Sphincter tears in primiparous women: Is age a factor?

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Abstract

Introduction and Hypothesis—Anal sphincter tears during vaginal delivery may result in serious sequelae. We examined whether younger primiparous patients were at increased risk for sphincter tears during vaginal delivery.

Methods—Data from an obstetric automated record were analyzed. Primiparous women delivering term infants (n = 5,937) were included to test for an association between age and sphincter tear rates. Three age groups were considered: young adolescents (≤16 years), older adolescents (17-20 years) and adults (≥21 years).

Results—No significant difference was found in tear rates among age cohorts (9.2%, 8.0%, and 9.6% respectively; p = 0.12). Logistic regression modeling revealed that young adolescents were not more likely to have sphincter tears compared to older cohorts.

Conclusions—Younger adolescents may not be at increased risk of anal sphincter tears. Decisions regarding interventions to decrease sphincter tears during vaginal delivery should not be made on the basis of maternal age alone.

Keywords

Anal Sphincter Tears; Maternal Age; Primiparous; Vaginal Delivery

Introduction

Maternal birth trauma can cause serious personal and economic sequelae. Anal sphincter tears occur in approximately 2-19% of all vaginal deliveries and are the most common precursor for fecal incontinence [1]. Estimates of the economic burden of fecal incontinence as a result of vaginal delivery surpass $17,000 per patient [2].

As the female pelvis ages and develops, fusion of the osseous structures occurs in a known sequence, with fusion of the ilium and pubis occurring at approximately age 18, followed by joining of the ilium and ischium, and finally the pubis and ischium by age 24 [3]. Structural

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under-development of the female bony pelvis can lead to dystocia [4], which in turn may predispose a woman to pelvic floor injury and resulting comorbidities such as urinary and fecal incontinence [5] [6]. Thus, we hypothesized that vaginal delivery through a less-developed pelvis may portend an increased risk of anal sphincter tears in younger versus older primiparous patients.

A study by Howard and colleagues addressed the differences in perineal lacerations of primiparas of different races [7], showing that African American primiparas were twice as likely as Caucasian primaparas to deliver with an intact perineum. However, no literature exists that addresses age-related differences in sphincter lacerations of adolescent populations. The objective of this study was to explore a potential relationship between maternal age and the occurrence of anal sphincter tears in three age groups of women who underwent primaparous vaginal delivery. In addition, we wished to identify risk factors for the incidence of anal sphincter tears among the age groups.

Materials and Methods

Institutional Review Board for Human Use approval was obtained. Data were derived from a university-based obstetric automated record (OBAR), a database containing antepartum, intrapartum and delivery data from births occurring in the labor and delivery unit.

Eligible subjects were primiparous women who underwent vaginal delivery of a live, term (≥37.0 weeks) singleton infant with cephalic presentation between January 1, 1992 and December 31, 2001. Exclusion criteria included multiparity, preterm delivery, twin gestation, fetal anomalies, and cesarean delivery.

To test for an association between age and anal sphincter tear rates, three age groups were considered. The first group consisted of young adolescents, age 16 years or younger (N=956). The second group consisted of older adolescents between the ages of 17-20 years, (N=3,147), and the third group consisted of adults age 21 years or older (N=1,834). We used age 21 as a cut-off for the “adult pelvis” based on previous anthropomorphic studies [3].

Our primary outcome variable was clinically recognized anal sphincter tears (i.e., third or fourth degree perineal lacerations). Differences in clinical and demographic variables between the three age groups were evaluated using ANOVA and χ^2. All variables showing statistical significance with univariate analysis ($p < 0.05$) were then included in a stepwise multivariable logistic regression model to adjust for potential confounding.

Results

The analysis included data from 5,937 women out of approximately 40,000 women delivering during this time frame. The characteristics of the three groups differed with respect to race, body mass index (BMI), marital status, tobacco use, and alcohol use (all $p \leq 0.0001$) (Table 1). A larger percentage of young adolescents were African-American, approximately 85.5%, compared to our older cohorts, 76.2% and 69.7%, respectively. BMI increased with age, as did the percentages of those who were married, used tobacco and used alcohol. The rate of vacuum-assisted vaginal delivery was significantly higher in the younger population.

The overall sphincter tear rate for all groups was 8.7% and did not differ significantly by age cohort (9.2% for young adolescents, 8.0% for older adolescents, 9.6% for adults; $p = 0.12$). When considering all perineal laceration types (first degree to fourth degree), 36.8% of young adolescents (352 of 956) were affected, compared to 38.1% of older adolescents (1,198 of 3,147) and 42.7% of adults (783 of 1,834) ($p = 0.001$) (Table 1). This difference

was driven by the numbers of first and second degree lacerations and was maintained after controlling for forceps use (p = 0.01).

In our sample of 5,937, the total number of third degree sphincter tears was 367, with 54 of these in the young adolescent group (5.7%), 190 in the older adolescent group (6.0%) and 123 in the adult group (6.7%) (p = 0.50). Fourth degree sphincter tears were less common with a total of 151, with 34 in the young adolescent group (3.6%), 61 in the older adolescent group (1.9%) and 56 in the adult group (3.1%) (age group p = 0.005).

Young adolescents were not more likely to have an anal sphincter tear compared to women aged 21 or greater. Additionally, women between 17 and 20 years of age were not more likely to have an anal sphincter tear compared to women 21 years of age or greater. According to this model, risk factors significantly associated with an increased risk of sustaining an anal sphincter tear were forceps and vacuum-assisted vaginal deliveries, shoulder dystocia, fetal birth weight > 4000 grams, and episiotomy (Table 2). Maternal race, alcohol and tobacco use, and increasing BMI were found not to be significantly associated with the occurrence of sphincter tears. Furthermore, a significant increase in overall lacerations of any type was seen with increasing maternal age, even after controlling for increased use of forceps in the older populations (data not shown).

Discussion

Contrary to our hypothesis, younger women were not found to be at increased risk for anal sphincter tears when compared to older cohorts at the time of primiparous vaginal delivery. This is consistent with the finding of Howard and colleagues who found that age was not significantly associated with overall increased perineal trauma at the time of primiparous vaginal delivery [7]. This same study also observed that African American primiparas were more likely to deliver with an intact perineum. It is unclear why some studies demonstrate that African American women appear to be less likely to sustain perineal trauma [7] [8], and there is a paucity of data on this subject. Some have suggested that biologic differences in collagen content may be predictive of prolapse rates in certain groups [9], but how this relates to obstetrical injuries is unknown. It has also been suggested that differences in pelvis type between African American and Caucasian women may contribute to the differences in sphincter tear occurrence. [10] The explanation may also be much simpler than tissue or structural differences. Birth weights among African Americans are lower overall compared to Caucasians, both at term and preterm, and may account for this finding in some studies. [7] [11] We did not find race to be predictive of a sphincter laceration. However, we did have a significantly higher percentage of African Americans in the young adolescent group compared to the other two cohorts. It is possible that if the trend of decreased lacerations among African Americans in other studies holds true, this could partially explain the lower laceration rates in this group. Although we included race as a covariate in the multivariable model, it is possible that we would have seen an elevated occurrence of sphincter tears in the young adolescent group had the racial makeup of our groups been more similar.

Although there was no significant difference in third degree sphincter tears among the cohorts, there was a significant difference in the number of fourth degree sphincter tears, with the lowest rate found in the middle-aged (older adolescent) group. This finding on sub-analysis is exploratory in nature and, with the overall low occurrence of fourth degree tears may have been unduly influenced by recording errors or just a spurious observation.

After controlling for maternal age, the factors that significantly increased the risk of sustaining an anal sphincter tear in all groups were birth weight ≥ 4000g, operative delivery, shoulder dystocia, and episiotomy. These are some of the same risk factors which have been

shown in numerous studies to greatly increase the risk of anal sphincter tears in the overall obstetric population [8] [10] [12] [13]. More specifically, operative delivery, via vacuum or forceps, is a known risk factor which greatly increases the risk of anal sphincter tears in the general obstetric populations [8] [10] [12] [13] and may have been prevalent enough, dominating any potential impact by age, to impede this study's ability to detect differences by age.

One prior study found age to be a significant risk factor for perineal injury only when the birthweight was less than 4000g. However, these investigators used a single age cut-off of 27 years, and showed that for infants less than 4000 grams, the risk of perineal injury was greater if the maternal age was ≥ 27 years. When the infant birth weight exceeded 4000 grams, the risk of perineal injury was so high, age no longer appeared to be a factor. [14] Variations in the morphology of the female pelvis can lead to labor dysfunction, difficult deliveries and severe perineal lacerations involving the anal sphincter complex [15]. A study by Frudinger and colleagues found a direct correlation between the differences in the morphology of the female pelvis and subsequent fecal incontinence after vaginal delivery [15], likely due to a narrowed subpubic arch, which may displace the fetal head more posteriorly during delivery, thus increasing contact with the perineum and anal sphincter complex. This may suggest that younger adolescent females are at an increased risk of anal sphincter tears as a result of a less-developed or contracted pelvis. However, other investigators found a negative correlation between age and the subpubic arch angle in adult females 25 years and older, with a decrease in subpubic arch angle as maternal age increased. There was no significant difference in the subpubic arch angle in those less than 25 years of age [16]. Perhaps with a lack of complete fusion of the bony pelvis, there is an increased ability of all tissues to expand, allowing increased maneuverability of the fetus and subsequent delivery with less damage to maternal anatomy. Further studies in female pelvic development may be warranted to investigate these factors more thoroughly.

The strengths of this study include a large sample size of primiparous women, and a large database maintained at a single site, which allowed efficient analysis over a ten year time frame. A possible limitation to this study is the risk of inaccurate recording of laceration types at the time of delivery, since the diagnosis of the laceration types are made by resident physicians with different levels of training and understanding of perineal anatomy. In addition, our sample is not representative of the overall U.S. population, as more than 70% of females in our study are African-American. We also do not have symptom data to determine the impact of sphincter tears in this population of patients, which is important since it has been shown that women that sustain a fourth degree tear are at increased risk for more severe symptoms [17].

It is important to understand the risk factors for anal sphincter tears, as serious sequelae such as incontinence of liquid/solid stool and gas may occur. Fecal urgency and the need for protection against incontinence episodes can further add to the detrimental impact on quality of life.[6] Furthermore, modifiable risk factors, such as avoiding elective operative deliveries and/or episiotomies, can allow potential prevention of the occurrence of this type of perineal trauma. While previous studies have demonstrated maternal age as a significant risk factor for the development of fecal incontinence [18], our results would suggest that all primiparous women are at risk for anal sphincter tears regardless of age or the state of their bony pelvic development. In our analysis, we did not find an association between maternal age at the time of primiparous delivery and sphincter tear occurrence. With consideration of these findings, decisions regarding interventions such as elective cesarean delivery to decrease sphincter tear during a first vaginal delivery should not be made on the basis of maternal age alone.

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Summary

Younger maternal age was not a risk factor for the incidence of anal sphincter tear at the time of primiparous vaginal delivery.

Table 1

Subject characteristics by age group

	Age ≤ 16 (n=956)	Age 17-20 (n=3147)	Age ≥21 (n=1834)	P value
Age, *yrs	15.4± 0.8	18.5 ± 1.1	23.7 ± 3.3	
Race N (%)				
African American	817 (85.5)	2398(76.2)	1278(69.7)	<0.001
Caucasian	131 (13.7)	717 (22.8)	481 (26.2)	
Other	8 (0.8)	32 (1.0)	75 (4.1)	
BMI kg/m2 *	24.3 ± 5.0	24.9 ± 5.8	26.9 ± 7.0	<0.001
Married N (%)	25 (2.7)	214 (7.0)	286 (16.0)	<0.001
Tobacco use N (%)	122 (13.9)	613 (20.7)	438 (25.1)	<0.001
Alcohol use N (%)	72 (8.3)	378 (12.8)	421 (24.2)	<0.001
Gest. age at del. *(wks)	39.7 ± 1.2	39.8 ± 1.3	39.8 ± 1.3	0.151
Birth weight *(gms)	3219 ± 414	3242 ± 443	3255 ± 462	0.131
Head circumference *(cm)	33.8 ± 2.1	33.9 ± 2.3	33.8 ± 2.4	0.538
Sphincter tear (3°/4°) N (%)	88 (9.2)	251 (8.0)	176 (9.6)	0.120
Laceration- any type N (%) (1^{st},2^{nd},3^{rd}, 4^{th} degree)	352 (36.8)	1198 (38.1)	783 (42.7)	0.001
Episiotomy N (%)	443 (50.9)	1372 (49.3)	776 (47.8)	0.342
Forceps use N (%)	115 (12.0)	390 (12.4)	299 (16.3)	0.000
Vacuum use N (%)	133 (13.9)	330 (10.5)	184 (10.0)	0.004
Shoulder dystocia N (%)	13 (1.4)	49 (1.6)	27 (1.5)	0.902

*Mean±SD

Table 2

Risk factors for anal sphincter tears

Logistic Regression Model Variables	Odds Ratio	95% Confidence Interval
Age > 21 years	ref	
Age 17-20 years	0.9	0.7-1.2
Age ≤ 16 years	1.1	0.8-1.5
Vacuum delivery	1.5	1.1-2.2
Shoulder dystocia	2.9	1.6-5.3
Birth weight > 4000g	3.1	2.1-4.4
Forceps delivery	3.5	2.7-4.5
Episiotomy	7.6	5.4-10.7