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Temporal relationship between posterior vaginal prolapse and defecatory symptoms

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Abstract

BACKGROUND—Posterior vaginal prolapse is thought to cause difficult defecation and splinting for bowel movements. However, the temporal relationship between difficult defecation and prolapse is unknown. Does posterior vaginal prolapse lead to the development of defecation symptoms? Conversely, does difficult defecation lead to posterior prolapse? This prospective longitudinal study offered an opportunity to study these unanswered questions.

OBJECTIVE—We sought to investigate: (1) Are symptoms of difficult defecation more likely to develop (and less likely to resolve) among women with posterior vaginal prolapse? (2) Is posterior vaginal prolapse more likely to develop among women who complain of difficult defecation?

STUDY DESIGN—In this longitudinal study, parous women were assessed annually for defecatory symptoms (Epidemiology of Prolapse and Incontinence Questionnaire) and pelvic organ support (POP-Q examination). The unit of analysis for this study was a visit-pair (two sequential visits from any participant). We created logistic regression models for symptom onset among those symptom-free at the index visit and for symptom resolution among those with symptoms at the index visit. To investigate the change in posterior vaginal support (assessed at point Bp) as a function of symptom status, we created a standard regression model, controlling for Bp at the index visit for each visit-pair.

RESULTS—3888 visit-pairs were derived from 1223 women (each completing 2-7 annual visits). At the index visit, 1143 (29%) reported difficulty with bowel movements and 643 (17%) reported splinting for bowel movements. Posterior vaginal prolapse (Bp 0) was observed among 80 (2%).

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Condensation

In this longitudinal study, posterior vaginal prolapse was not associated with onset of new defecation symptoms but significantly increased the odds that such symptoms would persist.

Among those without symptoms, posterior vaginal prolapse did not significantly increase the odds that defecatory symptoms would develop (difficult bowel movements $p=0.378$; splinting $p=0.765$). In contrast, among those with defecatory symptoms, posterior vaginal prolapse reduced the probability of symptom resolution (difficult bowel movements $p<0.001$; splinting $p=0.162$). The mean rate of change in posterior wall support was $+0.13\text{cm}$. Among women without posterior vaginal prolapse, the presence of defecatory symptoms at the index visit did not have an effect on changes in Bp over time; however among those with posterior vaginal prolapse (Bp 0), defecatory symptoms were associated with more rapid worsening of posterior support (difficulty with bowel movements $p=0.005$; splinting $p=0.057$).

CONCLUSIONS—Posterior vaginal prolapse did not increase the odds that new defecatory symptoms would develop among asymptomatic women but did increase the probability that defecatory symptoms would persist over time. Furthermore, among those with established posterior vaginal prolapse, defecatory symptoms were associated with more rapid worsening of posterior vaginal wall descent.

Keywords

defecatory symptoms; rectocele; posterior vaginal prolapse

INTRODUCTION

Posterior vaginal prolapse is thought to cause difficult defecation and splinting for bowel movements [1]. Anatomically, it is plausible that weakness of the rectovaginal septum could interfere with the ease of evacuation of a bowel movement. Indeed, 21-38% of women with posterior vaginal wall prolapse complain of difficult defecation or the need to splint to expel a bowel movement [2,3]. Additionally, bowel symptoms (including splinting, straining, incomplete evacuation, and obstructive defecation) improve after rectocele repair [4].

However, cross sectional studies show only a weak association between posterior vaginal prolapse and defecation symptoms [1, 5, 6]. Other studies [7,8,9,10] have failed to show any association between symptoms and stage of posterior wall prolapse. These observations appear to contradict the logic behind attributing difficult defecation to posterior vaginal prolapse. Thus, longitudinal follow up of women with and without defecatory complaints could provide valuable insights regarding a possible causal association between posterior vaginal prolapse and defecatory difficulties (as well as the converse).

In this research, we used data from a longitudinal cohort study of parous women [11,12] to assess the temporal relationship between defecation symptoms and posterior vaginal prolapse. In the Mothers' Outcomes after Delivery study [12], women are assessed annually for pelvic organ support and for pelvic floor symptoms. Data from this study therefore allowed us to describe changes over time in defecatory symptoms and posterior vaginal support. Specifically, we investigated two hypotheses: (1) symptoms of difficult defecation are more likely to develop (and to less likely to resolve) among those with posterior vaginal prolapse; and (2) posterior vaginal prolapse is likely to develop in those with symptoms of difficult defecation.

MATERIALS AND METHODS

The Mothers' Outcome After Delivery study is a longitudinal cohort study of parous women. This study received Institutional Review Board Approval and all participants provide written informed consent. Participants for this study [11] were selected for recruitment based on delivery type (cesarean prior to labor, cesarean during labor, vaginal birth) and age at delivery. Women are recruited for participation in this study 5-10 years after the first delivery. After enrollment and informed consent, participants are followed prospectively and are assessed annually for pelvic floor symptoms and prolapse. Data for this analysis were obtained from annual visits from 2008 through 2015.

The annual assessment for each participant included completion of the Epidemiology of Prolapse and Incontinence Questionnaire [13]. Relevant items on the questionnaire included "Do you ever have difficulty having a bowel movement?" and "Do you ever have to push on your vagina or around your rectum to have or complete a bowel movement?" The questionnaire was self-administered each year. Posterior prolapse was assessed annually with the pelvic organ prolapse quantification (POP-Q) examination [14]. Examiners were blinded to symptoms, delivery group, and to the results of prior examinations. To capture the extent of posterior vaginal support, analysis focused on measurement at Bp. Posterior vaginal prolapse was defined as Bp ≥ 0 .

Because the goal of this study was to assess changes over time, we excluded women who only attended one study visit. Among those with at least two visits, time-in-study varied because (a) women were enrolled into the study over several years and (b) some women dropped out of the study as the years passed. At the time of this analysis, women had participated for 2-7 years. The unit of analysis for this study was a visit pair approximately one year apart (two sequential visits from any participant, at time "T" (index visit) and time "T+1"). This approach allowed us to investigate the impact of time-varying exposures and to relate them to the outcome one year later. For example, this allowed us to consider the impact of posterior wall support (a time-varying exposure) at time "T" on the onset of defecatory symptoms at time "T+1". In turn, the approach also allowed us to determine whether, in women with same Bp, symptom status at the index visit is associated with change in Bp to be different one year later at "T+1" (i.e., effect of defecatory symptoms on Bp change). In this analysis, women who reported interval intervention (including surgery for prolapse and/or incontinence and supervised pelvic floor muscle training) were excluded because their status at follow up would presumably reflect the impact of intervention.

Our first hypothesis was that symptoms of difficult defecation would be more likely to develop and less likely to resolve among those with posterior vaginal prolapse. Thus, the first question we addressed was whether the probability of defecatory symptoms at visit "T+1" differs between those with or without posterior vaginal prolapse at time "T". In this analysis, we considered separately women presenting without defecatory symptoms at time "T" (in which case the question was whether posterior vaginal prolapse is associated with symptom onset) and those presenting with defecatory symptoms at time "T" (in which case the question was whether posterior vaginal prolapse is associated with symptom resolution). We used separate logistic regression models for the two outcomes of interest: onset of

symptoms among those symptom-free at the index visit and resolution of symptoms among those with symptoms at the index visit. This approach was used to generate regression coefficients whose antilogs represent the odds ratios quantifying the association between posterior vaginal prolapse at the index visit and the outcome of interest at the subsequent visit.

The second question was whether changes in posterior vaginal support (at Bp) differed for those with or without defecation symptoms. This question was addressed with a standard linear regression model, whereby the dependent variable was the measurement of Bp at the visit “T+1” and the two independent variables included (a) Bp at visit “T” and (b) an indicator of whether or not a defecation symptom of interest was present at that visit. Thus, the regression coefficient corresponding to the indicator for each defecation symptom quantified the expected change in Bp that can be attributed to the defecation symptom, controlling for Bp at the index visit. To determine whether defecatory symptoms may have a different effect on posterior support among women with established posterior vaginal prolapse (i.e., among those with Bp 0 at the index visit) we included in the model a term for such interaction (i.e., (Bp 0)*(defecation symptom)).

Since women were able to contribute multiple visit-pairs to the analysis, generalized estimating equations were used to account for repeated measurements (e.g., within participants).

RESULTS

Of 1529 women, 306 came only for one visit and are therefore excluded from this analysis (figure 1). The remaining 1223 women contributed 3925 visit-pairs. After excluding 3 visit pairs (0.1%) for incomplete data and an additional 34 visit pairs (0.9%) because of interval treatment for incontinence or prolapse, data for this analysis were derived from 3888 visit-pairs among 1223 women (each completing 2-7 visits). These pairs of visits were, on average 1.04 years apart (interquartile range= 0.97 to 1.15 years). The study population is described in table 1. Those excluded from the analysis (n= 306) were similar to those included.

Among 3888 visit pairs, 1143 (29%) reported difficulty with bowel movements and 643 (17%) reported splinting for bowel movements at visit “T” (i.e., the index visit). Symptom onset and resolution are shown in table 2. Specifically, among 2745 women who did not report difficulty with bowel movements at the index visit, 331 (12%) reported onset of that symptom at the subsequent visit; and, among 3245 who did not report splinting for bowel movements at the index visit, 179 (6%) reported onset of the symptom at the next visit. In turn, symptom resolution occurred in approximately one-third of women who reported either symptom at the index visit, as shown at the bottom of table 2.

To investigate whether symptoms of difficult defecation would be more likely to develop and to less likely to resolve among those with posterior vaginal prolapse, we compared both the *onset* of new symptoms and the *resolution* of defecatory symptoms between those with or without posterior vaginal prolapse. Among the 3888 visit pairs, posterior vaginal prolapse

(Bp = 0) was observed among 80 (2%) at visit “T” (i.e., the index visit). Among the 2745 visit pairs reporting no difficult bowel movements at time “T” (Table 2), the presence of posterior vaginal prolapse did not significantly increase the odds to develop this symptom at time “T +1” (OR= 1.39, p=0.378). Similarly, among the 3245 visit pairs reporting no splinting at “T”, the presence of posterior vaginal prolapse did not increase the odds for developing this symptom (OR=0.82, p=0.765).

In contrast, posterior vaginal prolapse was associated with a reduced odds of symptom resolution. Specifically, among 1143 visit-pairs reporting difficult bowel movements at time “T” (Table 2), the presence of posterior vaginal prolapse at that time reduced the odds of resolution at time “T+1” (OR= 0.26, p<0.001). A similar pattern was seen for splinting with bowel movements, although the observed differences were not statistically significant (OR= 0.58, p=0.162). In sum, with respect to the hypothesis that symptoms of difficult defecation are more likely to develop (and less likely to resolve) among those with posterior vaginal prolapse, our results demonstrated that posterior vaginal prolapse was not associated with symptom onset but did significantly decrease the odds for symptom resolution.

To investigate whether changes in posterior vaginal support differed for those with or without defecation symptoms, we examined how the presence of defecatory symptoms at time “T” was associated with changes in Bp. The mean Bp measurement at visit “T” was -2.17 ± 0.66 cm. Across all visits, the mean change in Bp from “T” to “T+1” was an increase of +0.13 cm. Controlling for Bp at the first visit, there was no association between defecatory symptoms at the first visit and worsening of posterior support over time. Specifically (Table 3), women who reported difficulty with bowel movements had, on average a 0.014 cm greater annual increase in Bp compared to those who did not report this symptom (95% confidence interval -0.022 cm to $+0.049$ cm; not significant). Similarly, Bp increased by 0.020 cm more for women who reported splinting compared to those who did not (95% confidence interval -0.025 cm to $+0.064$ cm, not significant).

To determine whether defecatory symptoms may have a different effect on posterior support among women with posterior vaginal prolapse (i.e., among those with Bp = 0 at the index visit) we included in the model such interaction. We found that among women with posterior vaginal prolapse (i.e., if the initial Bp was 0), the symptom of difficulty with bowel movements was associated with a 0.537 cm increase in Bp at the next visit (p= 0.005) versus those without this symptom (Table 3). Also, the symptom of splinting was associated with a 0.376 cm increase in Bp (p= 0.052). In contrast, among women without posterior vaginal prolapse there was no association between defecatory symptoms at the first visit and worsening of posterior support over time. Specifically, among women who did not have a posterior vaginal prolapse at the index visit (Bp<0), those who reported difficulty with bowel movements had, on average a 0.003 cm greater annual increase in Bp compared to those who did not report this symptom (p=0.873) and those who reported splinting had a 0.003 cm greater increase in Bp (p=0.899). Thus, defecatory symptoms were associated with more rapid worsening of posterior support only among those with established posterior vaginal prolapse.

COMMENT

Given that posterior vaginal prolapse is thought to be a cause of difficult defecation, a surprising finding of this study was that defecatory symptoms are *not* significantly more likely to develop among asymptomatic women with posterior vaginal prolapse versus asymptomatic women without such prolapse. This observation would argue against the theory that posterior vaginal prolapse – if untreated—leads to the development of defecation difficulty. Thus, our findings support expectant management of asymptomatic women with posterior vaginal prolapse, because this anatomic finding does not appear to increase the odds to develop defecation problems.

We also made some interesting observations about changes in posterior support over time. In this population, there was a trend toward worsening of posterior vaginal wall support (mean change of +0.13 cm per year at point Bp) with time. The rate of change was not different between symptomatic and asymptomatic women. The exception was among the 80 cases in which study participants had posterior vaginal descent past the hymen (Bp = 0) at the index visit. In that setting, the presence of defecatory symptoms predicted more rapid worsening of posterior vaginal wall descent in the year to follow. This was an unexpected finding and perhaps one of the most intriguing results of this study. This observation suggests that defecatory symptoms are a harbinger of worsening prolapse among women with posterior vaginal prolapse.

We also noted another important distinction between women with and without posterior vaginal prolapse: defecatory symptoms were significantly more likely to persist among women with posterior vaginal prolapse. Over approximately one year, defecatory symptoms resolved in one third of symptomatic women. However, resolution of symptoms was much less likely among those with posterior vaginal prolapse. This suggests that women who present with difficult defecation in the presence of posterior vaginal prolapse are likely to have persistent symptoms. Conversely, those without posterior vaginal prolapse may be reassured that symptoms may resolve.

The longitudinal design of this study made it possible for us to consider the temporal relationship between pelvic organ support and defecation symptoms. Most prior studies of the association between posterior vaginal prolapse and defecation symptoms have been cross sectional [5,6,7,8,9]. A strength of this study is that we had the opportunity to investigate changes over time in both symptoms and posterior vaginal support.

Our study provides an estimate for the rate at which posterior support worsens over time. At the index visit, when participants' mean age was 38 years, the average value of Bp was -2.17 ± 0.66 cm. If we extrapolate the observed mean annual change in Bp (+0.13 cm) over time, our results would suggest that the mean Bp in this population would reach the hymen within 16-17 years (e.g., age 54-55). This is consistent with epidemiologic data suggesting that the mean age of women undergoing rectocele repair is 55 ± 16 years [15]. However, our results should be extrapolated with caution; studies with longer follow up would be needed to assess whether the rate of change in Bp differs over time.

A weakness of this study was limited statistical power to study some temporal relationships, despite the acquisition of almost 4000 women-years of data. For example, we found that defecatory symptoms were not significantly more likely to develop among asymptomatic women with posterior vaginal prolapse versus asymptomatic women without posterior vaginal prolapse. However, for the symptom of difficult bowel movements, we calculate that a study five times larger would be needed to conclusively exclude the possibility of a significant difference with power of 80%. Similarly, we failed to show a statistical difference between the persistence of splinting for women with and without posterior vaginal prolapse; we calculate that we would have needed a study of 2.4 times larger to insure 80% power to exclude a statistical difference.

An additional limitation of this study is that we did not have data about all plausible factors that could influence defecation. We excluded women who underwent surgical treatment or pelvic floor physical therapy, but we did not have information about medical treatments that might impact bowel function, nor did we ask participants about changes in diet which could have affected symptoms. We did not characterize stool consistency. Thus, we cannot with certainty exclude that unmeasured factors affected the development or resolution of symptoms. Finally, we acknowledge that our measures of both posterior support and defecatory symptoms may have been somewhat simplistic. For example, we defined vaginal support according to the position of point Bp but we did not consider the possible impact of perineal descent. Similarly, the symptoms assessed in this research may not capture all clinically relevant aspects of defecatory function.

A strength of the study is the unique opportunity to prospectively follow changes in pelvic floor symptoms and pelvic organ support in a cohort of parous women. The longitudinal nature of the study provides an important and relatively rare opportunity to investigate the temporal relationships between symptoms and physical findings. Another strength is the use of validated instruments to assess prolapse and symptoms. Finally, blinding of the examiner to symptoms (and to prior examinations) reduces the likelihood of bias.

In summary, the findings of this study suggests that defecation symptoms wax and wane; the most notable impact of posterior vaginal prolapse is an association with the persistence of symptoms over time. Also, among women with posterior vaginal prolapse to or beyond the hymen, worsening of posterior vaginal support is accelerated in the presence of defecation symptoms. Our results provide an argument for intervention for symptomatic women with posterior vaginal prolapse, offer reassurance for those who have defecatory symptoms without posterior vaginal prolapse, and do not support the hypothesis that posterior vaginal prolapse is more likely to develop among those with chronic defecatory dysfunction.

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Figure 1.
Study population

Table 1

Description of the study population, and comparison to excluded participants, by status at first study visit.

	Women Excluded (N=306)	Women included (N=1223)
Age (years) *	37 [33, 41]	38 [35, 42]
Race Caucasian African American Other	76% (229) 19% (56) 6% (17)	81% (986) 15% (178) 5% (57)
Body mass index (kg/m ²) *	26.9 [23.4, 32.2]	25.4 [22.5, 29.8]
Parity 1 2 >2	31% (95) 53% (161) 16% (49)	28% (341) 56% (690) 16% (192)
At least one vaginal birth	46% (141)	50% (608)
Years from 1 st delivery *	6.4 [5.6, 8.0]	6.4 [5.6, 8.2]
Difficulty with bowel movement	30% (93)	34% (410)
Splinting for bowel movement	17% (51)	18% (223)
Bp *	-2.5 [-3.0, -2.0] †	-2.5 [-3.0, -2.0]
Bp >= 0	<1% (2)	2% (19)
Interval laxative use (between times "T" and "T+1")	N/A	2% (19)
Interval childbirth (between times "T" and "T+1")	N/A	3% (37)

Data are otherwise presented as % (n)

* median [interquartile range]

† Among 34 visit pairs excluded for interval treatment of prolapse or incontinence, median Bp at the index visit was -2.0 (IQR -1.5, -2.5).

Table 2

Onset and resolution of defecatory symptoms, by status at index visit of 3888 visit-pairs.

Symptom onset		
Symptoms <i>absent</i> at index visit	Symptom onset at follow up visit	Relative odds for symptom onset, posterior prolapse vs none
Difficulty with bowel movements (n=2745)	331 (12%)	No Difference (OR= 1.39) p=0.378
Splinting for bowel movements (n=3245)	179 (6%)	No Difference (OR= 0.82) p=0.765
Symptom resolution		
Symptoms <i>present</i> at index visit	Symptom resolution at follow up visit	Relative odds for resolution, posterior prolapse vs none
Difficulty with bowel movements (n=1143)	386 (34%)	OR= 0.26 p<0.001
Splinting for bowel movements (n=643)	206 (32%)	OR= 0.58 p=0.162

Table 3

Mean additional change in Bp measurement between index visit (at time “T”) and subsequent visit (time “T +1”) for 3888 visit pairs, controlling for Bp at the index visit. These values represent the additional estimated change in Bp attributed to the presence of each defecation symptom.

Symptoms at index visit	All visit pairs	By status of Bp at index visit	
		Bp ≥ 0	Bp < 0
Difficulty with bowel movements	0.014 cm (NS)	0.537 cm (p=0.005)	0.003 cm (NS)
Splinting with bowel movements	0.020 cm (NS)	0.376 (p=0.052)	0.003 cm (NS)