

Third and fourth degree perineal tears

Predictor factors in a referral hospital

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Background. Tears of the anal sphincter are a feared complication of vaginal delivery, as many as 50% of these patients experience incontinence as an after-effect. Identifying significant predictor factors leading to third or fourth degree perineal tears during vaginal delivery was the objective of this study.

Methods. During a two-year period (1995–1996), a third or fourth degree perineal rupture occurred in 214 women (3.7%) after vaginal delivery. Data from these deliveries were collected and compared to data from deliveries without anal sphincter tears in order to identify risk factors. A stepwise logistic regression model was used for the analysis.

Results. Independent risk factors of significance were vaginal nulliparity, a squatting position on a delivery chair, maternal age exceeding 35 years, baby's birth weight over 4000 g, vacuum extraction (both outlet and mid release), median episiotomy, oxytocin augmentation and birthing between 3 a.m. and 6 a.m.

Conclusions. This study identified several factors associated with anal sphincter tears. Median episiotomy should be avoided. Delivery, while squatting on a low chair, should be used with caution. A woman with one or more risk factors requires caution by birth attendants during delivery. Gynecologists should consider the option of cesarean section instead of vacuum extraction, especially when mid release is needed in the presence of macrosomia. A continuous audit regarding instrumental delivery technique is necessary.

Key words: anal sphincter tear; predictor factors

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The number of women requesting an operative delivery method is slowly but steadily increasing in western society (1). One of several reasons for such a request is the woman's fear of trauma to the pelvic floor during vaginal delivery (1, 2). Despite primary repair of the third or fourth degree perineal tear, 20–50% of the women will experience fecal incontinence afterwards (3).

Identifying women, before onset of labor, with an increased risk of anal sphincter rupture during vaginal delivery would therefore be of value. Identified risk factors reported in previous studies were

primiparous delivery (4–6), forceps delivery (4, 5, 7), high baby birth weight (4–6), median episiotomy (6, 7), abnormal fetal position (4) and induced labor (5). In the present case control study, different predictor factors for anal sphincter tearing during vaginal delivery were evaluated in a hospital with a relatively high incidence of anal sphincter tears.

Methods

This retrospective study covered a two-year period from January 1st 1995 to December 31st 1996. The study was performed in a Swedish referral hospital with approximately 3,600 deliveries per year. At this specific hospital, the midwife, after each deliv-

Abbreviations:

OR: odds ratios; CI: confidence intervals; BMI: body mass index.

ery, routinely records delivery data into a database located on the delivery ward. Six point six percent of the 6,789 deliveries during the investigated period were instrumental. The cesarean section rate was 14.2% of the total births. Thirty-nine point three percent of the women were primiparas (Table I).

During the studied period, 216 women (3.7%) were recorded as having obtained a third or fourth degree perineal rupture. After review of the 216 delivery files, 214 women were included in the study as having an anal sphincter rupture. Two of the women were not correctly registered and their medical records could not be obtained, nor could the diagnosis be confirmed. These two women were thus excluded from the study.

According to the Swedish national birth register, the number of third and fourth degree perineal ruptures over the same period was 200 for this hospital. These women were all registered in the local database. The national birth register is built on a diagnosis given by the doctor at discharge from the postnatal ward. Consequently, by using the national register only, 6.5% of the cases would have been missed.

For each of the 214 cases, an unmatched control was selected. The first patient admitted to the delivery room after the identified case, was selected as a control, provided she had a vaginal delivery without a third or fourth degree perineal rupture. Cases and controls were identified through the database in the delivery unit while data were gathered from the woman's medical record.

In total, 44 factors were identified and analyzed as possibly causing anal sphincter tear (Table II). Methods of pain relief were analyzed each *per se* and also pooled together in clusters comparing women with some form of analgesia to those who delivered with no pain relief other than nitrous oxide. A senior registrar or a consultant confirmed and repaired all sphincter tears. Episiotomies were of either median or mediolateral type. Vacuum

cups used were either Malmström or a soft cup, both 50-mm in diameter. Epidural analgesia during labor was in 98% of the cases given as a 'stand up epidural' with Sufenta® (Janssen-Cilag, Beerse, Belgium).

Statistics

A stepwise logistic regression model was used to estimate the probability of obtaining an anal sphincter tear during vaginal delivery. The least significant variable was excluded in each step. Three non-significant factors, epidural analgesia, mediolateral episiotomy and previous sphincter rupture, were kept in the model as they were considered to be of high interest. The Wald statistic was used to assess the significance of individual predictors in the logistic model. Odds Ratios (OR) with 95% confidence intervals (CI) were calculated. A *p*-value less than 0.05 was considered as statistically significant. SPSS 9.0 statistical software package was used for the analysis.

Results

During the studied period, there were 5,822 vaginal deliveries (Table I). An anal sphincter rupture, complete or incomplete, occurred in 214 women (3.7%) (Table III). The third degree tears were incomplete in 151 women (2.6%) and complete in 45 (0.8%). Consequently, the complete tears contributed to 23% of the third degree tears. Fourth degree tears involving the rectal mucosa occurred in 18 women (0.3%). The fourth degree tears were complete in all cases. Table II shows the distribution of the identified predictors in the two groups. All risk factors were represented in cases and controls except deep transverse position, shoulder dystocia and forceps delivery of which there were none in the control group.

Ten of the predictor variables were significantly related to the likelihood of having an anal sphinc-

Table I. Total number of deliveries, delivery mode, and frequency of episiotomy 1995–96

	Nulliparas		Multiparas		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Total number of deliveries	2,668	100	4,121	100	6,789	100
Spontaneous vaginal delivery	1,858	69.6	3,515	85.3	5,373	79.1
Vacuum extraction	340	12.7	106	2.6	446	6.6
Forceps delivery	3	0.1			3	0.04
Cesarean section	467	17.5	500	12.1	967	14.2
<i>Medio-lateral episiotomy</i>	230	10.4*	88	2.4*	318	5.5*
<i>Median episiotomy</i>	137	6.2*	77	2.1*	214	3.7*

*% of vaginal deliveries.

ter tear. These independent predictors were vaginal nulliparity, delivery while squatting on a low chair, maternal age over 35 years at delivery, birth weight exceeding 4000 g, delivery by vacuum extraction (both outlet and mid release), median episiotomy, labor enhancement with oxytocin, use of some form of analgesia and giving birth between 3 and 6 a.m. (Table IV).

Epidural anesthesia was not a significant risk factor, nor was a previous sphincter rupture. Medio-lateral episiotomy was not significantly associ-

ated with fewer third or fourth degree tears. The woman's non-pregnant body mass index (BMI) was not associated with anal sphincter tear. All cases had at least one risk factor. Consequently, not having any of the identified risk factors could be considered protective.

Discussion

The incidence of third and fourth degree perineal tears was 3.7% during the study period. This is considerably higher than the 0.6% reported by Sultan et al. (4) and Walsh et al. (8). It is also higher than the 1.8% reported by Poen et al. (5) but similar to the 3.3% recently reported by Samuelsson et al. (9). A higher incidence of 6% was reported by Zetterström et al. (6). This investigation (6) was performed in a hospital with a high frequency (62%) of mothers delivering in upright positions such as squatting, kneeling and standing. In the present study, the incidence of complete anal sphincter rupture was 1.1%, a higher figure than the 0.4% previously reported (10).

Most previous studies have shown an association between anal sphincter tear and nulliparity. Instead of looking at parity *per se*, we chose to estimate vaginal nulliparity and vaginal multiparity. Fourteen women, expecting their second infant, already had one child delivered by cesarean section and were thus, by definition, multiparas. In this study, however, they were included in the group of vaginal nulliparas. In agreement with others (4–6), vaginal nulliparity was a significant risk factor for anal sphincter rupture in the present study. This increased risk probably relates to a relatively inelastic perineum.

There is a strong association between midline episiotomies and anal sphincter tears (6, 7, 11–13). In some studies showing a low frequency of anal sphincter tears (4, 5, 8) only mediolateral episiotomies were performed. Median episiotomy is used routinely in North America, and a much higher frequency of third and fourth degree perineal tears is reported (11–13). Labrecque et al. (11) found the incidence of anal sphincter tearing as high as 15% among nullipara. The frequency of median episiotomy in primiparous women was 67.3%. In this Canadian study of 6,522 primiparous women (11), the Odds Ratio (OR) for median episiotomy causing sphincter rupture was 3.60. Klein et al. (14) reported the OR for this event as high as 22.08%. The mediolateral type has therefore replaced median episiotomy in many European countries. It is, however, not clear whether mediolateral episiotomy is beneficial or not in preventing anal sphincter trauma. Many authors (4, 12, 14, 15) recommend a restrictive attitude to-

Table II. Distribution of 44 estimated predictor factors in the two groups

	Women with anal sphincter tear (n=214)		Women without anal sphincter tear (n=214)	
	n	%	n	%
Age > 35 years	30	14.0	16	7.5
Vaginal nulliparity	177	82.7	104	48.6
Para 0	169	79.0	98	45.8
Para 1	38	17.8	66	30.8
Para 2	6	2.8	33	15.4
Para >2	1	0.5	17	7.9
Previous sphincter rupture	5	2.3	3	1.4
Birth weight >4000 g	73	34.1	38	17.8
Birth between 3 and 6 a.m.	45	21.0	30	14.5
Vacuum extraction, outlet	48	22.4	14	6.5
Vacuum extraction, mid release	30	14.0	7	3.3
Forceps	1	0.5	0	0
Medio-lateral episiotomy	32	15.0	17	7.9
Median episiotomy	25	11.7	7	3.3
Labor induction by oxytocin	3	1.4	1	0.5
Labor induction by prostaglandin	15	7.0	11	5.1
Labor induction by amniotomy	5	2.3	6	2.8
Labor stimulation by oxytocin	156	72.9	88	41.1
Labor stimulation by amniotomy	2	0.9	8	3.7
Epidural anesthesia	73	34.1	55	25.7
Local infiltration	97	45.3	55	25.7
Nitrous oxide 70%	172	80.4	159	74.3
Pethidin	30	14.0	17	7.9
Paracervical block	9	4.2	6	2.8
Pudendal nerve block	4	1.9	2	0.9
Acupuncture (pain relief)	73	34.1	48	22.4
Use of analgesia*	184	86.0	126	58.9
Occipital-posterior presentation	13	6.1	3	1.4
Deep transverse position	2	0.9	0	0
Breech presentation	4	1.9	4	1.9
Shoulder dystocia	3	1.4	0	0
1 st stage <2 hrs	26	12.1	38	17.8
1 st stage >8 hrs	36	16.8	19	8.9
2 nd stage < 20min	30	14.0	97	45.3
2 nd stage >120min	48	22.4	25	11.7
Birth position (BP) lithotomy	118	55.1	66	30.8
BP kneeling	9	4.2	21	9.8
BP squatting on a low chair	19	8.9	7	3.3
BP lateral	19	8.9	44	20.6
BP semi sitting	40	18.7	71	33.2
BP standing	2	0.9	0	0
Premature birth (<37 weeks)	5	2.3	10	4.7
Post term delivery (≥ 294 days)	11	5.1	4	1.9
Pre pregnancy BMI ≥ 28	28	13.1	29	13.6

*nitrous oxide excluded.

Table III. Frequency of third and fourth degree perineal tears 1995–96

	Vaginal nulliparas <i>n</i> =2,201		Vaginal multiparas <i>n</i> =3,621		All <i>n</i> =5,822	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Third degree perineal tear	155	7.0	41	1.1	196	3.4
Incomplete	122	5.5	29	0.8	151	2.6
Complete	33	1.5	12	0.3	45	0.8
Fourth degree perineal tear	14	0.6	4	0.1	18	0.3
Total	169	7.7	45	1.2	214	3.7

wards the use of mediolateral episiotomy. Poen et al. (5), however, found mediolateral episiotomy to prevent sphincter tears in nulliparous women. In our study, the protective role of mediolateral episiotomy was not statistically significant (OR 0.71; 95% CI 0.32–1.57).

In this specific hospital, both medio-lateral and median episiotomies are used (Table I). This could, to some extent, explain the relatively high incidence of sphincter ruptures. Furthermore, a high proportion of the women in the studied population was nullipara. The average age for the nullipara during the study period was 27.8 years. In this study, high maternal age and nulliparity are two predictors that significantly contribute to anal sphincter tears. Among midwives, a deeply rooted belief exists that a median episiotomy causes less trauma than a medio-lateral episiotomy, consequently making this the mode of choice for many midwives (16). In contradiction to this, women who had suffered from a third or fourth degree median episiotomy extension reported the highest degree of pain during the first intercourse post partum (14).

In agreement with others (4–6), we found that birth weight over 4000 g was a risk factor.

Oxytocin augmentation was associated with anal sphincter tear. This finding is in accordance with Poen et al. (5) and Haadem et al. (17). They conclude that the primary cause of this is an inelastic vaginal tissue slowing down the progress of labor. This poor progress would therefore lead to the use of oxytocin. We believe that one additional reason could be that myometrial contractions might in some cases become much stronger. The second stage of labor may accordingly become more difficult to control when oxytocin is used for labor enhancement.

One of the most significant predictors in our study was squatting on a low chair during delivery. In this position, the woman can push very hard, and it can be difficult for the birth attendant to control the delivery and protect the perineum. There has been a trend during the last ten years of letting the laboring mother choose her birthing position. Some of these positions strongly reduce the midwife's possibility of controlling the speed of delivery, with associated support of the perineum (18). One such position is squatting on a low birthing chair. Other birth positions with decreased possibilities for the midwife to give perineal protection are upright positions such as kneeling and standing. A high frequency (62%) of upright positions was reported from a delivery unit with a high number of perineal tears (6).

Manual perineal protection used to be a very important aspect of midwifery training and birth skills and was meticulously performed during the deliveries. During this procedure, the midwife supports the perineum with one hand, and holds the child's crowning head back with the other, usually during a few contractions. The purpose of this maneuver is to allow the perineum to stretch slowly to control the fetal head while crowning, preventing it from penetrating the introitus too fast. Lack of manual perineal protection could be one of the reasons for the increasing rates of anal sphincter ruptures reported in Sweden and elsewhere (18).

Several investigations have shown that forceps de-

Table IV. Logistic regression. Prediction of having an anal sphincter tear during vaginal delivery. Odds Ratios marked with * are not significant, but these factors were included in the model, as they were considered relevant

Predictor factor	Odds Ratio	95% CI
Vaginal primiparity	7.55	3.72–15.29
Delivery while squatting on a low chair	6.47	2.29–18.33
Age > 35 years	4.79	1.93–11.88
Birth weight > 4000 g	3.98	2.12–7.47
Vacuum extraction, mid release	3.49	1.27–9.59
Median episiotomy	3.44	1.25–9.48
Vacuum extraction, outlet	2.71	1.28–5.72
Giving birth late at night 3 a.m.–6 a.m.	2.07	1.06–4.02
Use of analgesia (nitrous oxide excluded)	2.05	1.06–3.96
Labor enhancement by oxytocin	2.00	1.13–3.53
Epidural anesthesia	*0.56*	0.32–1.00
Previous sphincter rupture	*2.26*	0.37–13.71
Medio-lateral episiotomy	*0.71*	0.32–1.57

livery increases the risk of anal sphincter tear (4, 5, 8, 19). In the study by Sultan et al. (19), 81% of forceps deliveries caused endosonographic anal sphincter defects, compared with 24% of vacuum extractions. Defecatory symptoms were also much more frequent in the forceps delivery group. Vacuum extraction is generally thought to be less traumatic than the use of forceps during delivery. In our study, vacuum extraction was a major predictor for anal sphincter tear. Mid release extraction was a higher risk factor than outlet extraction. At the study hospital, forceps deliveries are rare (0.04%) while deliveries by vacuum extraction are quite frequent (7.7% of vaginal deliveries) (Table I). The vacuum extractor has been routinely used for over 30 years, which means that staff gynecologists are well acquainted with the technique. We cannot, however, completely rule out the possibility that incorrect technique to some extent may have contributed to the increased risk of obtaining anal sphincter tear during vacuum delivery. The perineal support as well as the actual direction of the pelvis axis might be forgotten during an emergency extraction when the doctor, sometimes in panic, pulls the baby's head out too fast. Cup application as well as traction procedure should be essential parts of the delivery unit's training program regarding vacuum delivery in order to minimize a procedural and avoidable trauma to the pelvic floor.

In this study, maternal age above 35 years was associated with more anal sphincter tears. This is probably caused by inelastic perineal tissue.

There were significantly more anal sphincter tears occurring late at night between 3 and 6 a.m. The reason for this is not known. This is the time during the night when the midwife and the obstetrician may have difficulties in staying alert. It is reasonable to believe that if the quality of the birth attendant's work decreases due to tiredness and consequential lack of concentration, it would be during this period. The laboring mother is probably also tired at this hour and she may be less inclined to co-operate.

In this study, we found no increased risk of anal sphincter tear when using epidural anesthesia. This is in agreement with others (4, 15, 17). On the other hand, Poen et al. (5) found that epidural anesthesia increased the risk of anal sphincter tear in nulliparous women. In the present study, the use of some form of analgesia (pethidine, acupuncture, epidural analgesia, paracervical block, pudendal block or local infiltration) during delivery compared to no use of analgesia (except nitrous oxide) was a significant risk factor (OR 2.05; 95% CI 1.06–3.96). Not using any pain relief other than nitrous oxide may be an indicator of uncomplicated labor and delivery.

According to this study, a previous sphincter rupture was not associated with an increased risk of a third or fourth degree tear in a subsequent delivery (OR 2.3; 95% CI 0.37–13.71). A severe prior obstetrical laceration was, however, associated with a 3.4-fold risk of a recurrent third or fourth degree perineal rupture in a previous study (20). The moderate number of patients in our study limits the value of this finding and is a probable reason why this risk factor did not reach a significant level.

Conclusion

To decrease the incidence of obstetric anal sphincter ruptures midwives and doctors should avoid median episiotomy. Delivery while squatting on a low birthing chair should be used with caution. The obstetrician should consider the option of cesarean section instead of mid pelvis vacuum extraction, especially if an infant with macrosomia is expected and the mother is an elderly nullipara. A continuous audit regarding vacuum delivery technique is necessary at the delivery unit. Birth attendants should exercise extra attention during delivery when caring for a woman with two or more risk factors.

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