

GYNECOLOGY

The relationship of defecation symptoms and posterior vaginal wall prolapse in women undergoing pelvic organ prolapse surgery



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BACKGROUND: Defecation symptoms are common among women with pelvic organ prolapse. However, the relationship between posterior vaginal wall prolapse and defecation symptoms remains debatable. Even though there is a plausible biomechanical rationale for posterior wall prolapse to cause obstructed defecation, previous studies have drawn contradictory conclusions regarding the association.

OBJECTIVE: We aimed to examine the association between posterior vaginal wall prolapse and defecation symptoms by assessing the following: (1) does prevalence of defecation symptoms increase along with posterior wall prolapse severity, (2) is postoperative symptom improvement greater in women who underwent posterior compartment procedures in comparison with those who did not, and (3) is symptom improvement related to the symptom's correlation with the degree of prolapse?

STUDY DESIGN: We used data from a nationwide longitudinal cohort study with 3515 women undergoing pelvic organ prolapse surgery. We measured the prevalence of 9 defecation symptoms at baseline and at 6 and 24 months after surgery using the short form of the Pelvic Floor Distress Inventory. Baseline degree of prolapse was categorized in stages as defined by the Pelvic Organ Prolapse Quantification System. The relationship between the degree of posterior wall prolapse and prevalence of bothersome defecation symptoms was studied with logistic regression and adjusted for patient characteristics and severity of anterior wall and apical prolapse. Generalized estimating equations were used to assess the longitudinal change in symptom prevalence in groups of participants with and without repair for posterior vaginal compart-

ment. Correlations between symptom improvement and symptom dependency on the degree of prolapse was assessed by calculating Pearson's correlation coefficient.

RESULTS: The stage of posterior wall prolapse (stage 2 vs stage 0) correlated with splinting, straining, incomplete evacuation, fecal incontinence of liquid stool, pain during defecation, fecal urgency, and anorectal prolapse (adjusted odds ratios, 2.7, 2.1, 2.0, 1.5, 2.1, 1.4, and 2.2, respectively; $P \leq .007$ for all). Flatal incontinence and fecal incontinence of solid stool were not associated with the severity of posterior vaginal wall prolapse. Obstructed defecation symptoms (splinting, straining, and incomplete evacuation) improved more in women undergoing posterior compartment surgery compared with women undergoing repair for other compartments. The greatest improvement at follow-up was observed for those symptoms that showed strongest association with the degree of prolapse at baseline.

CONCLUSION: Obstructed defecation symptoms are dependent on the posterior wall anatomy. Women presenting with posterior wall prolapse, and these symptoms can expect to improve after surgery. Other defecation symptoms also improve after pelvic organ prolapse surgery, but they are not as specific to posterior wall anatomy as obstructed defecation symptoms.

Key words: defecation, fecal incontinence, obstructed defecation, Pelvic Floor Distress Inventory, pelvic organ prolapse, posterior vaginal wall prolapse

Problems with defecation like obstructed defecation and anal incontinence are more common among women with pelvic organ prolapse (POP) than in the general population.^{1,2} However, based on previous literature, it is not clear whether POP is the cause or a consequence of these symptoms, or

whether they only share a common etiology.³

Biomechanically, it is plausible that posterior vaginal wall prolapse interferes with rectal evacuation resulting in obstructed defecation symptoms like splinting (need to digitally support vagina or perineum to assist defecation), straining to defecate, and a feeling of incomplete bowel evacuation. However, many studies have failed to reliably demonstrate a relationship between posterior wall prolapse and obstructed defecation symptoms.^{4–12}

Some studies have reported an association between the presence of posterior vaginal wall prolapse and obstructed defecation symptoms,^{13,14} and a few studies have found a dose-response

effect (higher risk for symptoms with increasing prolapse severity).^{15–20} None of these studies assessed whether the symptoms improved after the anatomical defect was repaired, which would serve as further evidence for posterior vaginal wall prolapse being a contributing factor per se for obstructed defecation symptoms.

Association of posterior vaginal wall prolapse with other but obstructive defecation symptoms (ie, fecal urgency, pain during defecation, symptoms of anorectal prolapse, and anal incontinence) is less plausible and evidence scarce. The association may be due to sharing a common cause (eg, neuromuscular damage by obstetric trauma), rather than one being the cause for the other. Thus, restoring

Cite this article as: Karjalainen PK, Mattsson NK, Nieminen K, et al. The relationship of defecation symptoms and posterior vaginal wall prolapse in women undergoing pelvic organ prolapse surgery. *Am J Obstet Gynecol* 2019;221:480.e1-10

0002-9378/\$36.00

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<https://doi.org/10.1016/j.ajog.2019.05.027>

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AJOG at a Glance

Why was this study conducted?

The association between posterior vaginal wall prolapse and defecation symptoms remains unclear.

Key findings

First, the prevalences of splinting, straining, incomplete evacuation, incontinence of liquid stool, pain during defecation, and the symptom of anorectal prolapse increase with the advancing stage of posterior vaginal wall prolapse. Second, obstructed defecation symptoms show strongest correlation with posterior wall anatomy and also improve most after surgery. And third, incontinence symptoms and anorectal prolapse are less specific to posterior vaginal wall pathology.

What does this add to what is known?

This study supports the view that posterior vaginal wall prolapse contributes to obstructed defecations symptoms. In addition, other than obstructed defecation, symptoms increase along with the degree of posterior vaginal prolapse, but their improvement is not specific to posterior compartment surgery.

posterior vaginal wall anatomy may not relieve the symptoms.

We hypothesized that if posterior wall prolapse is a contributing factor for defecation symptoms, a dose-response relationship would exist: the greater the anatomical defect, the higher the symptom burden. Also, symptoms should improve after the correction of posterior vaginal wall prolapse. Furthermore, symptoms that are dependent on the anatomy should show greater improvement after surgery compared with those not related to anatomy.

The aim of this longitudinal cohort study was to study the association between posterior vaginal wall prolapse and defecation symptoms. We did this by quantifying the association between the degree of posterior vaginal wall prolapse and defecation symptoms included in the short form of Pelvic Floor Distress Inventory (PFDI-20). Furthermore, we studied whether these symptoms improved more after posterior compartment surgery compared with surgery for other vaginal compartments.

We also evaluated whether the individual symptom's dependency on anatomy at baseline predicts the improvement of the symptom. We used data from a national population-based study comprising preoperative and follow-up details from 3515 women operated because of pelvic organ prolapse.

Materials and Methods

Setting

The population of this longitudinal cohort study consists of participants in the Finnish Pelvic Organ Prolapse Study nationwide trial ([ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT02716506), NCT02716506). The primary aim of the cohort is to assess the effectiveness of pelvic organ prolapse surgery. FINPOP is organized and funded by the Finnish Society for Gynecological Surgery.

We invited all Finnish hospitals performing POP surgery to recruit all of the patients operated for POP during Jan. 1, 2015, through Dec. 31, 2015. A total of 41 of 45 centers (91%) participated including 5 of 5 university hospitals (100%), 17 of 18 secondary care hospitals (94%), primary care hospitals 15 of 17 (88%), and 4 of 5 private hospitals (80%).

The study follows the ethical standards for human experimentation established by the Declaration of Helsinki of 1964, revised in 2013. The Research Ethics Committee of the Northern Savo Hospital District approved the study on May 20, 2014 (reference number 5//2014), and each participating hospital granted an approval for conducting the study.

Participants

We recruited participants only after the decision to operate was made and the

decision to operate was not related to the trial. The surgeons made the decision on the method of POP surgery according to their normal practice. The inclusion criteria for the participants were as follows: age more than 18 years; sufficient mental and psychological ability to understand study information and give consent; and the ability to communicate in written and oral Finnish or Swedish. Written informed consent was obtained from each patient. We excluded participants with missing data at baseline from this analysis.

Baseline characteristics and operative data

Participants' baseline characteristics in the FINPOP cohort included medical history, history of previous pelvic surgery, height, weight, parity, and smoking status. The trial also administered the PFDI-20, the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire, and a generic health-related quality-of-life instrument.

The surgeons assessed the degree of prolapse at baseline using a simplified Pelvic Organ Prolapse Quantification system,²¹ as a single most distal point (in centimeters from hymen) for each of 3 compartments of the vagina (anterior, posterior, and apical compartment).

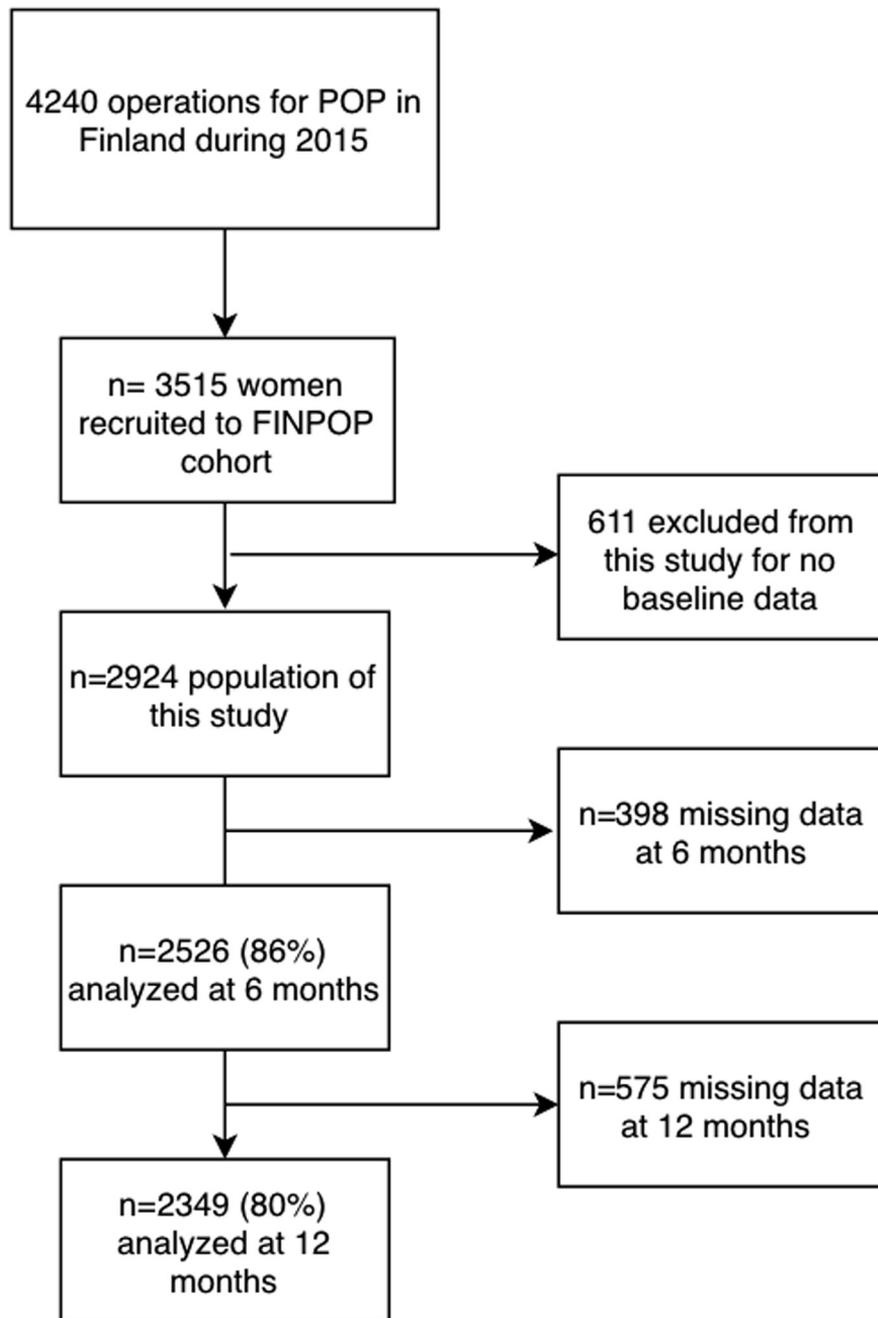
Follow-up

Participants completed and returned the PFDI-20, the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire-12, and a generic health-related quality-of-life instrument questionnaires at 6 and 24 months after surgery. We also asked the participants whether they had been operated for recurrence.

Data handling and analysis

The participant data were collected on standardized paper or electronic forms based on participants preference. Data collected in paper forms were entered into an electronic registry. Doctors recorded preoperative and operative data in electronic forms.

We categorized the baseline degree of posterior wall prolapse into 4 groups: stage 0, stage 1, stage 2, and stage 3–4

FIGURE 1
Cohort flowchart

Number of patients enrolled and analyzed at different time points is shown.

POP, pelvic organ prolapse.

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according to the Pelvic Organ Prolapse Quantification System.²² We did not record total vaginal length, so we were not able to specify stage 4 separately.

The PFDI-20 is a validated, condition-specific questionnaire

including total of 20 questions related to pelvic floor function.²³ Each question first asks whether patient has the symptom or not (yes or no response). If the patient answers yes, she is asked to rate the degree of bother. Scale is as

follows: 1, not at all; 2, somewhat; 3, moderately; and 4, quite a bit.

Nine defecation-related questions are: splinting, straining, incomplete emptying, fecal incontinence of solid stool, fecal incontinence of liquid stool, flatal incontinence, pain during defecation, fecal urgency, and anorectal prolapse. Splinting, straining, and incomplete evacuation were considered as obstructed defecation symptoms.

We calculated the proportions of patients with each symptom and symptom bother at baseline. We defined responses 3 (moderately) and 4 (quite a bit) as bothersome symptoms. We calculated the prevalence of bothersome symptoms at baseline by dividing the number of patients with bothersome symptoms by total number of patients at that time point.

We used binary logistic regression to assess the association between the degree of posterior vaginal wall prolapse, and bothersome symptoms at baseline. Confounders (most distal point of anterior vaginal wall and apex, age, body mass index, parity, previous hysterectomy, and previous POP surgery) were selected on the basis of previous literature and clinical experience (ie, factors associated with both the exposure and the outcome but not on the causal pathway), as motivated by Hernán et al.²⁴ Nagelkerke's R^2 was calculated to assess the model's ability to predict the proportion of variance in defecation symptoms.

Population-averaged panel data models with generalized estimation equations were fitted to evaluate the impact of surgery for posterior vaginal wall in improvement of symptoms over time. Specifically, we divided the population into the following 2 groups: (1) women who had a procedure for posterior vaginal wall as part of their operation and (2) women who did not have a procedure for posterior vaginal wall as part of their operation.

To assess whether symptoms improved more among women with posterior compartment surgery in comparison with women without posterior compartment surgery, we included time * group interaction in the

TABLE 1
Baseline patient characteristics (n = 2924)

Characteristic	Value	Data missing, n, %
Mean age, y (SD)	64 (11)	2 (0.1)
Mean BMI, kg/m ² (SD)	27 (4.1)	99 (3.4)
Parity, median (IQR)	2 (2–3)	47 (1.6)
Prior hysterectomy, n, %	974 (33)	0
Prior prolapse surgery, n, %	731 (25)	0
Prior rectocele repair, n, %	349 (12)	0
Diabetes, n, %	283 (10)	0
Current smoker, n, %	255 (8.8)	11 (0.4)
Laxative use, n, %	190 (6.5)	0
POP-Q stage, posterior vaginal wall		105 (3.6)
Stage 0, n, %	728 (26)	
Stage 1, n, %	451 (16)	
Stage 2, n, %	1220 (43)	
Stage 3–4, n, %	420 (15)	
POP-Q point Ba ≥0, n, %	1851 (66)	96 (3.3)
POP-Q point Bp ≥0, n, %	1259 (45)	105 (3.6)
POP-Q point C ≥0, n, %	1134 (41)	130 (4.4)

BMI, body mass index; IQR, interquartile range; POP-Q, Pelvic Organ Prolapse Quantification.

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model. The models were adjusted for confounders.

We assessed whether the dependency of each individual symptom on the anatomy of posterior vaginal wall correlated with the improvement of the same symptom after surgery (ie, whether the most dependent symptoms improved the most and the least dependent improved the least after surgery). Here the adjusted odds ratios (ORs) from baseline logistic regression (stage 2 vs stage 0) represented each symptom's dependency on anatomy, and adjusted ORs from generalized estimation equations (baseline vs 6 months) represented each symptom's improvement after surgery. We then calculated Pearson's correlation coefficient (*r*) for symptom improvement vs dependency on anatomy.

We report mean and SD for normally distributed continuous variables and median and interquartile range for variables not following normal distribution. We report OR estimates with 95%

confidence intervals (CI). We considered the value of *P* < .05 as significant in all analyses.

Results

The entire FINPOP cohort included 3535 operations for 3515 women. This covered 83% of the 4240 POP operations done in the whole country during the study period (National database: the Finnish Hospital Discharge Register of the National Institute for Health and Welfare). Population in this study consisted of 2924 of 3515 participants with baseline patient questionnaires available for analysis (83%). The flowchart and the data availability are presented in Figure 1. Table 1 presents demographic data at baseline.

A total of 2355 of 2924 operations (81%) were done using native tissue. Vaginal or abdominal mesh was used in 357 (12%) and 212 (7.3%) operations, respectively. A total of 1424 operations (49%) included some procedure aimed to correct the posterior vaginal wall, and

in 539 cases the posterior vaginal wall was the only operated compartment. By 24 months of follow-up, 165 of 2349 participants (7.0%) reported having had surgery for recurrent prolapse for any compartment. More details on the methods of surgery in the FINPOP have been published previously.²⁵

At baseline, 2637 participants (90%) presented with at least 1 defecation symptom of any degree of bother and 1474 (50%) with at least 1 bothersome defecation symptom (responses moderately or quite a bit). A total of 2123 participants (73%) presented with at least 1 obstructed defecation symptom of any degree of bother and 1063 participants with at least 1 bothersome obstructed defecation symptom (36%). Baseline prevalence of defecation symptoms is presented in Table 2.

The unadjusted OR for bothersome defecation symptoms increased linearly from posterior vaginal wall prolapse stage 0 to stage 2 for all symptoms except flatal incontinence and fecal incontinence of solid stool. Thereafter, prevalence did not increase along with the severity of posterior vaginal wall prolapse stage (Figure 2 and Table 3).

After adjusting for confounders, we observed the strongest relationship between anatomy and splinting followed by straining, incomplete evacuation, pain during defecation, and anorectal prolapse. Association was weaker for fecal urgency and incontinence of liquid stool (Table 3). We observed no correlation between posterior vaginal wall prolapse severity and incontinence of solid stool or flatus.

Nagelkerke's *R*² for each symptom was as follows: splinting of 0.09, straining of 0.07, incomplete evacuation of 0.09, incontinence of liquid stool of 0.03, pain during defecation of 0.04, fecal urgency of 0.02, and anorectal prolapse of 0.04.

The impact of posterior compartment surgery on symptom improvement over time is shown in Figure 3. The baseline prevalence of all symptoms was higher among women who underwent surgery including a procedure for posterior compartment compared with the group of women without a procedure for posterior compartment. In both groups, the

TABLE 2
Prevalence and degree of bother for individual defecation symptoms at baseline (n = 2924)

Symptom present	Symptom bother	Splinting	Straining	Incomplete evacuation	FI, solid stool	FI, liquid stool	FI, flatus	Pain during defecation	Fecal urgency	Anorectal prolapse
No		1337 (47%)	1358 (48%)	1150 (41%)	2309 (81%)	1355 (49%)	1071 (38%)	2157 (76%)	1349 (48%)	2160 (76%)
Yes	Not at all	42 (1.5%)	14 (0.5%)	53 (1.9%)	7 (0.2%)	32 (1.2%)	63 (2.2%)	6 (0.2%)	81 (2.9%)	52 (1.8%)
	Somewhat	708 (25%)	767 (27%)	963 (34%)	357 (13%)	825 (30%)	1046 (37%)	450 (16%)	898 (32%)	435 (15%)
	Moderately	492 (17%)	483 (17%)	494 (18%)	130 (4.6%)	388 (14%)	443 (16%)	174 (6.1%)	350 (13%)	128 (4.5%)
	Quite a bit	241 (8.5%)	211 (7.4%)	151 (5.4%)	51 (1.8%)	167 (6.0%)	191 (6.8%)	61 (2.1%)	124 (4.4%)	56 (2.0%)
Data missing		104 (3.6%)	91 (3.1%)	113 (3.9%)	70 (2.4%)	157 (5.4%)	110 (3.8%)	76 (2.6%)	122 (4.2%)	93 (3.2%)

All values are reported as number (percentage).

FI, fecal incontinence.

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prevalence of each symptom decreased significantly during the 6 months of follow-up ($P \leq .004$). At 24 months, symptom improvement remained significantly better compared with baseline except for anorectal prolapse among women without a procedure for posterior compartment ($P \leq .004$).

The time * group interaction was significant for obstructed defecation symptoms, fecal incontinence with liquid stool, and flatal incontinence, and women with posterior compartment surgery experienced greater improvement in these symptoms compared with women without posterior compartment surgery (Figure 3).

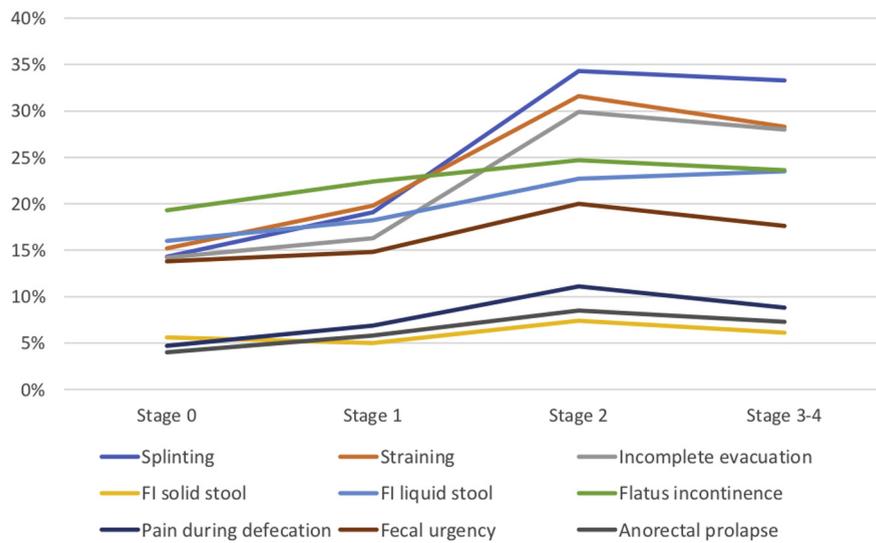
Symptom dependency on anatomy at baseline (stage 2 vs stage 0) correlated strongly with relative symptom improvement at 6 months of follow-up. Similar correlations were observed in the entire population and in women who underwent surgery for posterior compartment ($r = 0.77$ and $r = 0.76$, respectively). This indicates that the symptoms with the strongest dependency on anatomy showed the greatest relative improvement after anatomy was restored (Figure 4).

Comment

Our data provide evidence on posterior vaginal wall prolapse being a contributing factor for obstructed defecation symptoms. Splinting, straining, and incomplete evacuation showed a linear dose-response effect of increasing likelihood from posterior vaginal wall stage 0 to stage 2. These symptoms were also more likely to improve after surgery including a procedure for posterior compartment than after surgery for other vaginal compartments. Furthermore, these symptoms showed the strongest correlation with the degree of prolapse at baseline and were also more likely to improve after surgery compared with the other symptoms.

These findings, together with the biomechanical rationale for rectocele interfering with successful defecation, support the hypothesis that posterior vaginal wall prolapse results in obstructed defecation symptoms and not vice versa. Although this study

FIGURE 2
Prevalence of bothersome symptoms by prolapse stage at baseline



Crude prevalence of bothersome symptoms on y-axis according to the stage of prolapse (x-axis) is shown. Bothersome symptom was defined as answers moderate or quite a bit for symptom bother (assessed by using PFDI-20). Stage was defined according to the POP-Q system.

FI, fecal incontinence; PFDI-20, Short form of Pelvic Floor Distress Inventory; POP-Q, Pelvic Organ Prolapse Quantification.

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cannot prove causality, it is likely that the posterior wall anatomy is either a contributory causal factor, modifies the effect of independent anorectal pathology, or both. Greater symptom improvement after posterior wall repair compared with no repair is hard to reconcile if the direction of causality was the opposite.

On average, women with at least stage 2 posterior vaginal wall prolapse were almost 3 times more likely to report splinting and 2 times more likely to report straining and incomplete evacuation compared with women having normal posterior vaginal wall anatomy. The linear increase in symptom prevalence was present from stage 0 to stage 2.

Our data do not explain why women with stage 3–4 prolapse did not report more symptoms in comparison with women with stage 2 prolapse, but this is in concordance with a study by Tan et al.¹⁹ The reason may lie in different psychometric profiles of women with advanced prolapse: patients presenting with advanced prolapse might tolerate more severe symptoms and also report less bother. Also, it is possible that

intensifying symptoms caused by the growing bulge begin to dominate the defecation symptoms reducing their relative meaning.

Prevalence of pain during defecation and anorectal prolapse symptoms are not as specific to posterior vaginal wall pathology as obstructed defecation symptoms. They showed increased symptom burden with advancing stage of posterior wall prolapse. They were also more common at the baseline among women who had posterior compartment repair. However, these symptoms showed comparable improvement, regardless of the repaired compartment implying that they may be related to pelvic organ prolapse in general.

The association between anal incontinence symptoms and posterior wall prolapse was weak. Only incontinence of liquid stool correlated with the degree of prolapse, and it improved more with posterior compartment repair compared with another compartment repair. Incontinence of flatus and solid stool did not correlate with the anatomy, they improved less after surgery, and the

improvement occurred, regardless of the repaired compartment. Thus, we postulate that although incontinence symptoms improve after POP surgery, they are likely caused by other pathology such as obstetric anal sphincter or nerve injury, and the prolapse may intensify the effect.

Previous studies have drawn inconsistent conclusions on association between posterior wall prolapse and obstructed defecation symptoms. Some authors have found a significant but weak correlation between increasing posterior wall prolapse stage and obstructed defecation symptoms.^{15–20} Saks et al¹³ and Fialkow et al¹⁴ found an association between the presence but not the severity of posterior vaginal wall prolapse and obstructed defecation symptoms. However, many studies have failed to find any relationship.^{4–12}

Often the authors have concluded that the lack of this relationship suggests posterior wall prolapse not being a causal factor behind obstructed defecation symptoms.^{3,6,10,13} The previous data regarding the association of posterior wall prolapse and other than obstructive defecation symptoms are limited. Saks et al¹³ did not find a significant correlation, but their sample size was only 260.

The discrepancies between this study and those not finding a significant association probably derives from different inclusion criteria and sample sizes. Studies not finding an association have had smaller study populations^{11,12} or have not included patients with stages 0 and 1 and therefore lacked sufficient contrast.⁴

Our large sample size gave the means to analyze the dependency in finer detail dividing the material in 4 categories and not just in dichotomy. Our population included the whole spectrum from normal posterior wall to stage 4, and the positive linear correlation between stage and symptoms was evident only between stages 0 and 2. Excluding lesser degrees of posterior wall prolapse would stifle the findings also in this cohort.

Although our findings suggest that a causal relationship between posterior vaginal wall prolapse and obstructed

TABLE 3

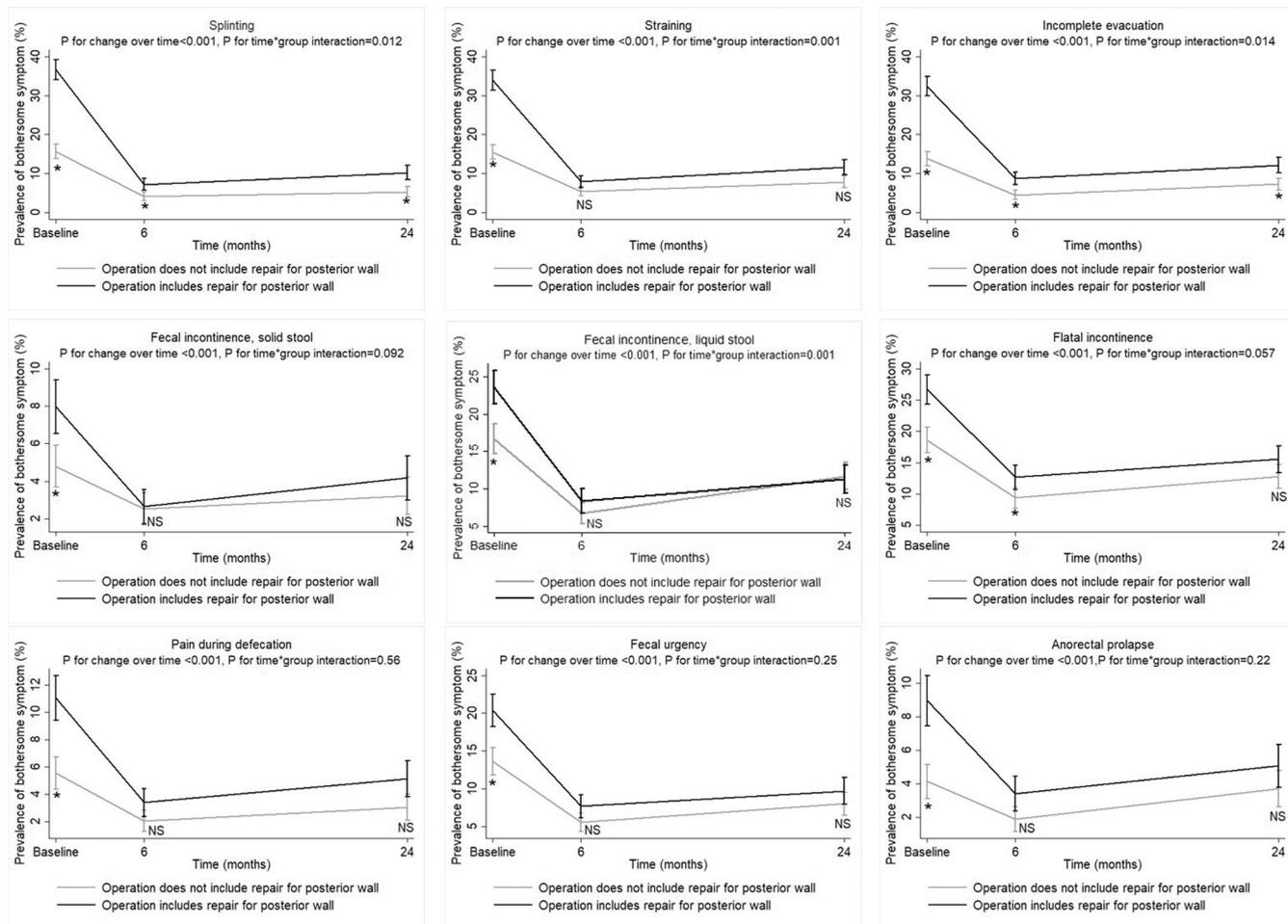
Regression analysis to calculate odds ratio for each bothersome defecation symptom by increasing prolapse stage at baseline (stage 0 used as reference)

Symptom	Degree of prolapse ^a	Symptom, n/total, n, % ^b	Unadjusted OR (95% CI) ^c	Pvalue ^c	Adjusted OR (95% CI) ^d	Pvalue ^c
Splinting	Stage 0	101/704 (14)	1.0	< .001	1.0	< .001
	Stage 1	81/423 (19)	1.4 (1.0–1.9)		1.5 (1.0–2.0)	
	Stage 2	408/1191 (34)	3.1 (2.4–4.0)		2.7 (2.1–3.5)	
	≥Stage 3	133/399 (33)	3.0 (2.2–4.0)		2.8 (2.0–3.9)	
Straining	Stage 0	108/712 (15)	1.0	< .001	1.0	< .001
	Stage 1	84/425 (20)	1.4 (1.0–1.9)		1.3 (1.0–1.9)	
	Stage 2	375/1188 (32)	2.6 (2.0–3.3)		2.1 (1.6–2.7)	
	≥Stage 3	115/406 (28)	2.2 (1.6–3.0)		1.8 (1.3–2.5)	
Incomplete evacuation	Stage 0	99/696 (14)	1.0	< .001	1.0	< .001
	Stage 1	69/423 (16)	1.2 (0.8–1.6)		1.2 (0.8–1.7)	
	Stage 2	354/1184 (30)	2.6 (2.0–3.3)		2.0 (1.5–2.6)	
	≥Stage 3	114/407 (28)	2.3 (1.7–3.2)		2.0 (1.4–2.8)	
Incontinence, solid stool	Stage 0	40/708 (5.6)	1.0	.24	1.0	.13
	Stage 1	22/436 (5.0)	0.9 (0.5–1.5)		0.8 (0.5–1.5)	
	Stage 2	89/197 (7.4)	1.3 (0.9–2.0)		1.3 (0.9–2.0)	
	≥Stage 3	25/413 (6.1)	1.1 (0.6–1.8)		1.0 (0.6–1.8)	
Incontinence, liquid stool	Stage 0	111/692 (16)	1.0	0.001	1.0	.002
	Stage 1	77/422 (18)	1.2 (0.8–1.6)		1.2 (0.9–1.7)	
	Stage 2	264/1162 (23)	1.5 (1.2–2.0)		1.5 (1.2–2.0)	
	≥Stage 3	92/392 (24)	1.6 (1.2–2.2)		1.5 (1.1–2.1)	
Flatus incontinence	Stage 0	134/693 (19)	1.0	0.06	1.0	.050
	Stage 1	97/433 (22)	1.2 (0.9–1.6)		1.2 (0.9–1.7)	
	Stage 2	294/1188 (25)	1.4 (1.1–1.7)		1.3 (1.0–1.7)	
	≥Stage 3	94/399 (24)	1.3 (1.0–1.7)		1.3 (0.9–1.7)	
Pain during defecation	Stage 0	33/705 (4.7)	1.0	< .001	1.0	< .001
	Stage 1	30/435 (6.9)	1.5 (0.9–2.5)		1.5 (0.9–2.5)	
	Stage 2	133/1195 (11)	2.6 (1.7–3.8)		2.1 (1.4–3.2)	
	≥Stage 3	36/411 (8.8)	2.0 (1.2–3.2)		1.5 (0.9–2.6)	
Faecal urgency	Stage 0	96/697 (14)	1.0	.003	1.0	.007
	Stage 1	64/431 (15)	1.1 (0.8–1.5)		1.1 (0.8–1.5)	
	Stage 2	235/1174 (20)	1.6 (1.2–2.0)		1.4 (1.1–1.9)	
	≥Stage 3	70/398 (18)	1.3 (1.0–1.9)		1.1 (0.8–1.7)	
Anorectal prolapse	Stage 0	28/704 (4.0)	1.0	.002	1.0	.002
	Stage 1	25/433 (5.8)	1.5 (0.9–2.6)		1.7 (1.0–3.1)	
	Stage 2	101/1193 (8.5)	2.2 (1.5–3.4)		2.2 (1.4–3.5)	
	≥Stage 3	29/399 (7.3)	1.9 (1.1–3.2)		2.2 (1.2–3.9)	

CI, confidence interval; OR, odds ratio.

^a Posterior vaginal wall stage by Pelvic Organ Prolapse Quantification; ^b Prevalence of bothersome symptom (answers moderately and quite a bit); ^c Binary logistic regression; ^d Binary logistic regression, adjusted for most distal point of anterior wall and apex, age, body mass index, parity, previous hysterectomy, and previous POP surgery.Karjalainen et al. The relationship of defecation symptoms and posterior vaginal wall prolapse. *Am J Obstet Gynecol* 2019.

FIGURE 3
Impact of surgery on bothersome defecation symptoms



Impact of posterior compartment prolapse surgery on the prevalence of bothersome defecation symptoms during the follow-up is shown. The bars denote 95% confidence intervals for symptom prevalence. The asterisk indicates $P < .05$.

NS, not significant ($P > .05$) for between-group comparison at different time points.

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defecation symptoms may exist, it is important to acknowledge that the applied multivariable models explained only 2–9% of observed variation in the outcome. Furthermore, the improvement of these symptoms after surgery was incomplete, and women without any posterior wall defect also had these symptoms and improved after surgery.

These facts indicate that there are also other factors explaining the defecation symptoms, and the factors likely have interactions, which are difficult to assess. Intussusception, often resulting

in obstructed defecation and fecal urgency, and anal sphincter defects, a risk factor for fecal incontinence, are common in the POP population.^{2,26} Furthermore, functional gastrointestinal disorders like functional or slow transit constipation also may explain some of the defecation symptoms in the POP population.

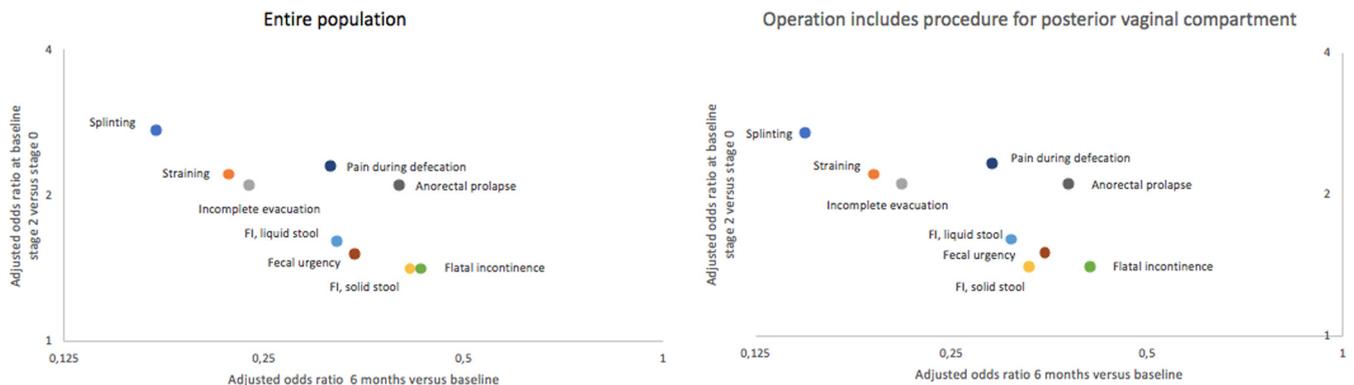
The most important limitation of this study is possible bias in data regarding improvement after repair. First, we had no data on the improvement of anatomy after surgery. Second, the improvement in reported

symptoms is not solely caused by improvement in the state of the disease. Nonspecific effect such as regression toward the mean, and placebo effect can contribute to the change. However, there is no reason to believe that nonspecific factors have an impact on one symptom more than the others. Thus, the relative improvements seen at 6 months are likely similarly biased for all symptoms.

Furthermore, we had multiple doctors performing clinical assessments and that has probably increased the variation (ie, random measurement error) in grading

FIGURE 4

Association between symptom's dependency on anatomy and symptom improvement



Both axes are shown on a logarithmic scale. On the Y-axis, adjusted odds ratios for bothersome symptoms with stage 2 prolapse at baseline (stage 0 as reference) are shown. On the X-axis, adjusted odds ratio for symptom prevalence at 6 months of follow-up (baseline as reference) is shown: graph on the left includes the entire population; graph on the right includes patients with surgery for posterior compartment. Higher odds ratio at baseline indicates stronger correlation between symptom and anatomy. Lower odds ratio at follow-up indicates greater relative improvement of symptoms.

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the degree of the prolapse. Because this was likely random, it does not lead to systematic bias but may have caused imprecision (ie, wider confidence intervals) in the estimates.

Heterogeneity in baseline severity and in surgical interventions limits the interpretation of improvement of symptoms. This is not a limitation regarding the correlation analysis, but we want to emphasize that the observed changes in symptoms should not be generalized for individual procedures. Furthermore, the cohort consists solely of patients who were operated, and the results may not be directly applicable to patients who do not meet indications for surgery.

Strengths of our study are as follows: a large, representative, population-based cohort; longitudinal design allowing the assessment of symptom improvement and correlation with anatomy; and a validated questionnaire used to measure the symptom burden.

To conclude, obstructed defecation symptoms are dependent on the posterior vaginal wall anatomy. Women presenting with posterior wall prolapse and these symptoms can expect to improve after surgery. Other defecation symptoms also improve after POP surgery, but they are not as specific to the posterior

vaginal wall prolapse as obstructed defecation symptoms are. In particular, anorectal prolapse, fecal urgency, and anal incontinence symptoms should raise a clinical suspicion of an underlying anorectal pathology. ■

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Received Dec. 27, 2018; revised April 30, 2019; accepted May 17, 2019.

This study was supported by Finnish Society for Gynecological Surgery, a nonprofit organization. Dr Karjalainen has received grants from Finnish Cultural Foundation, The Finnish Medical Foundation, and state research funding/Hospital District of Northern Savo. Funding sources were not involved with analysis or interpretation of the data.

The authors report no conflict of interest.

Presented at the 27th annual congress of the European Society for Gynaecological Endoscopy, Vienna, Austria, Oct. 7–10, 2018.

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