Published in final edited form as:

Int Urogynecol J Pelvic Floor Dysfunct. 2009 December ; 20(12): 1407–1411. doi:10.1007/s00192-009-0937-3.

Pelvic organ support among primiparous women in the first year after childbirth

Victoria L. Handa,

Department of Gynecology & Obstetrics, Johns Hopkins University, 4940 Eastern Avenue, Baltimore, MD 21224, USA

Ingrid Nygaard,

University of Utah, Salt Lake City, UT, USA

Kimberly Kenton,

Loyola University, Maywood, IL, USA

Geoffrey W. Cundiff,

University of British Columbia, Vancouver, BC, Canada

Chiara Ghatti,

University of Pittsburgh, Pittsburgh, PA, USA

Wen Ye, and

University of Michigan, Ann Arbor, MI, USA

Holly E. Richter

University of Alabama at Birmingham, Birmingham, AL, USA

for the Pelvic Floor Disorders Network

Victoria L. Handa: vhandal@jhmi.edu

Abstract

Introduction and hypothesis—This study describes pelvic organ support after childbirth.

Methods—This ancillary analysis of the Childbirth and Pelvic Symptoms Imaging Study compares pelvic organ prolapse quantification 6–12 months after childbirth among three cohorts of primiparous women: vaginal delivery with sphincter tear ($n=106$), vaginal delivery without sphincter tear ($n=108$), and cesarean without labor ($n=39$).

Results—Of participants, 31.2% had stage II support. Prolapse to or beyond the hymen was present in 14% after vaginal delivery with sphincter tear (95% confidence interval 8%, 22%), 15% (9%, 24%) after vaginal delivery without sphincter tear, and 5% (1%, 17%) after cesarean without labor ($p=0.23$). A study of 132 women per group would be required for 80% power to test differences between 5% and 15%.

Conclusions—While these data provide insufficient power to dismiss a difference in pelvic organ support between modes of delivery, they add to our understanding of support following childbirth.

Keywords

Pelvic organ prolapse quantification; Uterine prolapse; Childbirth; Cesarean; Obstetrical anal sphincter laceration

Introduction

Pelvic organ prolapse affects a large portion of adult women. Studies suggest that approximately half of women undergoing routine gynecologic examination demonstrate some evidence of prolapse [1, 2]. Epidemiologic studies consistently identify parity as an important risk factor for the development of pelvic organ prolapse [2–5]. However, it is unclear whether this loss of pelvic organ support is attributed to delivery or pregnancy itself. Some studies associate prolapse with pelvic floor injury sustained during vaginal delivery and suggest cesarean delivery may decrease the risk of pelvic organ prolapse [6–8]. Cesarean delivery as a potential prevention strategy remains unproven.

The goal of this study is to describe pelvic organ support 6–12 months after a first vaginal or cesarean delivery. This study is a secondary analysis of data collected for the Childbirth and Pelvic Symptoms Imaging Study (CAPSIS) [9], focusing on the results of structured examinations for pelvic organ support among primiparous women 6–12 months after a first delivery.

Materials and methods

This study is a secondary analysis of data collected for the Childbirth and Pelvic Symptoms (CAPS) Study [10], which was the parent study of CAPSIS [9]. Both of these studies were performed through the Pelvic Floor Disorders Network (PFDN), a cooperative agreement network sponsored by the Eunice Kennedy Shriver National Institute of Child Health and Human Development and the Office of Research on Women's Health.

CAPS (September 2002–March 2005) [10] was a prospective cohort study of postpartum fecal and urinary incontinence in primiparous women who sustained clinically recognized anal sphincter tears during vaginal delivery. The methods of the CAPS study were previously reported [10]. Three cohorts of women were enrolled immediately postpartum. The primary cohort consisted of primiparous women with a recognized anal sphincter laceration following vaginal delivery. The second cohort consisted of controls with a vaginal delivery not complicated by an anal sphincter laceration. This cohort was recruited from the next consecutive primiparous patient who delivered following a subject enrolled into the laceration cohort. The third cohort consisted of primiparas who underwent a cesarean section without labor. Women were recruited while in the hospital after delivery and interviewed by telephone 6 weeks and 6 months postpartum. Each PFDN institution, including the data-coordinating center at the University of Michigan, received Institutional Review Board (IRB) approval for the protocol and all participants provided written

informed consent. The CAPS study enrolled 921 primiparous women: 407 with clinically recognized tear, 390 without recognized tear, and 124 with cesarean before labor.

The CAPS population did not undergo a physical examination, and therefore, pelvic organ support was not documented among the 921 CAPS participants. However, CAPS participants were also invited to join the CAPSIS study, a supplementary study designed to estimate whether symptoms of fecal incontinence are associated with imaging findings, including endoanal ultrasound and magnetic resonance imaging (MRI). The CAPSIS study included a physical examination, with a structured assessment of pelvic organ support. Therefore, we used data from the CAPSIS population to investigate postpartum pelvic organ support in these three cohorts.

The methods of the CAPSIS study were previously published [9]. Subjects in this study were recruited from women enrolled in the CAPSIS study at the final CAPS visit. Separate IRB approval and written informed consent was obtained for this study. The CAPSIS study correlated standardized imaging (MRI and endoanal ultrasound), physical examination findings, including pelvic organ prolapse quantification (POP-Q) [11], and symptom assessment. The planned sample size for the CAPSIS study was 255. Ultimately, 256 women participated in CAPSIS (109 women in the sphincter tear group, 108 in the vaginal control group, and 39 in the cesarean control group).

The analysis reported in this study is a planned secondary analysis of CAPSIS data. Pelvic organ support data for this investigation were obtained from the CAPSIS physical examination, which was performed 6–12 months after delivery and included a structured assessment of pelvic organ support, according to the POP-Q system [11]. Age and race were self-reported at baseline. Body mass index was calculated from measurements of height and weight obtained at the 6–12 month examination. The infants' birth weights were abstracted from the hospital record.

Descriptive statistics are provided regarding pelvic organ support. For each birth cohort, support was classified by stage (according to the POP-Q system). In addition, we calculated the proportion of women with prolapse to or beyond the hymen. The sample size for this ancillary study was determined based on enrollment into the parent study. We used Fisher exact test to compare the proportions of women with prolapse to or beyond the hymen in the three groups. Finally, for each POP-Q measure, we calculated the median value and standard deviation for each cohort of women.

Results

A total of 256 primiparous subjects were enrolled in CAPSIS. This secondary analysis includes data from 253 women (98.8%). Characteristics of the population are summarized in Table 1. All groups were similar with respect to age, postpartum body mass index (BMI), and race, with the majority being Caucasian. Mean infant birth weight was lower in the vaginal delivery without sphincter tear group as compared to the other cohorts.

Pelvic organ support stage at 6–12 months postpartum is shown in Table 2. Almost one third of participants had stage II support (31.2%). Prolapse beyond the hymen was present in all

three cohorts. Specifically, the most dependent point of the vaginal wall was to or beyond the hymen in 15 of 105 of those who delivered vaginally with a sphincter tear (14%; 95% confidence interval (CI) 8%, 22%), 16 of 104 of those who delivered vaginally without a sphincter tear (15%; 95% CI 9%, 24%), and two of 39 of those who delivered by cesarean without labor (5%; 95% CI 1%, 17%). The difference between groups was not significant ($p=0.23$). In a post hoc analysis, we calculated that a sample of 132 women per group would be required for 80% power to test the difference between 5% and 15% prevalence of prolapse between two groups.

The individual POP-Q measures are shown in Table 3. There is a trend toward poorer support of the anterior vaginal wall in the vaginal delivery cohorts as compared to the cesarean without labor. However, other measures appear to be similar among cohorts.

Discussion

In this study, we describe the range of pelvic organ support in three cohorts of postpartum women. Our findings add to the scarce published information about objectively measured pelvic organ prolapse following the first delivery. In a PubMed literature search of publications through December 2008, we found only three manuscripts that objectively quantified prolapse in the first year after the first delivery using the POP-Q system [12–14]. Sze and colleagues [12] found postpartum prolapse, defined as stage II or worse, in 50 women (52%) 6 weeks after delivery. Similarly, O’Boyle and colleagues [13] found stage II support in two thirds of 62 primiparous women examined 5–22 weeks postpartum. We found stage II support in only one third of postpartum women. Thus, our results are somewhat more encouraging with respect to postpartum pelvic organ support. The differences may be due to the timing of the postpartum examination. Women in this study were not examined until they were at least 6 months from delivery and it is possible that a higher proportion of advanced stage pelvic organ support would have been observed earlier in the first year after delivery. Longitudinal studies, describing changes in pelvic organ support during pregnancy and the first year postpartum, would help to clarify the natural history of pelvic organ support related to childbirth.

We also considered pelvic organ support at all measured sites. The most striking finding was the relative absence of anterior vaginal wall prolapse among women who had undergone cesarean without labor. Among 39 women examined, all women had point Aa at least 2 cm above the hymen. In contrast, the median support observed in the other two comparison groups was 2 cm above the hymen, indicating that at least 50% of women delivered vaginally had prolapse beyond that point. It remains to be seen whether these small absolute differences in anterior wall support will translate into clinically meaningful prolapse later in life. It is important to note that we did not observe clinically significant apical prolapse in this population.

Similar to Zhu et al. [14], we observed a low prevalence of prolapse after cesarean delivery. We found prolapse to or beyond the hymen in only 5% of women who had undergone cesarean without labor. The 95% confidence interval for prevalence of prolapse to or beyond the hymen is between 1% and 17%. Thus, cesarean delivery was not completely protective.

However, our findings cannot be attributed with certainty to delivery method, since some women may have developed prolapse before delivery or pregnancy and prolapse was not assessed prior to delivery in this population. For example, O'Boyle found that POP-Q stage was higher in the third trimester than first trimester but did not change significantly following delivery [13]. Thus, postpartum changes cannot with certainty be attributed to mode of delivery or intrapartum events. Furthermore, our sample size was not sufficiently large to exclude a significant difference between groups. Our findings argue for larger studies to conclusively study pelvic organ support after childbirth and specifically to address possible differences between cesarean and vaginal birth.

Our study is unique because of the relatively large numbers of participants who underwent cesarean prior to labor and because we examined a large number of women who had sustained obstetrical sphincter tears during labor. Strengths of our study include the objective assessment of prolapse and that examiners were masked to delivery type. While our numbers are too small to allow statistical comparisons among groups, information from our population doubles that currently available in the literature in this area and provides preliminary data that will facilitate the planning of future studies. Specifically, further research would be required to determine whether cesarean delivery before labor reduces the incidence of pelvic organ prolapse and to investigate the prognostic significance of support defects and symptoms noted in the early postpartum period.

Acknowledgments

Supported by grants from the National Institute of Child Health and Human Development (U01 HD41249, U10 HD41268, U10 HD41248, U10 HD41250, U10 HD41261, U10 HD41263, U10 HD41269, and U10 HD41267).

References

1. Nygaard I, Bradley C, Brandt D. Pelvic organ prolapse in older women: prevalence and risk factors. *Obstet Gynecol.* 2004; 104:489–497. [PubMed: 15339758]
2. Swift SE. The distribution of pelvic organ support in a population of female subjects seen for routine gynecologic health care. *Am J Obstet Gynecol.* 2000; 183:277–285. [PubMed: 10942459]
3. Hendrix SL, Clark A, Nygaard I, Aragaki A, Barnabei V, McTiernan A. Pelvic organ prolapse in the WHI: gravity and gravidity. *Am J Obstet Gynecol.* 2002; 186:1160–1166. [PubMed: 12066091]
4. Samuelsson EC, Arne Victor FT, Tibblin G, Svardsudd KF. Signs of genital prolapse in a Swedish population. *Am J Obstet Gynecol.* 1999; 180:299–305. [PubMed: 9988790]
5. Handa VL, Garrett E, Hendrix S, Gold E, Robbins J. Progression and remission of pelvic organ prolapse. *Am J Obstet Gynecol.* 2004; 190:27–32. [PubMed: 14749630]
6. Dietz HP, Simpson JM. Levator trauma is associated with pelvic organ prolapse. *BJOG.* 2008; 115:979–984. [PubMed: 18503571]
7. Hoyte L, Schierlitz L, Zou K, Flesh G, Fielding JR. Two-and 3-dimensional MRI comparison of levator ani structure, volume and integrity in women with stress incontinence and prolapse. *Am J Obstet Gynecol.* 2001; 185:11–19. [PubMed: 11483897]
8. Hodroff MA, Stolpen AH, Denson MA, Bolinger L, Kreder KJ. Dynamic magnetic resonance imaging of the female pelvis: the relationship with the pelvic organ prolapse quantification staging system. *J Urol.* 2002; 167:1353–1355. [PubMed: 11832730]
9. Richter HE, Fielding JR, Bradley CS, Handa VL, Fine P, Fitzgerald MP, Visco A, Wald A, Hakim C, Wei JT, Weber AM. Pelvic Floor Disorders Network. Endoanal ultrasound findings and fecal incontinence symptoms in women with and without recognized anal sphincter tears. *Obstet Gynecol.* 2006; 108:1394–1401. [PubMed: 17138772]

10. Borello-France D, Burgio KL, Richter HE, Zyczynski H, Fitzgerald MP, Whitehead W, Fine P, Nygaard I, Handa VL, Visco AG, Weber AM, Brown MB. Pelvic Floor Disorders Network. Fecal and urinary incontinence in primiparous women. *Obstet Gynecol.* 2006; 108:863–872. [PubMed: 17012447]
11. Bump RC, Mattiasson A, Bø K, Brubaker LP, DeLancey JO, Klarskov P, Shull BL, Smith AR. The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. *Am J Obstet Gynecol.* 1996; 175:10–17. [PubMed: 8694033]
12. Sze EH, Sherard GB 3rd, Dolezal JM. Pregnancy, labor, delivery, and pelvic organ prolapse. *Obstet Gynecol.* 2002; 100:981–986. [PubMed: 12423864]
13. O'Boyle AL, O'Boyle JD, Calhoun B, Davis GD. Pelvic organ support in pregnancy and postpartum. *Int Urogynecol J Pelvic Floor Dysfunct.* 2005; 16:69–72. [PubMed: 15647966]
14. Zhu L, Bian XM, Long Y, Lang JH. Role of different childbirth strategies on pelvic organ prolapse and stress urinary incontinence: a prospective study. *Chin Med J (Engl).* 2008; 121:213–215. [PubMed: 18298911]

Appendix

Pelvic Floor Disorders Network Members

University of Alabama at Birmingham

Holly E. Richter, Ph.D., M.D., Principal investigator

Kathryn Burgio, Ph.D., Co-principal investigator

Patricia Goode, M.D., Co-investigator

R. Edward Varner, M.D., Co-investigator

Gregg Shore, M.D., Co-investigator

Franklin Tessler, M.D., Co-investigator

Mark Lockhart, M.D., MPH, Co-investigator

Velria Willis, R.N., B.S.N., Research coordinator

Baylor College of Medicine

Paul M. Fine, M.D., Principal investigator

Rodney A. Appell, M.D., Co-principal investigator

Peter K. Thompson, M.D., Co-investigator

Peter M. Lotze, M.D., Co-investigator

Naomi Frierson, Research coordinator

University of Iowa

Ingrid Nygaard, M.D., Principal investigator

Debra Brandt, R.N., Denise Haury, R.N. Research coordinators

Karl Kreder, M.D., Co-investigator

Catherine S. Bradley, M.D., Co-investigator

Satish Rao, M.D., Co-investigator

Johns Hopkins Medical Institutes

Geoffrey Cundiff, M.D., Principal investigator

Victoria Handa, M.D., Co-investigator

Mary Elizabeth Sauter, N.P., Research coordinator

Jamie Wright, M.D., Co-investigator

Loyola University, Chicago

Linda Brubaker, M.D., Principal investigator

Mary Pat FitzGerald, M.D., Co-principal investigator

Kimberly Kenton, M.D., Co-investigator

Dorothea Koch, R.N., Research coordinator

Charity Ball, R.N., Research coordinator

University of Michigan

Morton B. Brown, Ph.D., Principal investigator

John T. Wei, M.D., M.S., Co-principal investigator

Beverly Marchant, RN, BS, Project manager

John O.L. DeLancey, M.D., Co-investigator

Nancy K. Janz, Ph.D., Co-investigator

Dean G. Smith, Ph.D., Co-investigator

Patricia A. Wren, Ph.D., Co-investigator

Wen Ye, PhD, Statistician

James Imus, MS, Statistician

Yang Wang Casher, MS, Database programmer

University of North Carolina at Chapel Hill

Anthony G. Visco, M.D., Principal investigator

AnnaMarie Connolly, M.D., Co-investigator

John Lavelle, M.D., Co-investigator

Mary J. Loomis, R.N., Research coordinator

Anita K. Murphy, N.P., Research coordinator

Ellen C. Wells, M.D., Co-investigator

William Whitehead, Ph.D., Co-investigator

Julia Fielding, M.D., Co-investigator

University of Pittsburgh/Magee-Womens Hospitals

Halina Zyczynski, M.D., Principal investigator

Diane Borello-France, Ph.D., Co-investigator

Christiane Hakim, M.D., Co-investigator

Arnold Wald, M.D., Co-investigator

Judy A. Gruss, B.S., M.S., Research coordinator

Wendy Leng, M.D., Co-investigator

Pamela A. Moalli, M.D., Ph.D., Co-investigator

Steering Committee Chairman

Robert Park, M.D.

NICHD Project Scientist

Anne M. Weber, M.D., M.S.

Table 1

Characteristics of 253 primiparous participants

	Vaginal delivery with anal sphincter tear (N=106)	Vaginal delivery without anal sphincter tear (N=108)	Cesarean delivery before labor (N=39)
Age, years (mean, SD)	27.6±6.2	26.1±5.6	28.2±7.4
Postpartum BMI, kg/m ² (mean, SD)	27.2±6.9	26.7±6.2	29.3±8.3
Race ^a			
Caucasian	79 (76%)	71 (66%)	29 (74%)
Black	22 (21%)	31 (29%)	9 (23%)
Other	3 (3%)	6 (6%)	1 (3%)
Infant's birth weight, grams (mean, SD)	3593±442	3396±367	3526±483

^aTwo subjects refused to answer the question

Table 2

Pelvic organ support, by delivery cohort

Stage of pelvic organ support	Vaginal delivery with anal sphincter Tear (N=106)	Vaginal delivery without anal sphincter tear (N=108)	Cesarean delivery before labor (N=39)
Stage 0	32 (30%)	23 (22%)	17 (44%)
Stage 1	32 (30%)	51 (49%)	14 (36%)
Stage 2	40 (38%)	30 (29%)	8 (21%)
Stage 3	1 (1%)	0 (0%)	0 (0%)
Missing	1	4	0

Support is described according to Pelvic Organ Prolapse Quantification Stage

Table 3

Pelvic organ support, by delivery cohort

POP-Q measure (mean, SD)	Vaginal delivery with anal sphincter tear (N=106)	Vaginal delivery without anal sphincter tear (N=108)	Cesarean delivery before labor (N=39)
Aa	-2 (-3, -1)	-2 (-3, -1)	-3 (-3, -2)
Ba	-2 (-3, -1)	-2 (-3, -1)	-3 (-3, -2)
C	-7 (-8, -6)	-7 (-8, -6)	-8 (-8.5, -6)
D	-8 (-9, -7.5)	-8 (-9, -7.5)	-9 (-10, -8)
GH, straining	3 (2, 4)	3 (2.5, 3)	2 (1.5, 2.5)
GH, at rest	2 (2, 3)	2 (2, 3)	2 (2, 3)
PB, straining	3 (2.5, 3.5)	3.5 (3, 4)	2.5 (2, 4)
PB, at rest	3.5 (3, 4)	3.3 (3, 4)	3.5 (2.5, 4)
Ap	-3 (-3, -2)	-3 (-3, -2)	-3 (-3, -3)
Bp	-3 (-3, -2)	-3 (-3, -2)	-3 (-3, -3)
TVL	9 (8, 10)	9 (8, 10)	9 (9, 10)

Support is described in centimeters at each point for the pelvic organ prolapse quantification examination. Data represent median (intraquartile range)