Does the angle of episiotomy affect the incidence of anal sphincter injury?*

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Objective Mediolateral episiotomy is associated with lower rates of significant perineal tears than midline episiotomy. However, the relationship between precise angle of episiotomy from the perineal midline and risk of third-degree tear has not been established. This study quantifies this relationship.

Design Case–control study.

Setting National Maternity Hospital, Dublin, Ireland.

Sample One hundred primiparous women who had undergone right mediolateral episiotomy 3 months previously.

Methods Two groups of primiparous women were compared. Cases had sustained clinically apparent anal sphincter injury during delivery, while controls had not. The angle of episiotomy measured from the midline was marked on a superimposed sheet of transparent plastic film and measured using a protractor. Data were analysed using Student’s t test, chi-square test and logistic regression analysis.

Main outcome measures Angle of mediolateral episiotomy from the perineal midline.

Results Fifty-four cases and 46 controls were assessed. Cases were more likely to have undergone assisted delivery and consequently to have been delivered by an obstetrician than by a midwife. The mean angle of episiotomy measured significantly smaller in cases (30°, 95% CI 28–32°) than in controls (38°, 95% CI 35–41°; \( P < 0.001 \)). Analysis showed a 50% relative reduction in risk of sustaining third-degree tear for every 6° away from the perineal midline that an episiotomy was cut.

Conclusions These results show that a larger angle of episiotomy is associated with a lower risk of third-degree tear and mediolateral episiotomy incisions should be made at as large an angle as possible to minimise the risk of sphincter disruption.

Keywords Anal sphincter injury, episiotomy, vaginal birth.

Introduction Anal sphincter injury (third-degree perineal tear) at vaginal delivery is the most common cause of faecal incontinence in otherwise healthy women. The most important treatment is prevention. Patients, obstetricians and midwives alike have a universal desire to limit the incidence of third-degree tears in order to minimise the effect of vaginal delivery on the faecal continence mechanism. It is, however, an unfortunate paradox that most of the risk factors for anal sphincter injury (primiparity, instrumental delivery, birthweight >4 kg, persistent occipitoposterior position) are components of the normal labour and delivery process. The majority of women with these risk factors who deliver vaginally do not sustain third-degree tears or develop subsequent faecal incontinence.

Episiotomy was traditionally considered to protect the perineum from uncontrolled injury during delivery. Evidence indicates that this may not always be so. Midline episiotomy (vertical incision in the direction of the anal sphincter), when compared with mediolateral episiotomy (incision directed towards the ipsilateral ischial tuberosity), is associated with significantly higher rates of third-degree perineal tears (12 versus 2%). Predisposition to anal sphincter injury may be further compounded by instrumental delivery, with rates of 50% reported when forceps delivery and midline episiotomy are used in combination. Mediolateral episiotomy is

favoured in European practice, and although there are no data to justify it routinely, its restrictive use may reduce the incidence of posterior perineal trauma, the need for perineal suturing and healing complications.2,8

Nevertheless, even with restrictive use of mediolateral episiotomy, it is evident that not all episiotomies are the same. Tincello9 and Andrews10 have demonstrated that mediolateral episiotomies performed by obstetricians are significantly longer and more angled from the perineal midline than those performed by midwives. While it is suggested that a mediolateral episiotomy should begin at the posterior fourchette and be directed at an angle of between 40 and 60° from the midline,9,10 it is uncertain what the effect of the precise angle of mediolateral episiotomy incision is on the incidence of perineal trauma and at what angle from the midline an episiotomy fails to direct force away from midline structures such as the perineal body and anal sphincter.

The aim of this study, therefore, was to determine the impact of angle of episiotomy on anal sphincter injury and whether a smaller angle of incision was associated with a higher incidence of third-degree perineal tears.

Patients and methods

This study was carried out at the National Maternity Hospital, Dublin, from September 2003 to May 2004. Midline episiotomy is not practised in this institution and the overall incidence of third-degree perineal tears is approximately 2%.11 All women who have sustained recognised third-degree tears return to an obstetric perineal clinic12 for assessment 3 months following delivery. All women were seen at this clinic and examined by the same obstetric resident. Written informed consent was obtained.

Subjects

Consenting women who had undergone episiotomy 3 months previously were included in the study. Those who had sustained a third-degree tear constituted the case group, while controls comprised an age-matched group of participants in an observational study of the effect of antenatal perineal massage on postnatal faecal continence. While perineal massage may increase the incidence of intact perineum at vaginal delivery,13,14 it has not been shown to impact the incidence of third-degree tear15 and, by definition, none of the controls had sustained third-degree tear at delivery.

Only primigravid women were included in this analysis because previous vaginal birth could lead to additional perineal scarring, which could confuse accurate ascertainment of the precise angle of episiotomy.

Techniques

Faecal incontinence symptoms were assessed using a continence questionnaire,16 with a score of 0 indicating complete continence and a score of 20 complete incontinence. Obstetric details were recorded.

A simple technique for evaluating the angle of episiotomy from the midline was devised, which involved examination in the left lateral position and location of the episiotomy scar. The same measuring technique was used for cases and controls. The perineal midline was determined anatomically from the midpoint of the introitus. A piece of transparent plastic film was placed on the perineum, and the lines of the episiotomy and perineal midline were drawn using a permanent marker. The angle of episiotomy from the midline was measured using a protractor, with the film placed on a flat surface. Agreement between observers on both drawing and measuring the angle of episiotomy was evaluated using the coefficient of repeatability.17

Because of perineal distension at vaginal birth, the entire perineal area is larger at the time of cutting an episiotomy than at 3-month postnatal review; thus, an episiotomy scar may look different from a fresh laceration. The relative angles from the midline, however, remain equivalent, and consequently, the angle of episiotomy cut correlates with the angle of postnatal episiotomy scar.

Statistical analysis

Data were computerised and analysed using SPSS version 11 (SPSS Inc., Chicago, IL, USA). The Student’s t test was used to compare continuous data, and the chi-square test was used to compare rates. A significance level of 0.05 was set throughout. Logistic regression analysis was used to quantify the numerical relationship between the odds of third-degree tear and the angle of episiotomy. Birthweight and mode of delivery were also included in the logistic regression model.

In this case–control study, the proportion of women with third-degree tear was 54%, whereas the incidence of third-degree tear in the institution is 2%. Of itself, the case–control study only provided estimates of relative risks; however, absolute risks of third-degree tear for different angles of episiotomy were calculated by weighting the data appropriately to correspond to an overall population risk of 2%.

Results

A total of 100 women participated; all had undergone mediolateral episiotomies at their first vaginal delivery within the previous 3 months. The characteristics of the cases and control groups are summarised in Table 1. Fifty-four women had sustained a documented third-degree tear at delivery (cases), while 46 women (controls) had not.

Women in the control group were more likely to have had an unassisted vaginal delivery than those who had sustained a third-degree tear (58.7 versus 35.2%, P = 0.02). Although greater numbers of cases than controls were delivered with instrumental assistance, there were no statistically significant
The higher instrumental delivery rate among cases means that the women in this group were more likely to have been delivered by an obstetrician (66.7%), whereas controls were more likely to have been delivered by a midwife (54.3%, \( P = 0.03 \)). Only four (8.7%) women who underwent unassisted vaginal delivery were delivered by an obstetrician.

Mean birthweight was higher among women who had sustained a third-degree tear compared with those who had not (3755 versus 3504 g, \( P = 0.01 \)).

Continence scores at 3 months postpartum were nonsignificantly higher for cases than for controls, with a mean score of 1.04 (range 0–6) in the third-degree tear group compared with 0.67 (range 0–9) in the controls (\( P = 0.3 \)). The median continence score was 0 in both groups.

Based on ten replicated readings, the between-observer correlation coefficient for the angle of episiotomy was 0.994 (\( P < 0.001 \)). The mean difference between observers was 0.1° with an SD of 1.1°, giving a coefficient of repeatability of 2.2°, meaning that 95% of readings made by different observers are within 2.2° of each other. This is a high level of agreement, and it shows that measurement of episiotomy angle using the technique described above is reproducible.

The mean angle of episiotomy scar from the midline was smaller in cases (30°, 95% CI 28–32°; range 18–50°) than in controls (38.0°, 95% CI 35–41°; range 20–55°; \( P < 0.001 \)). This finding persisted when instrumental deliveries and unassisted births were analysed individually (\( P = 0.001 \)). Furthermore, the angle of episiotomy was still found to be smaller in women who sustained third-degree tear when birthweight was considered (\( P = 0.022 \) for deliveries <4000 g and \( P < 0.001 \) for deliveries >4000 g).

When the data were broken down into angle ranges and scaled to a 2% overall risk of third-degree tear in all women (Table 2), the risk of third-degree tear decreases substantially from just less than 10% in women with an angle of episiotomy less than 25° to 0.05% in women with episiotomies exceeding 45° (\( P = 0.0006 \)). A logistic regression analysis was performed examining the relationship of the angle of episiotomy with the risk of third-degree tear and showed that, on average, a 50% relative reduction in the risk of third-degree tear was achieved for every 6.3° larger the angle of episiotomy is from the perineal midline (\( P < 0.001 \)). Putting it another way, an average relative increase of 10.4% in the risk of third-degree tear is seen for every degree smaller that a mediolateral episiotomy is cut.

A further analysis added birthweight and mode of delivery into the logistic model. The relationship of episiotomy angle with risk of third-degree tear remained significant (\( P < 0.001 \)) and was not affected by the inclusion of the other two variables, showing that the relationship was not confounded by these factors.

**Discussion**

The results of this case–control study highlight that a smaller angle of episiotomy is more likely to lead to anal sphincter...
injury. This outcome is clinically relevant because episiotomy technique is relatively easy to modify, and our findings suggest that modified practice would potentially lead to reductions in anal sphincter injury rates.

It was unsurprising that our subjects who sustained third-degree tears were more likely to have undergone assisted vaginal deliveries since a number of studies have shown that both forceps and vacuum assistance increase the risk of anal sphincter damage. Although only a small minority who undergo forceps delivery sustain a recognised third-degree tear, up to 50% of such tears follow instrumental delivery.\textsuperscript{11,18,19} It is a widely held belief that forceps-assisted vaginal delivery is more traumatic to the continence mechanism, with the evidence implicating vacuum extraction being less conclusive. Within the confines of this study, it was interesting to note that, in keeping with guidelines from the Royal College of Obstetricians and Gynaecologists\textsuperscript{20} and other published work,\textsuperscript{21} vacuum appears to be the instrument of first choice, with more women in both groups being delivered with this than with forceps assistance. The results may falsely suggest that third-degree tear is more likely with vacuum than with forceps delivery; rather, this is explained by preferential use of the former instrument within our unit.

In our institution, only obstetricians perform instrumentally assisted deliveries; consequently, more cases were delivered by doctors, while midwives were more likely to supervise delivery of women who did not sustain a third-degree tear. Heavier birthweight has previously been documented to be a risk factor for anal sphincter injury,\textsuperscript{2} and our results confirm significantly higher mean birthweights in the population with third-degree perineal tears, although the association of the angle of episiotomy and the risk of anal sphincter injury persisted regardless of birthweight. The range of birthweights was wide, and several women in the control group delivered macrosomic babies. This emphasises that fetal size has a subsidiary influence acting in combination with other intrapartum risk factors.

Both cases and controls had low mean and median continence scores; women in this study who had sustained a third-degree tear were statistically no more likely to describe symptoms of continence compromise than those who did not. Nonetheless, a range of continence scores was seen in both groups, indicating that continence compromise can occur postnatally, regardless of mode of delivery or presence or absence of anal sphincter injury; therefore, it remains important to question and advise women on this problem in the postnatal period.

### Conclusion

This case–control study of the impact of mediolateral episiotomy angle on anal sphincter injury rates shows that an episiotomy cut at a smaller angle from the midline was more likely to be associated with third-degree perineal tear than that cut at a larger angle. The increased likelihood of third-degree tear is not unexpected, when one considers that anal sphincter injury is significantly more common when midline episiotomy is practised. The most likely explanation for this finding is that episiotomies cut at a very small angle function like midline incisions and are consequently more liable to extend into the anal sphincter mechanism.

While clinically it may be difficult to differentiate between the mean angles seen in both groups (30 versus 38°), the 10% relative increased risk predicted by logistic regression analysis for every degree closer to the perineal midline an episiotomy is cut is notable. We conclude that if right mediolateral episiotomy is indicated, the angle of this should be as large as possible in order to reduce the incidence, and thus the potential sequelae, of obstetric anal sphincter injury.

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### References


