



ELSEVIER

Differences in outcomes after third- versus fourth-degree perineal laceration repair: A prospective study

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KEY WORDS

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Anal incontinence
Endoanal
ultrasonography

Objective: The purpose of this study was to compare outcomes after third- versus fourth-degree laceration repair.

Study design: Fifty-six primiparous women who sustained a third- or fourth-degree tear were enrolled at delivery and demographic and obstetric data were collected. At 6 weeks' postpartum, subjects completed a bowel function questionnaire and endoanal ultrasonography was performed. Fisher exact test and chi-square were used for statistical analysis.

Results: Thirty-nine women with third- and 17 with fourth-degree tears were enrolled. Subjects with fourth- were more likely to report bowel symptoms (59% vs 28%, $P = .03$), and to demonstrate persistent combined defects of the internal (IAS) and external anal sphincter (EAS) (48% vs 8%, $P = .002$) than third-degree tears. Combined defects were associated with the highest risk of bowel symptoms (OR 18.7, 95% CI 3-101, $P < .001$).

Conclusion: Bowel symptoms were more common after fourth- than third-degree repair, and may be secondary to higher rates of combined defects of the IAS and EAS.

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Clinically recognized anal sphincter lacerations are reported to occur in 0.6%¹ to 20%² of vaginal deliveries, with higher rates documented after operative vaginal delivery.³ In a large population-based, retrospective study from California, Handa et al reported a 4.1% to 3.9% rate of third-degree tears, and a 2.1% to 1.7% rate of fourth-degree lacerations between 1992 and 1997.⁴ In another United States obstetric unit where midline episiotomy is practiced, Fenner et al found significantly higher rates of

third- (16.7%) and fourth-degree (3.6%) tears.⁵ The incidence of fourth-degree lacerations in the United Kingdom is not known because third- and fourth-degree tears have traditionally been analyzed as a single variable.

Obstetric anal sphincter lacerations are known risk factors for the development of anal incontinence in women^{1,6,7}; however, the majority of studies investigating outcomes after anal sphincter repair have failed to distinguish between the separate risks of third- and fourth-degree lacerations.^{1,8-11} A third-degree laceration involves the anal sphincter complex (external \pm internal sphincter), whereas fourth-degree lacerations extend through the rectal mucosa to expose the lumen of the bowel. Two retrospective studies have reported

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significantly higher rates of anal incontinence in women with a history of fourth-degree compared with third-degree tears. Sangalli et al¹² evaluated 177 women 13 years after delivery, 129 of which sustained a third-degree tear and 48 a fourth-degree tear. Anal incontinence was significantly more common in women with a history of fourth-degree (25%) than third-degree (11.5%) laceration. Furthermore, subsequent vaginal deliveries were associated with a higher prevalence of severe incontinence in women with fourth- but not third-degree lacerations. Fenner et al⁵ also found that the prevalence of bowel dysfunction was nearly 10 times higher in women with fourth-degree lacerations (30.8%) compared with women with third-degree lacerations (3.6%).

The aims of our study were to prospectively compare outcomes after third- and fourth-degree laceration repair to determine if differences existed in rates of anal incontinence, fecal urgency, and evidence of persistent anal sphincter disruption on endoanal ultrasonography. We wished to determine if correlations existed between bowel symptoms and persistent disruption of the internal sphincter, external sphincter, or both. This information may assist in the counseling and subsequent management of patients who sustain severe perineal injury after vaginal childbirth.

Material and methods

This prospective study was performed at Virginia Commonwealth University Medical Center between April 1, 2002 and July 2004, after approval by the Institutional Review Board. Primiparous women who sustained a third- or fourth-degree laceration during the study period were approached on the postpartum unit, and written consent was obtained for enrollment in the study. Subjects estimated their predelivery bowel habits and bowel symptoms by completing a Manchester Bowel Function Questionnaire¹³ before hospital discharge. This questionnaire assesses both anal incontinence symptoms and fecal urgency, a common complaint among women after anal sphincter repair.^{1,14} Fecal urgency was defined as the inability to defer defecation for more than 5 minutes. Demographic and intrapartum data were collected and recorded on data sheets by a study nurse. The methods of anal sphincter and rectal mucosal repair were not standardized because variations exist in practice patterns and no methods of repair have been proven superior.¹⁵ All subjects were discharged within 3 days of delivery and completed a 1-week course of oral antibiotics to reduce the chance of infection. Bowels were kept soft with lactulose syrup for 2 weeks after hospital discharge, and all subjects were instructed to contact the obstetrics clinic if constipation developed. Between 6 and 8 weeks after delivery, patients presented to a specialized "perineal clinic," which was staffed by the author (CMN). The

utility of an obstetric perineal clinic was previously described by Fitzpatrick et al.¹⁶

During the 6- to 8-week postpartum evaluation, all subjects completed a second Manchester Bowel Function Questionnaire to assess for any changes in bowel habits since delivery. The specific domains that were extracted from the questionnaire for this study were questions regarding fecal urgency and anal incontinence. Subjects who reported incontinence of gas, liquid, or solid stool were collectively analyzed as "anal incontinence." Subjects who reported new fecal urgency and/or anal incontinence were collectively analyzed as having "bowel symptoms."

All subjects then underwent pelvic and digital rectal examinations, and the vagina was carefully inspected for any evidence of fistula formation. The strength and tone of the pelvic diaphragm and anal sphincter were evaluated using a standardized 5-point rating scale developed by Chiarelli et al.¹⁷ Sensory function was tested using light touch and pinprick on the perineum and about each thigh and foot. Sacral reflex activity (S2-4) was evaluated by stroking the skin adjacent to the anus and observing for the reflex contraction of the anal sphincter (anal wink).

Endoanal ultrasonography was performed in the left lateral decubitus position using a rotating rectal probe, a 7-MHz transducer (focal range 2 to 4.5 cm), and a hard, sonolucent plastic cone (Brüel and Kjær, Naerum, Denmark). Serial images of the upper, middle, and lower anal canal were printed on paper. The integrity of the internal and external anal sphincters was evaluated separately and were reported as intact or disrupted. The endosonographic interpretation of the appearance of muscle layers has been previously validated¹⁸; an external sphincter defect appears as a break in the normal texture of the muscle ring,¹⁹ and an internal sphincter defect as a gap in the hypoechoic ring.²⁰ For analysis, subjects were then classified into 4 groups: no internal or external sphincter defects, external sphincter defect only, internal sphincter defect only, or combined internal and external sphincter defects. The author (CMN) interpreted the ultrasound results and was blinded to the degree of laceration sustained and the results of the questionnaire until all subjects had been examined and the ultrasound results were recorded on data sheets.

Statistical analyses were performed using SAS version 8.2 (SAS Language and Procedures, SAS Institute, Cary, NC). Summary statistics for continuous data are reported as mean \pm standard deviation (SD) and for categorical data as frequencies. Statistical comparisons between the tear-degree groups for continuous variables were performed using the 2-sample *t* tests, and for categorical variables they were performed using Fisher exact test or chi-square tests. When appropriate, odds ratios (OR) with 95% CI are reported. A *P* value of $< .05$ was considered significant.

Table Comparison of demographic and delivery data between third- and fourth-degree tears

	Third-degree (n = 39) n (%)	Fourth-degree (n = 17) n (%)	P value
Age*	24.8 ± 4.7	26.1 ± 6.1	.38
Race			.91
White	13 (33)	5 (29)	
Asian	2 (5)	0 (0)	
Black	14 (36)	8 (47)	
Hispanic	10 (26)	4 (24)	
Body mass index (kg/m ²)*	27.0 ± 6.6	25.2 ± 5.5	.32
Birth weight (g)*	3384.2 ± 461.8	3410.0 ± 363.6	.85
Length second-stage (min)*	78.4 ± 59.3	133.5 ± 105.3	.06
Mode of delivery			.18
Spontaneous	21 (53)	5 (29)	
Forceps	8 (21)	8 (47)	
Vacuum	8 (21)	3 (18)	
Forceps + vacuum	2 (5)	1 (6)	
Epidural anesthesia	31 (79)	16 (94)	.25
Shoulder dystocia	5 (13)	4 (24)	.43
Persistent occiput posterior	5 (13)	4 (24)	.43
Midline episiotomy	19 (49)	13 (76)	.08

* Mean ± standard deviation.

Results

A total of 56 primiparous women were included in this study. Thirty-nine women were classified as having a third-degree tear, and 17 had a fourth-degree tear. The demographic and delivery data of the study subjects are presented in the Table. There were no significant differences in age, race, body mass index, rates of midline episiotomy, operative vaginal delivery, persistent occiput posterior head position, shoulder dystocia, mean length of second-stage, or mean birth weight between women who had sustained a third- versus fourth-degree tear.

Postpartum, 25% of subjects (14/56) reported new symptoms of anal incontinence, and 34% (19/56) reported fecal urgency. Of those with anal incontinence, 6 reported loss of liquid stool and gas, and 8 reported bothersome gas incontinence only. No subject reported incontinence of solid stool. When anal incontinence and/or fecal urgency were analyzed collectively, 38% (21/56) had new bowel symptoms. Subjects with fourth-degree lacerations were significantly more likely to report new bowel symptoms than third-degree tears (59% vs 28%, $P = .03$).

On pelvic examination, no subject had evidence of a rectovaginal fistula or demonstrated a “cloaca-like” defect. There were no cases of wound breakdown or infection. Subjective assessments of pelvic floor strength and rectal tone were not statistically different in the 2 groups. All 56 women had an intact anal wink. On endoanal ultrasonography, 21% (12/56) demonstrated persistent defects of the internal sphincter, 41% (23/56) had defects of the external sphincter, and 20% (11/56) had combined defects. There was only 1 subject with an

isolated internal sphincter defect. Subjects with third-degree were more likely than fourth-degree tears to have an intact internal anal sphincter (92% vs 47%, $P < .0001$) but not external anal sphincter (67% vs 41%, $P = .07$). Subjects with fourth-degree tears were more likely to demonstrate persistent combined defects of the internal and external anal sphincters than third-degree tears (48% vs 8%, $P = .002$; Figure 1).

A significant correlation existed between bowel symptoms and persistent anal sphincter defects. Combined defects of the internal and external sphincters were associated with the highest risk of bowel symptoms compared with an intact sphincter complex (odds ratio [OR] 18.7, 95% CI 3-101, $P < .001$). Isolated defects of the external anal sphincter only were also significantly associated with bowel symptoms (OR 15.7, 95% CI 3-76, $P = .003$). A trend did exist for the significance of combined defects versus an isolated defect of the external sphincter and the presence of bowel symptoms ($P = .08$), but there was inadequate power to confirm this association (Figure 2).

Comment

This prospective study confirms the observation of 2 previous retrospective studies that women with a history of fourth-degree tears have significantly higher rates of bowel symptoms than women with third-degree tears. A plausible explanation for differences in outcome after third- versus fourth-degree repair was provided by the results of endoanal ultrasonography in these 2 groups. In our study, anorectal dysfunction was highly correlated

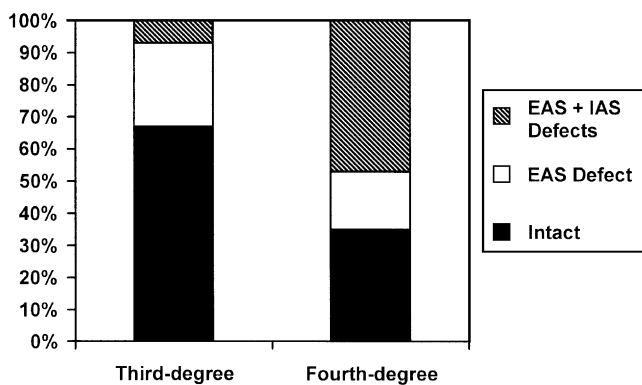


Figure 1 Degree of laceration and anal sphincter defects. Fourth-degree tears were associated with higher rates of combined anal sphincter defects ($P = .002$).

with persistent anatomic disruption of the anal sphincter complex. A “dose-response” of increasing symptoms with increasing injury was observed. Compared with women with an intact anal sphincter complex, subjects with isolated persistent defects of the external sphincter were 15 times more likely to report new bowel symptoms, and those with combined defects of the internal and external sphincters were 18 times more likely to report anorectal dysfunction. Because women with fourth-degree tears were significantly more likely to demonstrate persistent combined defects of the internal and external sphincters, this may explain the higher rate of reported anorectal dysfunction in this group.

Numerous studies have demonstrated a correlation between anal incontinence and persistent anal sphincter injury on endosonography after primary anal sphincter repair, but none have evaluated the separate risks of third versus fourth-degree repair. Sultan et al¹ studied 34 women after anal sphincter repair and found that bowel symptoms were associated with defects of the internal sphincter ($P < .01$) and external sphincter ($P < .025$), and noted that every symptomatic patient had combined internal and external defects. Pinta et al²¹ found a similar association between combined defects and symptoms in 7 women with a history of fourth- and 45 with third-degree tears. Unfortunately, the authors analyzed the 2 groups together and found that bowel symptoms were significantly associated with persistent combined defects, a finding in 15% of their cohort. Poen et al²² reported on 117 cases of anal sphincter injury, 40 of whom underwent examination and endoanal ultrasonography. Anal incontinence was correlated with combined defects of the internal and external sphincters, with a relative risk of 1.7. Of the 40 patients studied, 3 were identified as having a fourth-degree tear. The authors commented that rectal mucosal injury showed a higher tendency of anal incontinence with 58% versus 38%, but this was not statistically significant given lack of power. Abramowitz et al²³ performed a prospective study of 259 women before and

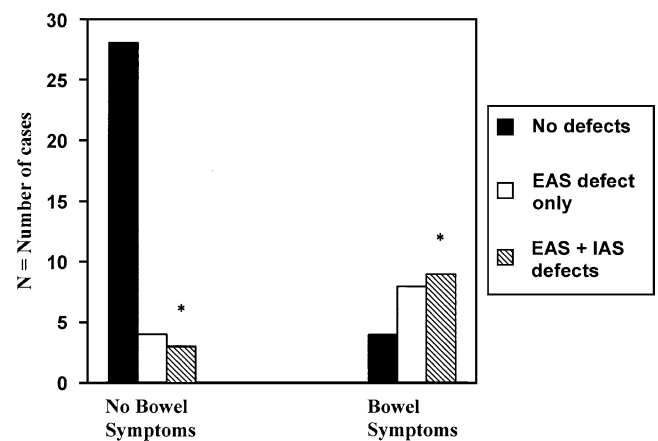


Figure 2 Bowel symptoms and anal sphincter defects. *Likelihood ratio for combined defects versus intact sphincter complex was 18.7, 95% CI 3-101, $P < .001$.

after childbirth, 39 of whom had a third- or fourth-degree tear, and again demonstrated a 5-fold higher rate of anal incontinence in women with persistent sphincter defects. Again, the separate impact of third versus fourth-degree was not evaluated.

Is the internal or external sphincter more important in maintaining continence and normal bowel function? The internal sphincter is composed of smooth muscle, is under autonomic control, and provides up to 75% of resting tone to the anal canal. The external sphincter is a striated muscle encircling the outer layer of the anal canal and contributes additional squeeze pressure under voluntary command.^{24,25} In our study, it was statistically impossible to evaluate the separate impact of internal versus external sphincter defects because every subject except 1, who had an internal sphincter defect had a coexisting external sphincter defect. What is clear is that isolated external sphincter defects and combined internal and external sphincter defects are associated with increasing likelihood ratios of anorectal dysfunction postpartum. Ninety-two percent of subjects with third-degree tears were found to have an intact internal sphincter, and this was possibly an important contributing factor to the lower rates of bowel symptoms in this group.

In our study, it was not the degree of laceration itself that was associated with bad outcomes, but rather the higher rate of “failed repair” that was observed in women with fourth-degree tears. Subjects with complete perineal rupture were more likely to have persistent defects of the entire anal sphincter complex after attempted repair than those with third-degree tears only. Perhaps when lacerations don’t extend all the way to the rectum, the anatomy is less distorted, there may be less blood loss, and a successful repair may be more easily accomplished. Future studies are needed to determine the best way to isolate and repair the internal and external anal sphincters.

The strengths of this study were the prospective design, the use of a validated bowel function questionnaire,

and the relatively large size of the cohort with adequate numbers of third- and fourth-degree tears to compare outcomes. Several limitations do exist. We did not formally evaluate pudendal nerve function with either EMG or pudendal nerve terminal latencies and, therefore, cannot determine if significant neurologic differences existed in the 2 groups. The length of follow-up was short, which could confound the results, but we do plan on evaluating the patients longitudinally. Finally, we did not include a control group of women with no history of anal sphincter laceration, which might have precluded the true assessment of additional risk that fourth-degree tears present over third-degree tears.

In conclusion, this study presents a prospective analysis of outcomes after third- versus fourth-degree tear, and they appear to be significantly different. Subjects with fourth-degree tears had higher rates of bowel symptoms than those with third-degree tears, and had significantly higher rates of combined persistent defects of the internal and external anal sphincters. Those women with a history of third-degree tears were much more likely to have an intact internal sphincter than fourth-degree tears. Combined defects were associated with a 18-fold increased risk of bowel symptoms compared with an intact anal sphincter complex. Research and teaching efforts should be directed at improving surgical techniques of anal sphincter repair.

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Discussion

JOHN CARAVELLO, MD, FACOG. Incomplete or complete laceration of the rectal sphincter complicating vaginal deliveries remains an important risk factor for the eventual development of bowel incontinence in women.¹ Immediate diagnosis and prompt repair of the sphincter usually occurs at delivery. Still, many women report anal incontinence. Fornell et al² prospectively followed 51 women with sphincter injuries diagnosed at delivery at a university hospital in Sweden. All women had a primary repair of the injury at delivery. At 6 months, study