622
> 4000	227/424 53,5	2.903	2.154	3.913
Duration of first stage of labor				
< 3 h	274/690 39,7	1.0		
> = 3 h < 6 h	468/1085 43,1	1.152	0.948	1.398
> = 6 h < 9 h	212/453 46,8	1.336	1.051	1.697
> = 9 h < 12 h	95/184 51,6	1.621	1.169	2.247
> = 12 h	43/74 58,1	2.106	1.295	3.425
Duration of second stage of labor				
< 30 min	484/1274 38,0	1.0		
30–59 min	237/518 45,2	1.345	1.094	1.654
> 59 min	374/694 53,9	1.908	1.582	2.301
Duration of bear down				
< 10 min	178/512 34,8	1.0		
10–20	265/633 41,9	1.351	1.062	1.719
20–30	168/392 42,9	1.407	1.074	1.844
30–40	110/255 43,1	1.423	1.047	1.936
40–50	98/185 53,0	2.114	1.503	2.973
50–60	89/164 54,3	2.227	1.558	3.182
> 60	184/345 53,3	2.144	1.622	2.834
Time from presenting part visible in vulva during contraction to delivery				
< 5 min	150/384 39,1	1.0		
> = 5 min < 10	211/562 37,5	0.938	0.718	1.225
> = 10 min < 15	187/447 41,8	1.122	0.850	1.482
> = 15 min < 20	117/253 46,3	1.342	0.973	1.850
> = 20 min < 25	126/238 52,9	1.755	1.266	2.433
> = 25 min	283/569 49,8	1.544	1.187	2.007
Manual perineal protection				
Yes	980/2557 43,4	1.0		
No	112/229 48,9	1.247	0.950	1.638
Visualization of perineum during last phase of bear down				
Excellent	697/1735 40,2	1.0		
Partial	342/664 51,5	1.578	1.318	1.889
No visualization	50/82 61,0	2.321	1.474	3.655
Perineal edema				
Slight	759/1921 39,5	1.0		
Moderate	272/466 58,4	2.147	1.748	2.638
Severe	60/96 62,5	2.553	1.672	3.897
Vacuum extraction				
No	1049/2418 43,2	1.0		
Yes	43/68 63,2	2.245	1.362	3.699
No use of oxytocin during first stage				
Use of oxytocin during first stage	794/1860 42,7	1.0		
Use of oxytocin during first stage	298/626 47,6	1.220	1.017	1.463
No use of oxytocin during second stage				
Use of oxytocin during second stage	596/1466 40,7	1.0		
Use of oxytocin during second stage	496/1020 48,6	1.382	1.176	1.623
No use of epiduralanesthesia				
Use of epiduralanesthesia	791/1869 42,3	1.0		
Use of epiduralanesthesia	301/617 48,8	1.298	1.081	1.558
Fetal presentation				
Normal	1039/2379 43,7	1.0		
Occiput posterior	43/75 57,3	1.734	1.090	2.760
Breech	10/31 32,3	0.615	0.288	1.311

Table IV. Risk factors significantly associated with grade II tear as analyzed with logistic multiple regression

	OR (95% CI)			p
Slight perineal edema	0.609	0.494	0.750	<0.0001
Infant weight (kg)	1.801	1.529	2.123	<0.0001
Excellent visualization of perineum	0.637	0.529	0.767	<0.0001
Duration of second stage of labor >60 min	1.307	1.027	1.663	<0.0001
Age of women (years)	1.046	1.028	1.064	<0.0001
Excellent cooperation of the woman	0.716	0.603	0.850	0.0002
Duration of second stage of labor <30 min	0.729	0.586	0.908	0.0046

tively (Table II). Extensive tears (type no. 11–13, 16–19 in Fig. 1) and/or episiotomy occurred in 37.3% of nulliparous and in only 16.0% of parous parturients (Table II). There was no significant association between II degree tear and the following variables: age of woman; number of contractions between passage of the head and delivery of the infant; manual perineal protection; manual assistance for delivery of shoulders; professional experience of the midwife; expeditious delivery due to suspected asphyxia; the woman's ability to relax between contractions and head circumference. Threatening fetal asphyxia (30%), vacuum extraction (23%) and tight perineum (18%) were the most common indications for episiotomy. 'Other indications' were much more frequent in parous women, which relates to fragile, scarred or injured pelvic floor after previous deliveries, episiotomy or suturing. Episiotomy was used in half of the women delivered by vacuum extraction. Most women (90.2%) were delivered in the three predetermined positions, but birth position did not appear to be a risk factor for II degree tear (data not shown).

The univariate analysis (Table III) demonstrated that the estimated risk of II degree tear among all women, was increased by nulliparity, and 1 previous delivery, high infant weight, long duration of first and second stage of labor, long duration of bearing down or the very last phase of the pushing phase. The risk of tearing was increased by partial or no visualization of perineum, perineal edema, vacuum extraction, use of oxytocin, epidural anesthesia and occiput posterior presentation. All factors were processed by stepwise logistic regression analysis (Table IV), including those factors that were not significantly associated with outcome in the univariate model. Slight perineal edema, excellent visualization of perineum, excellent cooperation of the woman and a duration of second stage of labor <30 min, all reduced the risk of II degree tear, whereas high infant weight, high age of the mother, and second stage of delivery >60 min independently increased the risk. There were no differences between nulliparous and parous women.

Discussion

The prospective design of the study was a prerequisite in order to obtain critical information concerning the mode of delivery and the way labor was assisted. It is usually not possible to retrieve such information from standard birth records. Much effort was put into the preparation of protocols with active participation of the staff to ensure high quality of the acquired information.

As expected, the frequency of lacerations is higher among nulliparous than parous women (93.5% versus 66.2%). All tears are more common among nulliparous women except for a small II degree tear (Fig. 1, no. 10, and Table II) which were more common in parous women. Röckner et al. (8) found that the frequency of women with intact perineum after delivery was 28% compared to 48.4% in the present study. The difference relates mainly to the higher frequency of episiotomies in Röckner's material.

It is difficult to find data in the literature for comparison because of the changed policy in Sweden with a relatively low rate of episiotomy (11.2%) in the present material as compared to previous studies.

We found presently that 37.3% of nulliparous and 16.0% of parous women suffered from serious perineal damage (comprising laceration no. 11–19; Fig. 1) which are surprisingly high occurrences. It is well known that the risk for anal sphincter tears is higher for nulliparous women (1, 3, 4), which agrees with the present data showing that extensive II degree tear was twice as high in nulliparous than in parous women. If the numbers for vaginal and perineal tears, episiotomy and sphincter tears were added, nulliparous have higher occurrence of damage compared to parous women (61.7%, respectively, 47.1%). This means that parous women suffers from fewer and less serious tears than nulliparous women, which is in accordance to results for other lacerations.

It is also interesting to note that the risk factors for II degree tears are very similar to the risk factors previously found for anal sphincter tears (4). This

could imply that the same strategy could be used for decreasing grade II and grade III/IV tears.

Nulliparous women are subjected to episiotomy three times as often as parous women (18% versus 6%). Most studies suggest that episiotomy, and midline episiotomy in particular, should be utilized with great caution as episiotomy tends to increase the risk of anal sphincter tears (3, 6, 7, 9, 10). It is also important to keep in mind that episiotomy itself increases the risk of chronic ailments (8). So it remains uncertain if some patients benefit from episiotomy and, if they do benefit, which patients should be targeted.

This study shows that a high proportion of women suffers from lacerations after delivery, and the number of extensive II degree tear is high. Even though many of these tears may be clinically insignificant, it will be interesting to see which of the lacerations that are associated with long-term deficits, which is being analyzed in an on-going follow-up study. The ultimate goal is to avoid lacerations that cause long-lasting and chronic problems by increased knowledge of the mechanisms involved and, subsequently, improvement of obstetric management.

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