Risk factors and management of obstetric perineal injury

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Abstract
Perineal injury sustained during childbirth is a major aetiological factor in the development of perineal pain, sexual dysfunction, prolapse and disturbance in bowel and bladder function. Preferential use of the vacuum extractor, restricting the use of episiotomy, repair of anal sphincter rupture by a trained doctor and selective caesarean section in these women can be beneficial in preventing complications. More focused training of midwives and doctors in perineal and anal sphincter anatomy and repair is needed to minimize the morbidity associated with inadequate repair and missed tears. Future research must address ways to predict and minimize severe perineal injury, and the management of subsequent pregnancies following anal sphincter injury.

Keywords anal sphincter; childbirth; delivery; episiotomy; incontinence; perineum; third degree tears

Introduction
The morbidity associated with perineal injury related to childbirth is a major health problem that affects thousands of women. As many as 91% of women report at least one new persistent symptom 8 weeks after delivery. Over 60% of women suffer perineal injury (either perineal tear or episiotomy) following spontaneous vaginal delivery and approximately 1000 women per day require perineal repair following vaginal birth.

Complications of perineal trauma following childbirth include haemorrhage, haematoma and abscess formation, perineal pain and discomfort, fistula formation, dyspareunia and anal incontinence. In addition, there has been an increase in litigation related to the complications of perineal trauma following childbirth.

Increased awareness of maternal morbidity following vaginal birth has led some women to request elective caesarean delivery despite being without any medical indications for this. However, elective caesarean delivery is associated with a fourfold risk of maternal morbidity compared with vaginal birth. In view of these facts, the modern obstetrician needs focused training to identify and manage women who are at high risk of developing postpartum morbidity and thereby re-establish women’s confidence in vaginal delivery.

Classification of perineal injury
Traditionally, perineal trauma following childbirth has been classified as first-, second- or third-degree tears. However this classification is incomplete and has created considerable confusion. The following descriptive classification (Figure 1) suggested by Sultan has now been incorporated into the Royal College of Obstetricians and Gynaecologists and international guidelines.

1. First-degree tear – involving the perineal or vaginal skin only
2. Second-degree tear – perineal skin and muscles torn, but intact anal sphincter
3. Third-degree tear – perineal skin, muscles and anal sphincter are torn
   a. less than 50% of the external anal sphincter thickness is torn
   b. more than 50% of the external anal sphincter thickness is torn, but internal anal sphincter intact
   c. both external and internal anal sphincters are torn, but anal mucosa intact
4. Fourth-degree tear – perineal skin, muscles, anal sphincter and anal mucosa torn
5. Buttonhole tear – anal sphincter intact but anal mucosa torn

Third- and fourth-degree tears that involve the anal sphincter complex are also termed ‘obstetric anal sphincter injury’. Anatomically, an episiotomy involves the same structures as a second-degree perineal tear.

Causes of and risk factors for perineal injury

Greater birthweight
Birthweight of more than 4 kg is associated with maternal perineal injury, especially third- and fourth-degree tears. This may be attributed to the larger head circumference, prolonged labour and difficult delivery, particularly when this is instrumental. A large baby is also likely to disrupt the fascial supports of the pelvic floor and cause stretch injury to the pelvic and pudendal nerves. Even after safe delivery of the head, shoulder dystocia is associated with perineal and anal sphincter trauma.

Malposition and malpresentation
Malposition, particularly the persistent occipitoposterior position, leads to a larger presenting diameter and is associated with difficult delivery. Face and brow presentations are known risk factors for anal sphincter injury. Breech deliveries do not appear to increase the risk, but this may be attributed to stringent selection criteria and a low threshold for caesarean section during labour.

Duration of labour and rate of delivery
Precipitate labour is associated with cervical, perineal, labial and urethral injury due to the lack of time available for the maternal tissues to adjust to the forces of delivery and for controlled delivery with an episiotomy if necessary. Furthermore, delivery following precipitate labour is more likely to occur under less favourable circumstances such as during transit to hospital, in a standing position and often without experienced assistance. There is evidence to suggest that a prolonged active second stage of labour causes pudendal nerve damage. There is evidence that perineal damage may occur in the first stage of labour. Caesarean...
section performed after the onset of labour, resulting in cervical dilatation of more than 8 cm, may be associated with pudendal nerve damage. It has been suggested that the passive second stage of labour should be accelerated with oxytocics particularly in women who have an epidural, rather than resorting to instrumental delivery, which can cause more trauma.

**Episiotomy**

Episiotomy is defined as surgical excision of the perineum to facilitate delivery. Although episiotomy is the commonest operation performed in obstetrics, there is little evidence to demonstrate any benefit with its routine use. Randomized studies have shown that median episiotomy is more likely to extend into the anal sphincter than mediolateral episiotomy (12% vs 2%). The Cochrane database shows that restriction of the use of episiotomy is associated with less posterior trauma. Although anterior perineal trauma was increased it had no effect on the development of urinary incontinence. It has been suggested that the ideal episiotomy rate should be no more than 20–30%.

**Instrumental delivery**

Instrumental delivery is an integral part of obstetrics, and though it reduces the caesarean section rate, maternal morbidity is higher than that following unassisted delivery. The injuries caused by instrumental delivery include both cervical laceration and anal sphincter injury. Although it is well recognized that forceps delivery has a higher maternal injury rate than vacuum extraction, it is important for the operator to be versatile with the use of both instruments. Certain circumstances preclude the use of the vacuum extractor; these include prematurity, face presentation, potential fetal bleeding tendency, delivery of the aftercoming head at breech presentation, lift out at caesarean section and equipment failure. Forceps delivery is likely to cause injury as the instrument occupies almost 10% more space in the pelvis. The shanks of the forceps stretch the perineum and can cause injury, particularly to the anal sphincter when pulling in the posterolateral direction to encourage flexion of the head. Unlike the vacuum extractor, which can become detached, the forceps does not have such a fail-safe mechanism and therefore excessive force can be applied, particularly under epidural anaesthesia.

As mentioned above, the benefits of episiotomy during spontaneous delivery have been questioned, and while an episiotomy is not absolutely necessary with the vacuum extractor, it is invariably performed with the forceps. Interestingly, one study has reported that a reduction in the episiotomy rate from about 90% to 30% during instrumental delivery (n = 2041) was associated with a reduction in the rate of fourth-degree tears and no significant change in the third-degree tear rate. Metal cups appear to be more suitable for occipitoposterior, transverse and difficult occipitoanterior position deliveries, while soft cups seem to be

**Figure 1** Classification of obstetric anal sphincter injury.
appropriate for straightforward deliveries as they are significantly more likely to fail to achieve vaginal delivery (OR 1.65, 95% CI 1.19–2.29). Although they were associated with less scalp injury (OR 0.45, 95% CI 0.15–0.60), there was no difference between the two groups in terms of maternal injury. A Cochrane review, which included the guidelines of 10 trials, concluded that use of the vacuum extractor for assisted vaginal delivery, compared with forceps delivery, was associated with significantly less maternal trauma (OR 0.41, 95% CI 0.33–0.50) and with less general and regional anaesthesia. There were more deliveries with vacuum extraction (OR 1.69, 95% CI 1.31–2.19) and fewer caesarean sections were performed in the vacuum extractor group, though the vacuum extractor was associated with an increase in neonatal cephalohaematoma and retinal haemorrhages. Serious neonatal injury was uncommon with either instrument. Use of the vacuum extractor rather than forceps thus appears to reduce maternal morbidity, though the reduction in cephalohaematoma and retinal haemorrhages seen with forceps may be a compensatory benefit. However, in a 5-year follow-up of a randomized controlled trial (RCT) comparing forceps with vacuum extraction, no significant differences were found in terms of visual problems or child development.

**Principles of the management of perineal injury**

The principles of management are as follows.
- Recognition and proper classification are important.
- Perineal injury should be examined under adequate analgesia and light.
- A combined vaginal and rectal examination is needed to exclude associated anal sphincter injury.
- Immediate repair of perineal injury rather than delayed repair is advisable, as immediate repair reduces the bleeding and pain associated with the injury, which may otherwise impair early breast-feeding and bonding. Immediate repair also prevents the development of oedema, which may affect subsequent recognition of the structures involved, and reduces the risk of infection.
- If there is any doubt about the extent of the injury, a second opinion must be sought.
- The presence of an experienced person during the assessment of perineal injury has increased the rate of detection of anal sphincter injury.
- The labia, clitoris and urethra should also be examined.

**Management of episiotomy and first- and second-degree perineal tears**

Non-suturing of first- and second-degree perineal tears has been described. There are only two, small RCTs in the literature, both of which showed no significant difference in short-term discomfort, but showed an association with poorer wound healing. Based on the current evidence, non-suturing is recommended only for first-degree perineal tears that are not actively bleeding and have regular and well-approximated wound edges.

Episiotomies and second-degree tears are conventionally sutured in three stages. The traditional interrupted suturing technique involves:
- a continuous locking suture in the vagina commencing from the apex and finishing at the level of fourchette with a loop knot
- re-approximation of the deep and superficial perineal muscles with three or four interrupted sutures
- skin suturing with continuous subcutaneous or interrupted transcutaneous sutures.

Another method for the repair of episiotomy and second-degree perineal tears is the continuous non-locking (Fleming’s) technique, in which a continuous non-locking suture is used to approximate the vagina and the deep and superficial perineal muscles without tension. Skin edges are apposed with a subcutaneous suture.

A recent large RCT involving 1542 women showed that the continuous non-locking technique is associated with a significant reduction in short- and long-term perineal pain and less frequent need for suture removal compared with the interrupted suturing technique. Suture materials used in the repair of episiotomy and first- and second-degree perineal tears range from catgut to synthetic absorbable sutures such as Dexon and Vicryl, though the use of catgut has been discontinued in Europe. A Cochrane review has shown that absorbable synthetic suture materials are associated with less perineal pain, use of analgesia, wound dehiscence and wound re-suturing than is catgut. A recently introduced absorbable suture material, Vicryl Rapide, dissolves earlier than Vicryl. A large RCT has shown that Vicryl Rapide is associated with significantly less superficial dyspareunia and a significant reduction in the need for suture removal up to 3 months after delivery.

Following the repair of episiotomy or second-degree perineal injury, adequate analgesia such as diclofenac suppositories is recommended. If there are associated urethral, labial, clitoral or vaginal tears, or if the repair is difficult, insertion of an indwelling catheter for 24 hours is recommended to prevent acute urine retention.

Proper documentation, including a diagrammatic description of the structures involved, is good medical practice. The patient must be informed about the extent of the trauma and the repair, pain relief, diet and pelvic floor exercises. Follow-up is not essential for uncomplicated episiotomy or first- or second-degree perineal injury.

**Principles and technique of primary sphincter repair of third- and fourth-degree tears**

Such repairs should be performed only by a doctor experienced in anal sphincter repair or by a trainee under supervision. They should be conducted in the operating theatre, with good lighting, appropriate equipment and aseptic conditions. The full extent of the injury should be evaluated by a careful vaginal and rectal examination, and it should be graded according to the classification above. Detailed notes should be made of the findings and
the subsequent repair. A pictorial representation of the tears is useful when reviewing the notes in the event of complications, audit or litigation.

General or regional (spinal, epidural, caudal) anaesthesia is an important prerequisite, particularly for overlap repair, as the inherent tone in the sphincter muscle can cause the torn muscle ends to retract within its sheath. Muscle relaxation is necessary to retrieve the ends, especially if overlapping of the muscles without tension is intended.

In a fourth-degree tear, the torn anal epithelium is repaired with interrupted Vicryl (polyglactin) 3/0 sutures with the knots tied in the anal lumen. The sphincter muscles are repaired with 3/0 polydioxanone (PDS) dyed sutures. Compared with a braided suture, these monofilamentous sutures are less likely to precipitate infection, and the author has not encountered problems with suture migration and therefore recommends PDS.

**Internal sphincter repair**

The internal anal sphincter should be identified and any tear should be repaired separately from the external sphincter. The internal anal sphincter lies between the external sphincter and the anal epithelium. It is paler than the striated external sphincter and the muscle fibres run in a circular manner. The internal sphincter resembles the flesh of raw fish, as opposed to the red meat appearance of the external sphincter. The ends of the torn muscle are grasped with Allis forceps and an end-to-end repair is performed with interrupted or mattress 3/0 PDS sutures. A torn internal sphincter should be approximated with mattress or single interrupted sutures, as overlapping can be technically difficult.

**External sphincter repair**

Different techniques of repair of the external sphincter have been described. The most commonly used technique in the UK appears to be end-to-end repair with ‘figure-of-eight’ sutures. As figure-of-eight sutures are haemostatic, they may cause ischaemia of the muscle ends, and therefore mattress sutures are preferable if an end-to-end repair is being considered. Colorectal surgeons prefer the overlap technique for patients who present with faecal incontinence, though longer-term follow-up suggests that the symptoms may deteriorate with time. Based on this, Sultan *et al.* described an overlap technique for the external sphincter and separate approximation of the internal sphincter. The torn ends of the external anal sphincter are identified and grasped with Allis tissue forceps. To perform an overlap, the muscle may need to be mobilized by dissection with a pair of McIndoe scissors, separating it from the ischio-anal fat laterally. If the overlap technique is preferred, the external sphincter should be grasped with Allis forceps and pulled across to overlap in a ‘double-breast’ manner. The torn ends of the external sphincter can then be overlapped as shown in Figure 1, using PDS 3/0 sutures. It is important that the full length of the external sphincter is identified to ensure complete approximation or overlap. Compared with the overlap technique, lack of complete apposition is more likely to occur with the end-to-end technique. Anal length has been shown to be the best predictor of faecal incontinence following secondary sphincter surgery. A shorter anal length has been reported following end-to-end primary repair of the external anal sphincter, probably as a result of incomplete apposition.

An advantage of the overlap repair is that the full length of the external sphincter must be visualized, and overlapping allows a greater surface area of contact between muscle. Unlike in end-to-end repair, if further retraction of the overlapped muscle ends were to occur, it is highly likely that muscle continuity would be maintained. Although Sultan *et al.* achieved favourable results with the overlap technique, this could have been a reflection of operator expertise.

There are four completed RCTs comparing the primary end-to-end and overlap techniques for external anal sphincter repair following obstetric injuries.

- In the first, by Fitzpatrick *et al.*, 112 patients were randomised to the end-to-end or overlap technique. All sphincters were repaired with Maxon, but the patients were followed-up for only 3 months. There were no significant differences in outcome in either arm of the study.
- In the second RCT, by Fernando *et al.*, 64 patients were randomised to the overlap and end-to-end techniques, performed by only two trained clinicians. Faecal urgency at 12 months was reported in 32% of the end-to-end group and 3.2% of the overlap group (p = 0.02), and 24% of the end-to-end group reported faecal incontinence associated with urgency compared with none of the overlap group (p = 0.01). Compared with the other RCTs, which used larger groups of trained clinicians to perform repairs, this study showed an improvement in outcome with overlap repair but may not be applicable to all labour wards.
- In the third RCT, by Williams *et al.*, 112 participants were randomized to four groups: to end-end or overlap repair of the torn anal sphincters, and braided polyglactin (coated Vicryl) 2/0 or PDS 3/0. In this study, there were no significant differences in anal continence rates or quality-of-life scores in the four groups after 12 months of follow-up.
- In the fourth RCT, by Garcia *et al.*, 41 women with complete third- or fourth-degree perineal tears were randomized to overlap and end-to-end groups and followed-up for 3 months. There were 23 women in the end-to-end group and 18 in the overlap group, but only 15 and 11, respectively, returned for follow-up. No significant differences were found between the groups in terms of symptoms of faecal incontinence and transperineal ultrasound findings. However, the authors acknowledged that the randomization was inaccurate and that their study was underpowered.

In a separate RCT of secondary repair, 24 patients were randomized to end-to-end or overlap repair. At a median follow-up of 26 months, there were no significant differences in anal continence. Other studies have evaluated secondary sphincter repair for anal incontinence in colorectal patients and showed a significant increase in continence rate with overlap repair. However, one study showed a deterioration of anal incontinence 5 years after secondary repair for obstetric anal sphincter injury.

The evidence to date indicates that there is no significant difference in short-term outcome between the end-to-end and the overlap technique and therefore either technique can be used.

In grade 3a tears, the overlapping technique is not possible without completely dividing the external anal sphincter. However, as most of the fibres are intact tears, complete division of the external anal sphincter is not justified and the
torn fibres are best approximated with interrupted sutures. In grade 3b tears, if the overlapping technique is used it is advisable to divide the remaining few intact fibres to facilitate the repair.

Great care should be taken when reconstructing the perineal muscles, to provide support to the sphincter repair. A short, deficient perineum makes the anal sphincter more vulnerable to trauma during subsequent vaginal deliveries. Muscles of the perineal body are reconstructed with interrupted Vicryl 2/0 sutures after closing the vaginal epithelium with a continuous Vicryl 3/0 suture. Lastly, the perineal skin is approximated with a Vicryl 3/0 subcuticular suture.

A rectovaginal examination should be performed to confirm complete repair and ensure that all tampons or swabs have been removed.

Antibiotics
Intravenous antibiotics (cefuroxime 1.5 g and metronidazole 500 mg) should be commenced intraoperatively and continued orally for 1 week. Although there are no randomized trials to substantiate the benefit of this practice, infection could jeopardize the repair and lead to incontinence or fistula formation.

Postoperative care
Severe perineal discomfort, particularly following instrumental delivery, is a known cause of urine retention, and following regional anaesthesia it can be up to 12 hours before bladder sensation returns. A Foley catheter should be inserted for about 24 hours unless the midwifery staff can ensure that spontaneous voiding occurs at least every 3 hours.

As passage of a large bolus of hard stool may disrupt the repair, a stool softener (lactulose 15 ml b.d.) and a bulking agent such as Fybogel (ispaghula husk, one sachet b.d.) is prescribed for at least 2 weeks postoperatively. It is important to ensure that bowel action has occurred before the patient is discharged.

Follow-up and subsequent pregnancies following third- and fourth-degree tears
The woman must understand the extent of the tear and how to seek help if symptoms of infection or incontinence develop. All women should be warned of the possible sequelae of anal sphincter disruption, and ideally should be assessed 6–12 weeks post-partum by anorectal physiology tests and anal ultrasonography (Figure 2). Asymptomatic women with low squeeze pressures and a defect of more than one quadrant are at increased risk of developing anal incontinence following another vaginal delivery and therefore counseling should include the option of caesarean section (Figure 3). If manometry and anal ultrasonography facilities are unavailable locally, symptomatic women should be referred to a specialist centre for these investigations. Women who are asymptomatic and have no clinical evidence of a deficient perineum or low anal sphincter tone can undergo vaginal delivery by an experienced midwife or doctor.

As there is no evidence that elective prophylactic episiotomy prevents another tear, episiotomy should only be performed if clinically indicated; that is if the perineum is thick and inelastic and an episiotomy will prevent multiple radial tears.

Symptomatic women with severe injuries should be offered a secondary sphincter repair and subsequent pregnancies should be delivered by caesarean section. Women with mild symptoms should be managed with advice on the avoidance of gas-producing foods, regulation of bowel action, bulking agents, constipating agents such as loperamide and codeine phosphate, and biofeedback. This group of women are at risk of deterioration following a subsequent vaginal delivery and should therefore be offered caesarean section. The risk of a repeat third-degree tear is low, but no randomized studies have been performed to evaluate the benefit of routine Caesarean section.

Medicolegal implications
Although the creation of a third- or fourth-degree tear is seldom found to be an issue of culpability, missing a tear is considered to be negligent. It is essential that a rectal examination is performed before and after any perineal repair and that the findings are carefully documented in the notes. At least 20% of consultant obstetricians continue to classify a tear of the anal sphincter that has not breached the anal mucosa as a second-degree tear. As a consequence, the safe principles of repair mentioned above are not applied and repair and subsequent management are likely to be inadequate. Poor note-keeping, repair by an inexperienced doctor, deviation from recommended safe practice, failure to inform and counsel the woman, failure to inform the general practitioner, and inappropriate follow-up and advice regarding subsequent pregnancies are common issues raised at litigation. As more than two-thirds of doctors practicing obstetrics feel inadequately trained, it is important that focused and intensive training is made available. In this regard, Sultan and colleagues have introduced an ongoing course using video presentations, specially designed models and fresh animal anorectal specimens to demonstrate the anatomy and techniques of...
repair. The feedback from attendees is that this type of training should be an essential part of the modular training for specialist registrars.

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**FURTHER READING**


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**Practice points**

- Clarify the classification of perineal tears and identify risk factors for injury
- Safe practice, education, training, management of subsequent pregnancies following anal sphincter injury and prevention of injuries should be emphasized
- Investigations comprise anal ultrasonography, manometry, electromyography, urodynamics and MRI

**Research directions**

- Timing of pelvic floor exercises
- Benefits of episiotomy in instrumental delivery
- Prevention of anal sphincter injury
- Role of immediate endoanal scanning in the detection of anal sphincter injury
- Randomized trials of the management of subsequent pregnancies following anal sphincter rupture