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Risk factors for the breakdown of perineal laceration repair after vaginal delivery

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KEY WORDS
Perineal laceration
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Objective: The purpose of this study was to identify risk factors that are associated with the breakdown of perineal laceration repair in the postpartum period.
Study design: We conducted a retrospective, case-control study to review perineal laceration repair breakdown in patients who were delivered between September 1995 and February 2005 at the University of Michigan. Bivariate analysis with chi-square test and *t*-test and stepwise logistic regression analysis were performed.
Results: Fifty-nine cases and 118 control deliveries were identified from a total of 14,124 vaginal deliveries. Risk factors were longer second stage of labor (142 vs 87 minutes; $P = .001$), operative vaginal delivery (odds ratio, 3.6; 95% CI, 1.8-7.3), mediolateral episiotomy (odds ratio, 6.9; 95% CI, 2.6-18.7), third- or fourth-degree laceration (odds ratio, 3.1; 95% CI, 1.5-6.4), and meconium-stained amniotic fluid (odds ratio, 3.0; 95% CI, 1.1-7.9). Previous vaginal delivery was protective (odds ratio, 0.38; 95% CI, 0.18-0.84). Logistic regression showed the most significant factor to be an interaction between operative vaginal delivery and mediolateral episiotomy (odd ratio, 6.36; 95% CI, 2.18-18.57).
Conclusion: The most significant events were mediolateral episiotomy, especially in conjunction with operative vaginal delivery, third- and fourth-degree lacerations, and meconium.

Care of the perineum, both during and after childbirth, has long been a topic of interest in obstetrics. There has been a considerable amount of research in the area of risk factors for perineal laceration, but relatively little investigation of the risk factors for breakdown of the initial laceration repair. Race as a risk factor for severe laceration has been examined by multiple studies, with a relationship found with Asian race, whereas black race is protective.[1-3] Operative vaginal delivery, episiotomy, perineal length, birth weight, and nulliparity have also been identified as risk factors for laceration.[1-10] Sequelae of perineal laceration include sphincter damage with associated defecatory disorders (urgency, incontinence of flatus or stool, pain with defecation),[9-12] chronic perineal pain,[7] dyspareunia,[13] wound infection,[14-16] fistula formation, and dehiscence.[9,15]

There is a relative paucity of data on risk factors for dehiscence of perineal lacerations because it is a relatively rare outcome. Although the exact incidence rate is

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unknown, it is accepted generally at 0.1% to 2.1%, depending on the degree of initial laceration,[17,18] but has been reported in up to 4.6% of patients with a fourth-degree laceration.[14] A significant number of these lacerations are associated with infection.[14,19-21] Although it is rare, when it occurs, dehiscence represents a source of significant morbidity to those patients who are affected. Dehiscence may range in severity from a simple separation of the skin or mucosa to more severe separations that involve the anal sphincter or mucosa. These may be associated with pain, infection, loss of perineal body mass, vaginal outlet relaxation, and loss of continence. Our objective was to identify risk factors that are associated with perineal laceration breakdown in the postpartum period and to describe the associated breakdown.

Methods

A retrospective, case-control study was performed to review perineal laceration repair breakdown (PLB) in all patients delivered at the University of Michigan from September 1995 through February 2005. Deliveries were analyzed by inpatient and outpatient International Classification of Diseases–ninth revision diagnostic codes 664.14, 664.24, 664.34, 674.2, 674.22, 674.24 (disruption of perineum, wound débridement, wound incision and drainage, episiotomy repair, and secondary closure of wound/dehiscence) to identify cases of PLB. Medical record review confirmed PLB in the postpartum period. *Dehiscence* was defined as complete separation of the mucosa of at least 50% of the length of the repair and/or deeper separation of the perineal body. Minor superficial separation of the vaginal mucosa or skin of the perineum was not included.

Control subjects identified as having a significant perineal laceration without evidence of breakdown were matched to cases in a 2 to 1 fashion. *Significant perineal laceration* was defined as a spontaneous laceration of second degree or greater. Also included in this definition was episiotomy of at least second degree. Control subjects were identified in a temporal fashion, from the first delivery before and the next delivery subsequent to the index case meeting the above criteria. Perineal injury was recorded on the delivery record and in the inpatient medical record by the delivering or repairing physician or certified nurse midwife. Inpatient and outpatient records that pertained to prenatal care, delivery, and postpartum care were reviewed for the presence of potential antepartum and intrapartum risk factors for breakdown.

Standard definitions for degree of perineal trauma are *first-degree* (perineal laceration extending through the perineal skin and vaginal mucosa only), *second-degree* (perineal laceration extending through the bulbocavernosus and transverse perineal muscles), *third-degree* (perineal laceration extending through the external anal sphincter), and *fourth-degree* (perineal laceration extending through the anal mucosa).

Antepartum variables that were evaluated included age, race, body mass index, parity, previous vaginal delivery, previous perineal laceration, smoking, preexisting medical conditions, gestational diabetes mellitus, and type of insurance as a marker for socioeconomic status. Intrapartum variables that were examined included the degree of laceration, presence and type of episiotomy, operative delivery (low or outlet vacuum or forceps), birth weight, chorioamnionitis, meconium, antibiotics in labor, duration of rupture of membranes, duration of second stage of labor, and both delivery provider and provider who performed the primary repair.

Statistical analysis was performed with SPSS software (SPSS Inc, Chicago, IL). The chi-square test was used to analyze categoric variables, and the *t*-test was used for continuous variables. Odds ratios (OR) and 95% CIs were calculated, and a probability value of $<.05$ was considered statistically significant. Backwards elimination stepwise logistic regression was conducted on dichotomous outcomes with PLB as the dependent variable. The Institutional Review Board of the University of Michigan Medical School approved this study and waived consent.

Results

Fifty-nine cases were identified during the 10-year period that was examined. There were 19,067 deliveries at the University of Michigan over this time, of which 14,124 deliveries were vaginal births. Patients in the case group had 38 second-degree lacerations (64.4%), 17 third-degree lacerations (28.8%), and 4 fourth-degree lacerations (6.8%). Twenty of the cases had a mediolateral episiotomy (33.9%), and 11 cases had a midline episiotomy (18.6%).

One hundred eighteen control subjects were identified. Cases and control subjects were similar in most antepartum risk factors that were examined and included age, body mass index, race, smoking, diabetes mellitus, insurance status, predelivery medical problems (such as hypertension, diabetes mellitus, lupus, asthma, hypothyroidism), and delivering provider. The only difference found between cases and control subjects was the percentage of patients who had had a previous vaginal delivery (Table I).

A number of intrapartum risk factors differed significantly between cases and control subjects and included third- or fourth-degree lacerations, episiotomy, rate of operative vaginal delivery, presence of meconium, and duration of second stage of labor (Table II). There

Table I Antepartum characteristics

Characteristic	Cases (n = 59)	Control subjects (n = 118)	*P* value
Age (y)*	30.3 ± 4.5	29.4 ± 5.5	.27
Race (n)			.64
White	47 (79.6%)	84 (73.7%)	
Black	2 (3.4%)	7 (5.9%)	
Asian	6 (10.2%)	14 (11.9%)	
Other/unknown	4 (6.8%)	10 (8.5%)	
Body mass index (kg/m^2)*	29.4 ± 4.9	29.4 ± 4.8	.99
Nulliparity (n)	45 (76.3%)	71 (60.2%)	.03
Previous vaginal delivery (n)	10 (16.9%)	41 (34.7%)	.014
Smoking (n)	5 (8.5%)	11 (9.3%)	.97
Diabetes mellitus (n)	2 (3.4%)	4 (3.4%)	.98
Previous medical condition (n)	26 (44.1%)	46 (39.0%)	.52
Insurance (n)			.29
Private	53 (89.8%)	99 (83.9%)	
Medicaid	6 (10.2%)	19 (16.1%)	

* Data are given as mean ± SD.

Table II Intrapartum characteristics

Characteristic	Cases (n = 59)	Control subjects (n = 118)	*P* value
Third-/fourth-degree laceration (n)	21 (35.6%)	18 (15.3%)	.002
Episiotomy (n)	31 (52.5%)	53 (44.9%)	.001
Midline (n)	11 (18.6%)	42 (35.6%)	
Mediolateral (n)	20 (33.9%)	11 (9.3%)	
Operative delivery (n)			0.001
Forceps	21 (35.65%)	15 (12.75%)	
Vacuum	3 (5.15%)	4 (3.45%)	
Meconium	19 (32.25%)	19 (16.15%)	.014
Second stage of labor duration (min)	141.6	86.5	.001
Labor augmentation (n)	28 (33.35%)	60 (66.75%)	.72
GBS+ (n)	7 (11.95%)	16 (13.65%)	.94
Chorioamnionitis (n)	3 (5.15%)	5 (4.25%)	.80
Antibiotics in labor (n)	11 (18.65%)	29 (24.65%)	.37
Birth weight (g)*	3584 ± 514	3449 ± 505	.10
Suture type (n)			.08
Vicryl alone	47 (79.7%)	79 (675%)	.16
Chromic alone	5 (8.5%)	25 (21.2%)	.37
Chromic and Vicryl	6 (10.2%)	7 (5.9%)	.05

GBST, Group B strep positive.
* Data are given as mean ± SD.

initially appeared to be a difference in repairing providers, with more cases having been repaired by obstetricians and a more widely distributed group of repairing providers among control subjects (certified nurse midwife, family practice, and obstetrics). On further analysis, it became apparent that this difference was due to the fact that most third-degree, all fourth-degree, and all mediolateral episiotomies were repaired by the obstetric service and that cases were more likely to have one of these types of perineal injury.

In the bivariate analysis, the most significant independent risk factor that was identified was mediolateral episiotomy (OR, 6.9; 95% CI, 2.6-8.7), followed by operative vaginal delivery (OR, 3.57; 95% CI, 1.8-7.3), higher-order lacerations (third and fourth degree; OR, 3.1; 95% CI, 1.5-6.4), and meconium-stained amniotic fluid (OR, 3.0; 95% CI, 1.1-7.9). Increased second stage of labor duration was also a risk factor in the absence of any other predisposing factors (Table II). A second stage of labor of >60 minutes by itself was associated with an increased risk for breakdown (OR, 3.36; 95% CI, 1.7-6.7), even among subjects who had a previous vaginal birth (OR, 9.25; 95% CI, 1.8-46.4).

A backwards elimination stepwise logistic regression analysis was performed. The final model is shown in Table III. The most significant risk factor that was identified was the interaction between operative vaginal delivery and mediolateral episiotomy (OR, 6.36).

Among the 59 cases that were identified, 28 cases (47.5%) had no complication other than the breakdown. Twenty-four cases (40.7%) were associated with infection. Infectious morbidities included perineal abscess (17 cases), perirectal abscess (one cases), or cellulitis (7 cases); one case had both a perineal and a perirectal abscess. Overall, 29 cases received antibiotics; 3 cases had wound hematomas, and 2 cases received blood transfusions. There was no relationship between cases with previous medical conditions and perineal infection.

On average, cases had 1.73 additional hospital days attributable to their breakdown (range, 0-11 days). Cases also had 4.05 outpatient visits that were related to the breakdown and included the routine postpartum visit (range, 1-13 visits). Cases required an average of 0.98 trips to the operating room for either débridement or repair (range, 0-7 cases). Cases received local anesthesia (3 cases), intravenous sedation (8 cases), spinal/epidural sedation (39 cases), or general anesthesia (8 cases) for their operative débridement and repair.

Comment

The results of our study demonstrate that PLB in the postpartum period is associated with operative vaginal

Table III Stepwise logistic regression analysis

Variable	OR	95% CI
Operative delivery + mediolateral episiotomy	6.36	2.18-18.57
Operative delivery + midline episiotomy	0.15	0.02-1.45
Third-/fourth-degree laceration	3.70	1.51-9.08
Meconium	3.22	1.32-7.88
Second stage of labor >60 minutes	3.07	1.38-6.81

The following categoric variables were entered into the model: age >30 years, obesity (body mass index, ≥ 30 kg/m^2), previous vaginal birth, tobacco use, medical complications of pregnancy, insurance (public vs private), episiotomy (if it was cut and what type), meconium, macrosomia, antibiotic use during labor, chorioamnionitis, rupture of membranes at ≥12 hours, second stage of labor >60 minutes, higher-order laceration, delivering physician, primary repairing service, race (white vs nonwhite), operative vaginal delivery, suture type. The following interactions were also included in the model: instrumentation · meconium, instrumentation · episiotomy, operative vaginal delivery · higher-order laceration, operative delivery · episiotomy, operative vaginal delivery · episiotomy · higher-order laceration, and higher-order laceration · suture type.

delivery in conjunction with mediolateral episiotomy, third- and fourth-degree perineal lacerations, the presence of meconium-stained amniotic fluid, and increased duration of the second stage of labor.

PLB was also associated with significant morbidity and the need for additional medical care in the postpartum period, which included additional hospital days, outpatient visits, trips to the operating room for either débridement or repair, and associated anesthetic and antibiotic requirements. Not all patients in our study required secondary repair in the operating room. Some patients were able to tolerate repair in the outpatient office setting; other patients were allowed to heal by secondary intention.

Infection rates were high, with 40.7% of cases having some form of documented wound infection. An additional 6.8% patients received a course of oral antibiotics for suspected wound infection (data not included). Most studies report infection as the most likely causative factor in dehiscence.[14-16,20] Factors that may predispose to infection include contamination at the time of repair with stool, devitalized tissue, poor perineal hygiene, and hematoma formation. Because a number of these factors were not documented in the medical record during the course of routine delivery and repair of lacerations, we were unable to evaluate them as a part of this study.

Because of these high rates of infection and concerns over devitalized tissue, traditional recommendations are advocated for a delayed closure of PLBs, on the order of 3 to 4 months, to allow for revascularization of tissue and to minimize inflammation. This results in embarrassment, loss of sexual function and physical discomfort for the patient. Several studies have evaluated both inpatient or intensive outpatient wound preparation with irrigation, débridement, and sitz baths for an average of 7 days (range, 4-10 days), followed by early surgical repair, and have shown excellent results that are comparable with delayed closure with much higher patient satisfaction.[16,21,22-24] Additional studies have demonstrated that early repair is successful, even in the presence of infection, with the appropriate use of antibiotics and wound preparation.[16,18,21]

An additional area for exploration is the area of suture choice for repair. Most repairs were performed with a single type of suture. This was primarily Vicryl, but was provider dependent. In instances in which >1 type of suture was used, it involved either third- or fourth-degree lacerations: The anal mucosa was repaired with chromic; the sphincter was repaired with Vicryl, and variable sutures were chosen for the remainder of the repair. In the categoric analysis, the use of both chromic and Vicryl at the time of repair was associated with increased rates of breakdown (Table II); however, this relationship did not remain significant in the final logistic regression model (Table III).

Our study is retrospective and thus limited by ascertainment bias. Patients who required operative repair or débridement had a high capture rate, which may have skewed the number of cases toward patients who needed operative repair. Additionally, patients who did not have a symptomatic dehiscence (ie, infection, pain, drainage) may have been missed because the dehiscence had healed by secondary intention by the 6-week postpartum visit. We were also limited in drawing any conclusions about race as a risk factor in PLB because of the predominately white population at the University of Michigan. Future study in a more diverse patient population would be necessary to answer adequately the question of race as a risk factor.

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