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Taiwanese Journal of Obstetrics & Gynecology 51 (2012) 148–152

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Third- and fourth-degree perineal laceration in vaginal delivery

Introduction

Perineal repair after episiotomy or spontaneous obstetric laceration is one of the most common surgical procedures. Potential sequelae of obstetric perineal lacerations include chronic perineal pain [1], dyspareunia [2], and urinary and fecal incontinence [3–5]. Few studies of laceration repair techniques exist to support the development of an evidence-based approach to perineal repair.

Perineal anatomy

The perineal body, located between the vagina and the rectum, is formed predominantly by the bulbocavernosus and transverse perineal muscles. The puborectalis muscle and the external anal sphincter contribute additional muscle fibers. The anal sphincter complex lies inferior to the perineal body. The external anal sphincter is composed of skeletal muscle. The internal anal sphincter, which overlaps and lies superior to the external anal sphincter, is composed of smooth muscle and is continuous with the smooth muscle of the colon. The anal sphincter complex extends for a distance of 3–4 cm [6]. The internal anal sphincter provides most of the resting anal tone that is essential for maintaining continence. Laceration of this sphincter is associated with anal incontinence [4]. Interestingly, repair of the internal anal sphincter is not described in standard obstetric textbooks [7,8].

Classification of perineal laceration

A first-degree tear is defined as a superficial tear confined to the epithelial layer. Second-degree tears extend into the perineal body but not into the external anal sphincter. Third-degree tears involve superficial or deep injury to the external anal sphincter, whereas a fourth-degree tear extends completely through the rectal mucosa. Significant morbidity is associated with third- and fourth-degree tears, including risk of flatus and stool incontinence, rectal vaginal fistula, infection, and pain.

Incidence and risk factors

Third- and fourth-degree lacerations are considered severe lacerations, and they occur in approximately 5% of vaginal deliveries. Modifiable risk factors associated with this condition were analyzed, specifically episiotomy, forceps-assisted vaginal delivery, forceps with episiotomy, vacuum-assisted vaginal delivery, and vacuum with episiotomy. Dandolu et al [9] reported a total of 258,507, and there were 18,888 (7.3%) third- and fourth-degree lacerations. Instrumental vaginal delivery, particularly with use of episiotomy, significantly increased the risk of laceration [forceps odds ratio (OR): 3.84, forceps with episiotomy OR: 3.89, vacuum OR: 2.58, vacuum with episiotomy OR: 2.93]. Episiotomy, on the whole, was associated with a threefold increase in the risk of sphincter tears. However, episiotomy in the absence of instrumental delivery seems to be protective with an OR of 0.9. Instrumental vaginal delivery, particularly forceps delivery, appears to be an important risk factor for anal sphincter tears. The risk previously attributed to episiotomy is probably due to its association with instrumental vaginal delivery. Forceps delivery is associated with higher occurrence of anal sphincter injury compared to vacuum delivery [9].

Midline episiotomy is a known major risk factor for severe perineal lacerations. Sheiner et al [10] showed a study of obstetric risk factors for third-degree perineal tears in a university medical center where midline episiotomies are not performed. A comparison between vaginal deliveries complicated with third-degree perineal tears and deliveries without third-degree perineal tears was performed. Deliveries occurred between the years 1988 and 1999 in a tertiary medical center. A multiple logistic regression model was constructed in order to find independent risk factors for third-degree perineal tears. During the study period, 79 (0.1%) consecutive cases of third-degree perineal tears were identified. Significant risk factors from the univariate analysis were fetal macrosomia [OR 2.7, 95% confidence interval (CI) 1.2–5.5], nulliparity (OR 2.9, 95% CI 1.8–4.6), labor induction (OR 1.9, 95% CI 1.0–3.5), failure of labor to progress during the second stage (OR 10.8, 95% CI 5.4–21.1), nonreassuring fetal heart rate patterns (OR 11.7, 95% CI 6.1–21.5), mediolateral episiotomy (OR 2.8, 95% CI 1.8–4.5), vacuum extraction (OR 10.6, 95% CI 6.1–18.3), and forceps delivery (OR 29.2, 95% CI 7.3–97.2). However, using a multivariable analysis, only fetal macrosomia (OR 2.5, 95% CI 1.2–4.9), vacuum extraction (OR 8.2, 95% CI 4.7–14.5), and forceps delivery (OR 26.7, 95% CI 8.0–88.5) remained as independent risk factors. The

1028-4559/$ - see front matter
doi:10.1016/j.tjog.2012.01.035

combined risk for instrumental deliveries of macrosomic newborns was 8.6 (95% CI 1.2–62.5; $p = 0.010$). After adjustment for possible confounding variables, mediolateral episiotomy *per se* was not an independent risk factor for third-degree perineal tears. Instrumental vaginal deliveries of macrosomic fetuses should be avoided whenever possible to decrease the occurrence of third-degree perineal tears [10].

Another study reported by Angioli et al [11], the risk factors associated with severe laceration were analyzed at a single, large teaching institution. This study consisted of an analysis of data from 1989 through 1995, including 50,210 women during the 7-year study period, in which both univariate and multivariate analyses were performed with variables such as maternal age, race, birth weight, type of episiotomy if any, and type of vaginal delivery. The episiotomy procedure and the type of episiotomy as well as birth weight, assisted vaginal delivery, and older maternal age were identified as independent risk factors associated with third- and fourth-degree perineal lacerations. Although episiotomy is an important risk factor for severe lacerations after vaginal delivery, there are other significant independent risk factors, such as maternal age, birth weight, and assisted vaginal delivery, that should be considered in counseling and making decisions regarding delivery modality. Older patients who are being delivered of a first child are at higher risk for severe laceration. Midline episiotomy and assisted vaginal delivery should therefore be avoided in this population whenever possible, especially in the presence of a large baby [11].

In their report, Hudelist et al [12] identified the risk factors for third- and fourth-degree perineal tears in patients undergoing either spontaneous or vaginal-assisted delivery by forceps routinely combined with mediolateral episiotomy. They retrospectively reviewed 5377 vaginal deliveries based on the analysis of the obstetric database and patient records during a 5-year period from 1999 to 2003. Cases and control individuals were chosen randomly and patients' records were reviewed for the following variables: maternal age, parity, gestational age, tobacco use, gestational diabetes or pregnancy-induced hypertension, use of peridural anesthesia, duration of first and second stages of labor, use of mediolateral episiotomy, forceps combined with mediolateral episiotomy, induction of labor, infant head diameter, shoulder circumference, and birth weight. Of 5044 spontaneous vaginal deliveries 32 (0.6%) and of 333 assisted vaginal deliveries 14 (4.2%) patients sustained a perineal defect involving the external sphincter. A univariate analysis of these 46 cases and 155 randomly selected control participants showed that low parity ($p = 0.003$; Mann–Whitney U test), prolonged first and second stages of labor ($p = 0.001$, $p = 0.001$), high birth weight ($p = 0.031$), episiotomy ($p = 0.004$; Fisher exact test), and forceps delivery ($p = 0.002$) increased the risk for sphincter damage. In multivariate regression models, only high birth weight ($p = 0.004$; OR 1.68, 1.18–2.41, 95% CI), and forceps delivery combined with mediolateral episiotomies ($p < 0.001$; OR 5.62, 2.16–14.62, 95% CI) proved to be independent risk factors. There was a statistical significant interaction of birth weight and head circumference ($p = 0.012$; OR 0.99, 0.98–0.99, 95% CI). Although the use of episiotomy conferred an increased risk toward a higher likelihood of severe perineal trauma, it did not reach statistical significance ($p = 0.06$; OR 2.15, 0.97–4.76, 95% CI). In consistence with previous reports, women who are vaginally delivered of a large infant are at a high risk for sphincter damage. Although the rate of these complications was surprisingly low in vaginally assisted childbirth, the use of forceps, even if routinely combined with mediolateral episiotomy, should be minimized whenever possible [12].

Epidural analgesia has become more popular and, in some institutions, is used in more than 70% of vaginal deliveries. In a study of 2759 patients, epidural analgesia was given to approximately 23% of patients during the study period. The overall severe perineal laceration rate was 6.38%; 10.25% of women with epidural analgesia had severe perineal lacerations compared with 5.22% of those who did not have an epidural analgesia. Controlling for other variables, the use of epidural analgesia was a significant predictor of severe perineal injury. When instrument use was included in the analysis, epidural analgesia was no longer a significant predictor of severe perineal lacerations. Instrumentation was found to be a strong predictor of severe perineal laceration, but the use of epidural analgesia significantly predicts instrumentation use. Carroll et al conclude that epidural analgesia during vaginal delivery increases the risk of severe perineal lacerations secondary to a threefold increase in the risk of instrumentation use. The use of instrumentation during vaginal delivery more than tripled the risk of severe perineal lacerations.

Surgical principles

Following delivery of the placenta, the cervix, vagina, and perineum should be carefully examined for evidence of injury. If a laceration is seen, its length and position should be noted and repair initiated. Special attention should be paid to repair of the perineal body, the external anal sphincter, and the rectal mucosa. Failure to recognize and repair rectal injury can lead to serious long-term morbidity, most notably fecal incontinence. Primary approximation of perineal laceration affords the best opportunity for functional repair, especially if there is evidence of rectal sphincter injury. The external anal sphincter should be repaired by direct apposition or overlapping the cut ends and securing them using interrupted sutures.

Obstetric perineal lacerations are classified as first to fourth degree, depending on their depth. A rectal examination is helpful in determining the extent of injury and ensuring that a third- or fourth-degree laceration is not overlooked. Repair of the perineum requires good lighting and visualization, proper surgical instruments and suture material, and adequate analgesia. Compared with surgical repair using catgut or chromic suture, repair using 3–0 polyglactin 910 (Vicryl) suture results in decreased wound dehiscence and less postpartum perineal pain [13–16]. Use of rapidly absorbed polyglactin 910 (Vicryl Rapide) suture decreases the need for postpartum suture removal after repair of second-degree lacerations [17]. Local anesthesia can be used for repair of

most perineal lacerations. However, general or regional anesthesia may be necessary to achieve adequate muscle relaxation and visualization for surgical repair of severe or complex lacerations. Severe perineal lacerations involving the anal sphincter complex pose a surgical challenge. Recent studies [3,18] have demonstrated a 20% to 50% incidence of anal incontinence or rectal urgency after repair of third-degree obstetric perineal lacerations. These injuries do not require immediate repair; hence, an inexperienced physician can delay the procedure for a few hours until appropriate support staff are available. With severe perineal lacerations involving the anal sphincter complex, we irrigate copiously to improve visualization and reduce the incidence of wound infection. Because these lacerations are contaminated by stool, a single dose of a second- or third-generation cephalosporin may be given intravenously before the procedure is started.

Repair of second-degree perineal lacerations

Repair of a second-degree laceration requires approximation of the vaginal tissues, muscles of the perineal body, and perineal skin. The steps in the procedure are as follows: The apex of the vaginal laceration is identified. For lacerations extending deep into the vagina, a Gelpi or Deaver retractor facilitates visualization. An anchoring suture is placed 1 cm above the apex of the laceration, and the vaginal mucosa and underlying rectovaginal fascia are closed using a running unlocked 3–0 polyglactin 910 suture. If the apex is too far into the vagina to be seen, the anchoring suture is placed at the most distally visible area of laceration, and traction is applied on the suture to bring the apex into view. The running suture can be locked for hemostasis, if needed. The sutures must include the rectovaginal fascia, which provides support to the posterior vagina. The running suture is carried to the hymenal ring and tied proximal to the ring, completing closure of the vaginal mucosa and rectovaginal fascia.

Repair of fourth-degree perineal lacerations

Repair of a fourth-degree laceration requires approximation of the rectal mucosa, internal anal sphincter, and external anal sphincter. A Gelpi retractor is used to separate the vaginal sidewalls to permit visualization of the rectal mucosa and anal sphincters. The apex of the rectal mucosa is identified, and the mucosa is approximated using closely spaced interrupted or running 4–0 polyglactin 910 sutures. Traditional recommendations emphasize that sutures should not penetrate the complete thickness of the mucosa into the anal canal, to avoid promoting fistula formation. The sutures are continued to the anal verge (i.e., onto the perineal skin). An alternative technique is overlapping repair of the external anal sphincter. Colorectal surgeons prefer to use this method when they repair the sphincter remote from delivery [18,19]. The overlapping technique brings together the ends of the sphincter with mattress sutures and results in a larger surface area of tissue contact between the two torn ends. Dissection of the external anal sphincter from the surrounding tissue with Metzenbaum scissors may be required to achieve adequate length for the overlapping of the muscles. The suture is passed from top to bottom through the superior and inferior flaps, then from bottom to top through the inferior and superior flaps. The proximal end of the superior flap overlies the distal portion of the inferior flap. Two more sutures are placed in the same manner. After all three sutures are placed, they are each tied snugly, but without strangulation. When tied, the knots are on the top of the overlapped sphincter ends. Care must be taken to incorporate the muscle capsule in the closure. The perineal muscles, vaginal mucosa, and skin are repaired using the same techniques described for the repair of second-degree lacerations.

Postpartum care

The literature contains little information on patient care after the repair of perineal lacerations. The use of sitz baths and an analgesic such as ibuprofen is suggested. If a woman has excessive pain in the days after a repair, she should be examined immediately because pain is a frequent sign of infection in the perineal area. After repair of a third- or fourth-degree laceration, several weeks of therapy with a stool softener is given to minimize the potential for repair breakdown from straining during defecation.

Sequelae and complication

Perineal injuries, either spontaneous or with episiotomy, are the most common complications of spontaneous or operative vaginal deliveries. Perineal trauma during vaginal delivery can have long-term adverse effects, including perineal pain, dyspareunia, and chronic fecal incontinence, and may increase the risk of development of recto-vaginal fistulas. After childbirth-related third- or fourth-degree perineal lacerations, the estimated incidence of wound disruption, fecal incontinence, or fistula ranges from 1% to 10%. Some researchers reported that bowel-related complications were more common following fourth-degree tear repair compared with third-degree repair. Furthermore, women with fourth-degree tears were significantly more likely to have an increased rate of combined defects of the internal and external sphincters.

The frequency of postpartum perineal morbidity (dehiscence, infection, and rectovaginal fistula) in women after fourth-degree perineal repair was studied by Goldaber et al [20]. They retrospectively reviewed in a case-cohort study of 390 women at Parkland Memorial Hospital with fourth-degree perineal repair during 1989 and 1990. Of the 390 women, 21 (5.4%) had postpartum perineal morbidity. Seven (1.8%) had dehiscence alone, 11 (2.8%) had infection and dehiscence, and three (0.8%) had infection alone. Overall, there were 18 dehiscences (4.6%) and 14 infections (3.6%) in the total group with perineal morbidity. Two high rectovaginal fistulas were concomitantly detected in women with perineal dehiscence. Only shoulder dystocia, metritis, and postpartum fever occurred significantly more frequently in patients with postpartum perineal morbidity than in women without perineal

morbidity. Smoking and human papillomavirus infection were not associated with perineal repair morbidity. Postpartum perineal morbidity after fourth-degree perineal repair is an uncommon event. It is not predicted by readily preventable antepartum or intrapartum factors [20].

Prevention

The incidence of severe perineal trauma can be decreased by minimizing the use of episiotomy and operative vaginal delivery. A Cochrane review demonstrated that liberal use of episiotomy does not reduce the incidence of anal sphincter lacerations and is associated with increased perineal trauma [21]. A meta-analysis of eight randomized trials of vacuum extraction versus forceps delivery demonstrated that one sphincter tear would be prevented for every 18 women delivered with vacuum rather than forceps [22].

Discussion and conclusion

The common complaints among women following anal sphincter repair are incontinence of stool and fecal urgency. The overall reported rate of anal sphincter lacerations is approximately 6% to 20%, with higher rates documented following forceps or vacuum delivery. The risk factors for anal sphincter damage include delivery with forceps or a vacuum, and the first baby or delivering a large baby.

Severe perineal lacerations are reported to occur in up to 6% of women during vaginal delivery [23]. Fourth-degree tears are the most severe type, with completely transected anal sphincters and overlying anal mucosa. These injuries are accompanied by serious morbidity in over 50% of cases, even after early detection and repair [23–26]. It is important for experienced staff to perform anatomically correct repair [24–26]. The mucosa should be approximated with absorbable submucosal sutures [15,27]. And slowly absorbable or nonabsorbable sutures should be used to repair the anal sphincter [24–26], preferably by the overlap technique [28,29].

The need for simultaneous diversion of feces is an area that is under-researched. Colostomies have been traditionally used to reduce infectious morbidity by diverting stools away from the perineal repair. Loop sigmoid colostomies allow full diversion of feces away from the distal bowel limb [30,31], are rapidly constructed, and are easily closed without laparotomy. They are readily accepted for secondary repairs [24,32,33] and when patients develop frank recto-vaginal fistulae [34], but the decision becomes less clear for primary repair of acute perineal lacerations. The medical literature contains only a few case reports and small series with reports of colostomies during repair of acute injuries, but the indications are elusive and its performance is not standard [23,35–37]. There is also a marked difference in expert opinion, with 30% of coloproctologists but no obstetricians recommending diversion for third- or fourth-degree tears in a recent practice survey [24]. Colostomies may impair healing by reducing collagen metabolism and altering mucosal defense in the defunctionalized rectum [38]. They may also increase infectious morbidity by attenuating mucosal integrity and promoting microbe translocation [39]. And although our patient did not develop complications, 20–25% of patients experience additional morbidity at colostomy closure [40,41]. Several authorities repair fourth-degree lacerations without diversion because several factors promote uneventful healing. These are low energy injuries with minimal tissue loss and excellent blood supply. Furthermore, the trans-anal approach affords excellent exposure of obstetric lacerations, abolishing the problem of difficult exposure in the pelvis at laparotomy.

Many patients managed in this fashion may not experience morbidity, but some fourth-degree lacerations are more prone to dehiscence. Surely, the laceration allowing extensive free recto-vaginal communication encountered in such case is more likely to result in dehiscence than a laceration that transects only the anal mucosa over the sphincters, although both are classified as fourth degree by the current staging systems. This is an obvious limitation of current staging systems that makes standardized treatment difficult.

We firmly believe that the severe anatomic disruption patient warranted diversion to protect the repair. And with the proven safety of same admission colostomy closure [41], patients can have reversal before leaving hospital. Deciding on colostomy creation for fourth-degree lacerations is difficult because there is little evidence upon which to base management decisions. This is an area that is still under-researched. Further study is warranted and therapeutic decisions should be individualized at this time. Some long-term effects of this type of trauma may include chronic fecal incontinence, perineal pain, recto-vaginal fistulas, and pain during sexual intercourse. Many patients who experience chronic bowel incontinence may not seek medical help because they find the nature of the problem embarrassing, which can have a toll on quality of life.

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