

GENERAL GYNECOLOGY

Pelvic pain and mode of delivery

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OBJECTIVE: We sought to determine the long-term effect of mode of delivery on the prevalence and severity of pelvic pain.

STUDY DESIGN: Six to eleven years after a first delivery, pelvic pain (dysmenorrhea, dyspareunia, and pelvic pain not related to menses or intercourse) was measured using the Oxfordshire Women's Health Study Questionnaire. Obstetrical exposures were assessed by review of the hospital delivery record. The prevalence of moderate to severe pelvic pain was compared between the 577 women who delivered via cesarean for all births and the 538 who delivered at least 1 child vaginally. Other obstetrical exposures were also studied.

RESULTS: Prevalence of pelvic pain was similar between women who delivered vaginally and by cesarean. Among women who delivered vaginally, those who experienced at least 1 forceps delivery and women who delivered at least 1 baby ≥ 4 kg vaginally reported a higher rate of dyspareunia. Perineal trauma was not associated with dyspareunia.

CONCLUSION: Forceps delivery and a vaginal delivery of a baby ≥ 4 kg are associated with dyspareunia 6-11 years after vaginal birth. Vaginal birth is not associated with a higher rate of pelvic pain when compared to cesarean delivery.

Key words: dysmenorrhea, dyspareunia, mode of delivery, pelvic pain

Cite this article as: Blomquist JL, McDermott K, Handa VL. Pelvic pain and mode of delivery. *Am J Obstet Gynecol* 2014;210:423.e1-6.

Pelvic pain is common, accounting for 10% of all ambulatory referrals to a gynecologist.¹ Prevalence rates range from 4–15% depending on the population studied.^{2,3} Several previous studies have suggested that mode of delivery may have an impact on the development of pelvic pain.

During a vaginal delivery, descent of fetal head and stretching of the perineum can cause direct tissue and neuromuscular injury. Prior to vaginal birth, the area of the levator hiatus is 6–36 cm². The area of the average fetal head in the plane of minimal diameter measures 70–90 cm². Stretching of the tissues to

accommodate the fetal head may result in tears of the levator ani muscles as well as the perineum. Quinn⁴ recently found an association between levator ani lacerations and unexplained chronic pelvic pain.

Cesarean delivery has also been advocated as a cause of pelvic pain. Twelve percent of women continue to report pain related to their cesarean delivery 10.2 months postoperatively.⁵ Potential causes of pain related to cesarean delivery include ilioinguinal or iliohypogastric nerve entrapment,⁶ uterine scar defect,⁷ and pelvic adhesions.⁸ Almeida et al⁸ reported that cesarean delivery is a risk factor for chronic pelvic pain with an odds ratio (OR) of 3.7 and 95% confidence interval (CI) of 1.7–7.7.

The only comparative study on the topic is the Term Breech Trial.⁹ The trial authors asked a subset of participants about pelvic pain ≥ 2 years postpartum. Based on intent to treat, there was no difference in pain during sex, pain on the outside of the abdomen, pain deep inside the abdomen, and pain in the genital area between women planning a vaginal birth and those planning a cesarean birth. It is important to note that 50% of the women planning a vaginal birth actually delivered by cesarean. Therefore, this study leaves unanswered questions with regards to pain and mode of delivery.

The objective of this study was to assess the effect of mode of delivery on pelvic pain 6–11 years after the first delivery. Specifically, in the setting of a longitudinal cohort study, we investigated whether mode of delivery (vaginal birth ever vs cesarean delivery only) is associated with dysmenorrhea, dyspareunia, and pelvic pain not associated with menses or intercourse. We also assessed the effect of other maternal and obstetrical characteristics on pelvic pain.

MATERIALS AND METHODS

This was a planned supplementary analysis of data collected for the Mothers' Outcomes after Delivery (MOAD) study, a longitudinal cohort study of maternal health outcomes after childbirth. The study began recruitment in 2008 and is ongoing. The study details have been previously described.¹⁰ Briefly, women are recruited 5–10 years after delivery of their first child at Greater Baltimore Medical Center. Recruitment is based on delivery type (cesarean without labor, cesarean with labor, vaginal birth) and matched for maternal age and years since delivery. As previously reported,¹⁰ participation in this research was similar across birth groups. Participants are seen on an annual basis at which time a physical examination is performed and questionnaires are completed. Institutional

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Support was provided by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (R01HD056275).

The authors report no conflict of interest.

Reprints not available from the authors.

0002-9378/\$36.00

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<http://dx.doi.org/10.1016/j.ajog.2014.01.032>

TABLE 1
Maternal characteristics of N = 1115 participants by delivery group

Characteristic	Cesarean delivery only (n = 577)	At least 1 vaginal birth (n = 538)	P value
Age at first follow-up, y	39.8 (36.7–44.0)	40.1 (36.6–43.6)	.649
Time from first delivery, y	7.8 (6.9–9.6)	7.8 (6.8–9.6)	.990
African American race	16% (91)	12% (63)	.056
Maternal age >35 y at first delivery	28% (159)	25% (137)	.456
Multiparity	70% (401)	77% (415)	.005
BMI ≥ 30 kg/m ² at first follow-up	34% (196)	18% (99)	< .001
History of prolonged second stage	18% (104)	28% (148)	< .001

Data are median (interquartile range) or % (n).

BMI, body mass index.

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review board approval was obtained for this research and all participants provided informed consent.

Questions about pelvic pain are asked at the first follow-up MOAD visit, approximately 1 year after a woman's baseline visit, and 6–11 years after her first delivery. The Oxfordshire Women's Health Study¹¹ Questionnaire is used to assess prevalence, severity, and frequency of pelvic pain. The questionnaire is a validated tool and has previously been used to study gynecologic pain populations.^{11,12} At the time of this analysis, 1497 women were enrolled in the MOAD study, and 1416 (95%) were eligible for the first follow-up survey. Among those who were eligible, 1129 (80%) completed the survey (including the Oxfordshire Questionnaire), 230 (15%) did not participate in this follow-up study, and 57 (4%) were still pending at the time of this analysis. Of the 1129 completing the survey, 14 women were excluded from the analysis because they reported having surgery for pelvic pain prior to their first delivery, leaving 1115 for the analysis.

The primary outcome for this analysis was moderate or severe pelvic pain as determined by the Oxfordshire Questionnaire. The questionnaire explores 3 types of pelvic pain: dysmenorrhea (pain associated with menses), dyspareunia (pain associated with sexual intercourse), and pelvic pain not associated with menses or intercourse. Women who are still menstruating are asked about

dysmenorrhea. Those who report dysmenorrhea are asked how often the painful periods occurred over the past year: never, occasionally (with <25% of periods), often (with 25–50% of periods), usually (with >50% of periods), or always (with every period). They are also asked to classify their pain as none, mild, moderate, or severe. Women who report having intercourse in the past year are asked similar questions regarding dyspareunia. In addition to the frequency and severity questions, women reporting dyspareunia are asked whether their pain occurred during intercourse, in the 24 hours after intercourse, or both during and in the 24 hours after intercourse. All women participating in the survey are asked about pelvic pain not associated with menses and intercourse, and those who report having pain are asked to classify the severity of their pain in the same fashion as mentioned above.

The main exposure of interest was vaginal birth. Women who had at least 1 vaginal delivery were compared with women who delivered all of their children by cesarean. The delivery records for every Greater Baltimore Medical Center delivery were reviewed by a MOAD physician and the following obstetrical exposures were recorded: vaginal birth, prolonged second stage (>2 hours), vaginal delivery with birthweight ≥ 4000 g, perineal laceration, episiotomy, anal sphincter laceration, and operative vaginal delivery (vacuum or forceps). The

1115 women in this analysis contributed 2126 delivery records to the study; of those, only 107 (5%) deliveries occurred at outside hospitals. In cases where the woman delivered somewhere other than Greater Baltimore Medical Center or the information was missing on the chart, the woman's self-reported history was used. In addition to the obstetrical exposures, we also considered the following confounders: age at first follow-up, years from first delivery to first follow-up, race, maternal age at first delivery, multiparity, and obesity at time of first follow-up. Obesity was defined as a body mass index (BMI) of ≥ 30 kg/m².

To compare maternal characteristics by mode of delivery, P values were calculated using a Fisher exact test for categorical variables and a Kruskal-Wallis test for continuous variables. The χ^2 tests were run to detect differences in pelvic pain prevalence, severity, and frequency by mode of delivery. To identify differences in prevalence of moderate to severe pain by maternal characteristics and obstetrical exposures, we used multivariate logistic regression, modeling pelvic pain on the characteristic of interest, age >40 years and BMI ≥ 30 kg/m². All analysis was performed using SAS 9.2 statistical software (SAS Institute, Cary, NC). Statistical significance was defined at the $\alpha = 0.05$ level.

RESULTS

In all, 1115 women completed the first follow-up visit and are included in this analysis. There was no difference in participation between women who had delivered vaginally vs those who had delivered exclusively by cesarean. In all, 577 delivered by cesarean only and 538 had at least 1 vaginal birth. The maternal characteristics, by delivery group, are listed in Table 1. Women who delivered by cesarean were significantly more likely to be obese, and women with at least 1 vaginal delivery were more likely to have experienced a prolonged second stage of labor. Of those women who experienced at least 1 vaginal birth, 14% (75) delivered at least 1 infant ≥ 4 kg vaginally, 62% (331) had at least 1 perineal laceration, 55% (297) had at least 1 episiotomy, 18% (99) had at least 1 anal

sphincter laceration, and 25% (132) had at least 1 operative delivery (data not shown).

Pelvic pain by mode of delivery is summarized in Table 2. Women who delivered by cesarean only were more likely to report moderate to severe dysmenorrhea ($P = .020$). We found no other significant differences between delivery groups in the prevalence or severity of pelvic pain. Eighty-one women (7%) experienced both a vaginal and cesarean delivery, and therefore would carry risk factors for both types of deliveries. In a separate sensitivity analysis that excluded these 81 women, our primary conclusions were unchanged.

Overall, dysmenorrhea was common in our population with 42% of women reporting pain with menses. Dyspareunia was also relatively common (21%), however, very few women reported moderate to severe dyspareunia or a decrease in frequency of intercourse due to dyspareunia. In all, 191 (17%) women had talked to a health care provider about pain, and 19 women (2%) reported having surgery for pelvic pain. The median age of women at the time of their surgery was 36 years (interquartile range, 32–39), with no difference noted between groups for prevalence or age at surgery.

Moderate to severe pelvic pain based on maternal and obstetrical characteristics is presented in Table 3 (adjusted for age >40 years and BMI ≥ 30 kg/m²). Dysmenorrhea was reported more frequently by younger and obese women and less frequently among women using hormonal contraception. Although moderate or severe dysmenorrhea was significantly more common among women who delivered by cesarean (Table 2), this relationship loses significance after adjusting for age and obesity (Table 3). In a post hoc analysis, our study had had 80% power to detect a $\geq 9\%$ difference in dysmenorrhea. Among those who had at least 1 vaginal birth, moderate to severe dyspareunia was more common among those who experienced a vaginal delivery of a baby ≥ 4 kg and those who had at least 1 forceps delivery. Moderate or severe pain unrelated to menses or intercourse was not associated with any of the

TABLE 2

Pelvic pain based on mode of delivery for N = 1115

Pain	Mode of delivery		P value
	Cesarean delivery only (n = 577)	At least 1 vaginal birth (n = 538)	
Dysmenorrhea^a			
No longer menstruating	86/558 (15%)	55/521 (11%)	.056
Menstruating without pelvic pain	242/558 (43%)	245/521 (47%)	
Menstruating with pelvic pain	230/558 (41%)	221/521 (42%)	
Among menstruating women			
Pelvic pain occurs often, usually, or always	148/472 (31%)	126/466 (27%)	.152
Moderate/severe pain	134/472 (28%)	101/466 (22%)	.020
Dyspareunia^b			
No intercourse in past year	30/559 (5%)	24/513 (5%)	.866
Intercourse without pelvic pain	409/559 (73%)	380/513 (74%)	
Intercourse with pelvic pain	120/559 (21%)	109/513 (21%)	
Among women who had intercourse in past year			
Pelvic pain occurs often, usually, or always	32/529 (6%)	38/489 (8%)	.322
Decreased frequency of intercourse due to pain			.722
Yes	36/529 (7%)	28/489 (6%)	
Not sure	8/529 (2%)	9/489 (2%)	
Timing			.834
Pelvic pain during intercourse	50/529 (9%)	50/489 (10%)	
Pelvic pain after intercourse	28/529 (5%)	27/489 (6%)	
Pelvic pain both during and after intercourse	42/529 (8%)	32/489 (7%)	
Moderate/severe pain during intercourse	30/529 (6%)	23/489 (5%)	.573
Moderate/severe pain after intercourse	20/529 (4%)	10/489 (2%)	.137
Pelvic pain not associated with menses or intercourse ^c	120/555 (22%)	87/515 (17%)	.053
Moderate/severe pain	30/555 (5%)	24/515 (5%)	.675

^a n = 36 women were not sure if they experienced pelvic pain with periods and were excluded from dysmenorrhea portion of table; ^b n = 43 women were not sure if they experienced pelvic pain during or after intercourse and were excluded from dyspareunia portion of table; ^c n = 45 women were not sure if they experienced pelvic pain not associated with menses or intercourse and were excluded from unassociated pain portion of table.

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maternal or obstetrical characteristics studied.

To better distinguish risk factors that contribute to pelvic pain, moderate to severe dyspareunia was modeled on age >40 years, BMI ≥ 30 kg/m², vaginal

delivery of a baby ≥ 4 kg, perineal trauma status (history of both episiotomy and laceration, at least 1 episiotomy and no lacerations, at least 1 laceration and no episiotomies, or neither), and history of forceps delivery. The model, restricted

TABLE 3
Pelvic pain by maternal characteristics and obstetrical outcomes

Characteristic ^a	Moderate or severe dysmenorrhea (n = 938 ^b)		Moderate or severe dyspareunia during and/or after intercourse (n = 1018 ^c)		Moderate or severe pelvic pain unrelated to periods or intercourse (n = 1070 ^d)	
	% (Yes/total)	P value ^e	% (Yes/total)	P value ^e	% (Yes/total)	P value ^e
Overall	25% (235/938 ^b)		7% (69/1018 ^c)		5% (54/1070 ^d)	
Primary race		.459		.843		.491
Caucasian/other	25% (199/811)		7% (58/875)		5% (47/923)	
African American	28% (36/127)		8% (11/143)		5% (7/147)	
Maternal age >35 y at first delivery		.361		.252		.465
Yes	18% (43/233)		7% (19/263)		5% (14/286)	
No	27% (192/705)		7% (50/755)		5% (40/784)	
Hormonal contraception use		.008		.096		.231
Yes	17% (27/162)		4% (7/177)		3% (6/181)	
No	27% (208/776)		7% (62/841)		5% (48/889)	
Multiparous		.932		.261		.852
Yes	25% (176/703)		6% (47/748)		5% (40/782)	
No	25% (59/235)		8% (22/270)		5% (14/288)	
Obstetrical exposure group		.147		.249		.783
Cesarean only	28% (134/472)		8% (41/529)		5% (30/555)	
At least 1 vaginal birth	22% (101/466)		6% (28/489)		5% (24/515)	
Prolonged second stage ^f		.420		.178		.403
Yes	21% (44/214)		8% (19/233)		5% (13/247)	
No	25% (137/550)		6% (34/590)		4% (27/616)	
Vaginal delivery of baby ≥ 4 kg ever ^g		.608		.036		.325
Yes	19% (12/64)		11% (8/70)		7% (5/73)	
No	22% (89/402)		5% (20/419)		4% (19/442)	
Perineal laceration ever ^g		.542		.009		.720
Yes	23% (65/286)		4% (11/307)		4% (14/318)	
No	20% (36/180)		9% (17/182)		5% (10/197)	
Episiotomy ever ^g		.065		.347		.365
Yes	18% (48/265)		7% (18/268)		4% (11/286)	
No	26% (53/201)		5% (10/221)		6% (13/229)	
Anal sphincter laceration ever ^g		.618		.199		.803
Yes	19% (17/89)		9% (8/92)		4% (4/97)	
No	22% (84/377)		5% (20/397)		5% (20/418)	
History of operative deliveries ^g		.384		.006		.802
Spontaneous only	21% (76/356)		4% (16/367)		5% (18/387)	
Vacuum without forceps	21% (10/48)		4% (2/52)		4% (2/53)	
At least 1 forceps delivery	24% (15/62)		14% (10/70)		5% (4/75)	

N = 1115, adjusted for age >40 y and body mass index ≥30 kg/m².

^a As measured at second Mothers' Outcomes after Delivery visit, unless otherwise noted; ^b Among menstruating women who verified whether or not they had dysmenorrhea; ^c Among sexually active women who verified whether or not they had dyspareunia; ^d Among women who verified whether or not they had pelvic pain unrelated to menses or intercourse; ^e All P values have been adjusted for age >40 y and body mass index ≥30 kg/m²; ^f Among those who experienced second stage of labor at least once; ^g Among those who experienced at least 1 vaginal birth.

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to sexually active women with a history of vaginal delivery, revealed that after adjusting for the other risk factors, only vaginal delivery of a baby ≥ 4 kg (OR, 2.45; 95% CI, 1.02–5.93) and forceps delivery (OR, 4.04; 95% CI, 1.69–9.66) significantly predicted moderate to severe dyspareunia.

COMMENT

The most important finding of this research is that the prevalence of pelvic pain was similar between women who delivered vaginally and those who delivered by cesarean. We found no association between route of delivery (vaginal vs cesarean) and report of dysmenorrhea, dyspareunia, or pelvic pain not associated with menses or intercourse 6–11 years after a first delivery. As noted, our study had 80% power to detect a $\geq 9\%$ difference in the proportion of women with dysmenorrhea.

Dysmenorrhea was more common among younger women and obese women, but was not associated with mode of delivery or any of the obstetrical characteristics studied. One previous study⁷ reported an association between dysmenorrhea and uterine scar dehiscence based on transvaginal ultrasound studies. The number of previous cesarean deliveries correlated with size of the defect and increased risk of dysmenorrhea and pelvic pain. Others have suggested that an incision in the uterus may predispose one to adenomyosis and thus dysmenorrhea. Our study does not suggest an association between cesarean birth and dysmenorrhea.

Among women who delivered vaginally, dyspareunia was reported more frequently among women who experienced at least 1 forceps delivery and among those who experienced a vaginal delivery of at least 1 child ≥ 4 kg. We found no conclusive association between perineal trauma and pelvic pain. Perineal trauma is a known cause of immediate postpartum pain and dyspareunia.^{12,13} For example, in a retrospective cohort study of 615 primiparous women, Signorello et al¹⁴ showed that dyspareunia at 3 months postpartum was associated with the degree of perineal trauma, with a second-degree episiotomy

or tear doubling the odds for dyspareunia (OR, 1.8; 95% CI, 1.2–2.8) and a third- or fourth-degree tear increasing the odds almost 4-fold (OR, 3.7; 95% CI, 1.7–7.7) compared to no perineal trauma. The difference dissipated at 6 months postpartum, suggesting that this association pertains only to the first few months after delivery.

Systematic reviews comparing episiotomy to spontaneous laceration have suggested that episiotomy is associated with more perineal trauma. However, episiotomy has not been shown to be associated with dyspareunia.^{14–16} Similarly, our study shows no association among dyspareunia and perineal trauma, episiotomy, or anal sphincter laceration. This finding may be related to the long interval between delivery and questionnaire in our study compared to the short-term outcome in other studies.

Our study showed an increase in dyspareunia among women who delivered at least 1 child with forceps. In addition to an increased risk of perineal trauma, forceps deliveries have been shown to be associated with levator ani lacerations.^{17–20} Likewise, levator ani trauma has been shown to be associated with pelvic pain. In a case-control study, Quinn⁴ showed a higher rate of levator ani injury in women with unexplained chronic pelvic pain (20/26) compared to controls (2/32). We speculate that levator ani injury may contribute to increased pain seen in our participants who delivered with forceps.

The strengths of our study include the large sample size, use of a validated questionnaire, long-term follow-up, and review of all hospital records to confirm maternal and obstetrical exposures. In addition, our groups are based on actual route of delivery rather than intent to treat as with the Term Breech Trial.⁹

One of the weaknesses of this study is that we have information about pelvic pain at only 1 point in time. For example, a history of dysmenorrhea was not assessed among women who were no longer menstruating (15% of cesarean delivery and 11% of vaginal delivery participants). Thus, we do not know if these women had dysmenorrhea at any other time since delivery. Similarly, if a woman did not have

intercourse over the prior year, she was not asked about dyspareunia. In addition, we do not have information about other causes of pelvic pain such as endometriosis, pelvic inflammatory disease, and fibroids. Finally, because our participants agreed to participate in a longitudinal cohort study, they may differ from other parous women. The most notable example is that these participants volunteered for research that requires an annual gynecologic examination. We speculate that women with severe pain and dyspareunia may be less likely to participate in this type of research. However, this would be unlikely to threaten the internal validity of our investigation.

In conclusion, our study shows that vaginal birth is not associated with a higher prevalence of dysmenorrhea, dyspareunia, or pelvic pain not associated with menses or intercourse as compared to cesarean delivery. However, we did find a higher rate of dyspareunia among women who experienced at least 1 forceps delivery and women who delivered at least 1 baby ≥ 4 kg vaginally. Physicians will find this information helpful in counseling patients as they prepare for childbirth. ■

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