

Predictive factors for overactive bladder symptoms after pelvic organ prolapse surgery

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Abstract

Introduction and hypothesis This study focussed on the factors which predict the presence of symptoms of overactive bladder (OAB) after surgery for pelvic organ prolapse (POP).

Methods Consecutive women who underwent POP surgery with or without the use of vaginal mesh materials in the years 2004–2007 were included. Assessments were made preoperatively and at follow-up, including physical examination (POP-Q) and standardised questionnaires (IIQ, UDI and DDI).

Results Five hundred and five patients were included with a median follow-up of 12.7 (6–35) months. Bothersome OAB symptoms decreased after POP surgery. De novo bothersome OAB symptoms appeared in 5–6% of the women. Frequency and urgency were more likely to improve as compared with urge incontinence and nocturia. The best predictor for the absence of postoperative symptoms was the absence of preoperative bothersome OAB symptoms.

Conclusion The absence of bothersome OAB symptoms preoperatively was the best predictor for the absence of postoperative symptoms.

Keywords Overactive bladder · Urgency · Urge incontinence · Frequency · Nocturia · Pelvic organ prolapse

Introduction

Pelvic organ prolapse (POP) is a prevalent problem, which has been reported to affect 50% of parous women [1]. Eleven percent of the women will have undergone an operation for prolapse or urinary incontinence by the age of 80 [2].

Symptoms of an overactive bladder (OAB) are often found in patients with POP. According to the International Continence Society, OAB is defined as urgency with or without urge incontinence, usually with frequency and nocturia [3]. This term can only be used if there is no proven infection or “obvious pathology” [3]. POP is in general not considered as “obvious pathology”. It is generally accepted that OAB is a highly prevalent disorder that increases with age in both sexes and that has a profound impact on quality of life.

Community [4, 5] based studies showed that the prevalence of OAB symptoms is higher in patients with POP than without POP. Treatment of POP (surgery, pessaries) results in an improvement of the OAB symptoms [6]. It is not known which factors predict the persistence or disappearance of OAB symptoms after POP surgery.

This study focussed on factors which predict the presence of symptoms of overactive bladder after surgery for pelvic organ prolapse.

Methods

The study group consist of consecutive women who underwent pelvic organ prolapse surgery with or without mesh in the years 2004–2007 in two large hospitals in the Netherlands (Radboud University Nijmegen Medical Centre and Reinier de Graaf Group Delft). The mesh we used was the Prolift® system. This was used in various combinations in the anterior

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compartment (53%), posterior compartment (65%) and central compartment (18%). All patients included completed questionnaires before surgery and at follow-up. The patient self-reported questionnaire is a composite of internationally well-known questionnaires that have been validated for the Dutch language. It contains disease-specific questions from the validated Dutch translation of the IIQ [7] and UDI [7] and the DDI [8]. Patients rate the amount of bother of each symptom on a five-point Likert scale, from 0 (no complaints) to 4 (very serious complaints). Scores on various domains are composed [9] on the basis of their Likert scale values on a scale ranging from 0 (best quality of life) and 100 (worst quality of life).

Preoperatively, all women underwent a full gynaecological examination including the POP-Q quantification score [10] and were invited for a postoperative visit 6 months and 1 and 2 years after operation in which the POP-Q was repeated and questionnaires were filled out. The last available follow-up in each patient was used in this study, and thus, the minimum follow-up was 6 months.

Patient characteristics and peri-operative complications were collected from the medical files.

Procedures were performed or supervised by senior (uro) gynaecologists. Preoperatively, none of the women were on bladder training or used antimuscarinics. Postoperatively, it appeared that a small number of women had utilised bladder training, usually advised by a general practitioner or physiotherapist in the period between operation and her control visit. None of the patients were on antimuscarinics at the time of follow-up. All data were collected and analysed in the context of a Quality of Care project, which was formally deemed exempt from CME/IRB approval.

Measurements

For this study, the bother of OAB symptoms was dichotomized in patients who were asymptomatic or with only little or no bother versus those with symptoms and moderate to severe bother.

Data are presented as number of women (percentage), mean (standard deviation) or median (range) as appropriate. McNemar test was used to compare the difference between the bother of OAB symptoms before and after operation, and the paired *t* test was used to compare the difference in the domain scores. Logistic regression was used for uni- and multivariate analysis. For logistic regression, the backward elimination procedure was used. Variables with a $P < 0.3$ in univariate analysis were included in the multivariate analysis. Odds ratios (OR) and 95% confidence intervals (CI) for each of the OAB symptoms are presented. The level of significance was set at alpha of 0.05. All data were entered and analysed in a SPSS 15.0 database for Windows (SPSS, Inc., Chicago, IL, USA).

Results

Table 1 shows the characteristics of 505 women included in this study. The median duration of follow-up was 12.7 (6–35) months. Only 21 patients underwent concomitant urinary stress incontinence surgery. Table 2 gives the overall and compartmental pre- and postoperative POP-Q stages showing a significant improvement for all compartments. In Tables 3, the prevalence of pre- and postoperative OAB symptoms is presented. De novo symptoms with moderate to severe bother are mentioned separately. For all symptoms, there was a significant improvement after POP surgery. Table 4 also shows the various UDI domain scores demonstrating an improvement in all domains, including the domain of OAB.

In Table 5, the various possible risk factors for the presence of postoperative moderate to severe OAB symptoms, including the de novo symptoms, are presented in a univariate

Table 1 Patient characteristics, details of previous pelvic operations and characteristics of surgery in the study group

Number of patients	505
Age (years) ^a	61 (32; 93)
Parity ^a	2 (0; 8)
Body mass index (kg/m ²) ^a	26 (17; 42)
Postmenopausal status ^b	428 (88.1%)
Hormone replacement therapy ^b	32 (6.5%)
Previous urogynaecological surgery	
Anterior compartment ^c	184 (36.4%)
Posterior compartment ^c	174 (34.4%)
Central compartment ^d	308 (64.0%)
Incontinence surgery ^e	66 (16.0%)
Comorbidity	
Central nervous system disease	43 (8.5%)
Cardiovascular disease	107 (21.2%)
Respiratory disease	36 (7.1%)
Gastrointestinal disease	47 (9.3%)
Endocrine disease	49 (9.7%)
Musculoskeletal disease	71 (14.1%)
Type of surgery	
Anterior compartment	321 (63.6%)
Posterior compartment	398 (78.8%)
Central compartment	98 (19.4%)
Use of vaginal mesh material	253 (50.1%)
Stress incontinence surgery	21 (4.2%)

^a Data are presented as number of women (percentage) or median (range)

^b Note that data on 19 patients are missing

^c Note that data on 18 patients are missing

^d Note that data on 15 patients are missing

^e Note that data on 21 patients are missing

Table 2 Overall and compartmental POP-Q stages at baseline and at postoperative follow-up

	Stage	Preoperative ^a	Postoperative ^b	<i>P</i>
Overall	0	0 (0%)	42 (8.9%)	0.000
	1	0 (0%)	195 (41.1%)	
	2	207 (41.0%)	215 (45.4%)	
	3	283 (56.0%)	18 (3.8%)	
	4	15 (3.0%)	4 (0.8%)	
Anterior	0	35 (6.9%)	171 (36.1%)	0.000
	1	116 (23%)	139 (29.3%)	
	2	160 (31.7%)	148 (31.2%)	
	3	180 (35.6%)	12 (2.5%)	
	4	14 (2.8%)	4 (0.8%)	
Posterior	0	36 (7.1%)	250 (52.7%)	0.000
	1	89 (17.6%)	144 (30.4%)	
	2	232 (45.9%)	69 (14.6%)	
	3	134 (26.5%)	7 (1.5%)	
	4	14 (2.8%)	4 (0.8%)	
Central ^a	0	40 (8.2%)	130 (27.4%)	0.000
	1	352 (72.6%)	320 (67.5%)	
	2	32 (6.6%)	14 (3.0%)	
	3	49 (10.1%)	6 (1.3%)	
	4	12 (2.5%)	4 (0.8%)	

Data are presented as number of women (percentage). *P*=*p* value using McNemar comparing preoperative versus postoperative POP-Q in the anterior, posterior and central compartment

^aNote that data on 20 patients are missing preoperatively

^bNote that data on 31 patients are missing postoperatively

logistic regression model. The OR shows the chance of presence of moderate to severe bother of symptoms after operation. An OR>1 indicates that the factor is positively correlated with the outcome variable; an OR<1 indicates that the factor has a negative correlation with postoperative OAB symptoms.

Table 6 shows the multivariate analysis of the OAB symptoms.

Discussion

The present paper reports on a study on OAB symptoms in relation with POP surgery and especially risk factors for the presence of postoperative OAB symptoms. Overall, an improvement of OAB symptoms after POP surgery has been found, which is in line with the existing literature [11–20]. Very few studies paid attention to de novo OAB symptoms. We specifically looked at de novo OAB symptoms and found, between the various symptoms, a surprisingly similar amount of 5–6%. We identified only one study on de novo symptoms, and the authors detected a much higher percentage of women with de novo OAB symptoms (21.6%) [15]. This could be explained by the fact that in our study, only women with moderate or severe bother of OAB symptoms were included. In our view, this is the more relevant outcome measure.

When comparing the various symptoms of OAB, it appeared that frequency and urgency showed more improvement (with an improvement of 28%) as compared to urge incontinence and nocturia (12% and 14% respectively). As expected, the improvement in OAB symptoms is also reflected in the improvement found in the UDI OAB domain score.

Predictive factors

This is the first study on predictive factors for postoperative OAB symptoms. We have studied this in a uni- as well as a multivariate model. It appeared that patient characteristics such as age and BMI did not influence the risk of bothersome OAB symptoms after POP surgery. Few studies have assessed the operated compartment in relation to the presence of postoperative OAB [11–13, 15–20], and most could not demonstrate better results for surgery in the anterior compartment [11, 13, 15, 19, 20].

Our study showed that urinary urge incontinence symptoms decreased more in case the anterior compartment was operated as compared to the other compartments. A

Table 3 Pre- and postoperative bother and de novo moderate to severe bother

	Preoperative		Postoperative			<i>P</i> ^a
	No symptoms or little or no bother	Moderate to severe bother	No symptoms or little or no bother	Moderate to severe bother	De novo	
Frequency	320 (63.4%)	185 (36.6%)	410 (81.2%)	74 (14.6%)	31 (6.1%)	0.000
Urgency	323 (64.0%)	182 (36.8%)	415 (82.2%)	65 (12.9%)	25 (5.0%)	0.000
Urge incontinence	398 (78.8%)	107 (21.2%)	447 (88.5%)	31 (6.1%)	27 (5.3%)	0.000
Nocturia	368 (72.9%)	137 (27.1%)	421 (83.4%)	56 (11.1%)	28 (5.5%)	0.000

^a*P* value using McNemar comparing the pre- versus postoperative bother of OAB symptoms

Table 4 UDI domain scores

	Preoperative domain score	Postoperative domain score	<i>P</i> ^a
Overactive bladder	33.0 (27.1)	20.8 (23.0)	0.000
Incontinence ^b	24.9 (26.6)	19.0 (22.2)	0.000
Obstructive micturition ^c	28.4 (29.4)	15.3 (22.4)	0.000
Genital prolapse ^d	51.4 (33.6)	6.0 (15.6)	0.000

Data are presented as number of women (percentage) or mean (SD)

^a*P* value using paired *t* test comparing the pre- versus postoperative UDI domain scores

^bNote that data on 15 patients are missing

^cNote that data on 13 patients are missing

^dNote that data on 27 patients are missing

limitation of this finding is that the vast majority of women underwent surgery in more than one compartment.

The preoperative POP-Q stage was also assessed as a predictor of postoperative OAB symptoms. In the multivariate analysis, postoperative frequency and urgency appeared less common in women with higher preoperative POP-Q stages. Two previous studies showed heterogeneous results in this respect [21, 22].

It appeared that for different OAB symptoms, different risk patterns emerge. For a symptom such as nocturia, this is understandable. The presence of nocturia may be more dependent on external factors such as poor sleep and nocturnal polyuria, which are both unlikely to be influenced by the presence of a vaginal prolapse, and probably more related to cardiac condition [23].

However, for the trias urgency, frequency and urge incontinence, a more uniform pattern was expected. Apparently, not all these symptoms are influenced by the presence of a vaginal prolapse in a similar amount and by similar pathophysiology.

The absence of preoperative OAB symptoms was by far the best predictor for the absence of postoperative OAB symptoms. In the univariate analysis, this holds for all symptoms, but in the multivariate model, the absence of frequency protects against the presence of postoperative frequency, urgency and urge incontinence; the absence of urgency protects only against urgency postoperatively; and the absence of urge incontinence protects not only against postoperative urge incontinence but also against frequency and nocturia. The absence of nocturia protected against postoperative frequency and nocturia, with an OR of more than 7 (as high as 7.4 (95% CI 4.2; 13.2)).

Interestingly, we have found that an operation with the use of vaginal mesh material (Prolift®) had a favourable effect on urgency symptoms as compared to conventional

surgery. Other studies have also shown this improvement of the symptoms after mesh application, but overall, the literature is inconclusive [16, 18, 19].

Another interesting finding of this study was that we have found that previous hysterectomy was a predictor for bothersome postoperative urgency. In the previous literature, we found that patients with vault prolapse after previous hysterectomy frequently report symptoms of urgency (79%), as well as other OAB symptoms (urge incontinence 63%, frequency and nocturia (42%)) [24].

Pathophysiology of OAB in relation to POP

In general, OAB symptoms in relation with POP are still poorly understood. Possibly, bladder outlet obstruction is the dominant factor, but neurogenic factors have also been suggested [11, 25–30]. Therefore, if the pathophysiology is not yet fully understood, it cannot be expected that the effect of surgery, which can both induce and cure OAB symptoms, will be easy to understand.

Strengths and weaknesses

Strengths of this study is the large sample size, which enables multivariate analysis and the assessment of predictive factors for postoperative OAB symptoms. Furthermore, the median follow-up was 13 months, which is considerable as compared to many other studies on POP surgery.

Weakness of the study might be that the translation of the results may not be applicable to a surgical naive population, because the study has been performed in two tertiary referral centres with a high number of complex and recurrent surgery. Our patient group is heterogenic with regards to history as well as surgeries performed. The vast majority of women had undergone previous urogynaecologic surgery, and the majority of women underwent surgery in more than one compartment, which hampers interpretation of results per compartment. Since both participating centres are tertiary referral centres, the patients' complaints in relation to the anatomic situation is sometimes difficult to understand and may sometimes even be the reason for referral.

Conclusions

Bothersome OAB symptoms decreased after POP surgery. Frequency and urgency were more likely to improve or disappear as compared to urinary urge incontinence and nocturia. De novo bothersome OAB symptoms appeared in 5–6% of women. The absence of bothersome OAB symptoms preoperatively is the best predictor for the absence of postoperative symptoms. Use of vaginal mesh material had a favourable effect on urgency symptoms.

Table 5 Risk factors for moderate to severe bother on the various OAB symptoms in the univariate logistic regression analysis

		Frequency OR (95% CI)	Urgency OR (95% CI)	Urge incontinence OR (95% CI)	Nocturia OR (95% CI)
Follow-up (months)		1.0 (0.91; 1.0)	1.0 (0.9; 1.0)	1.0 (0.9; 1.0) ^a	1.0 (1.0; 1.1)
Age (years)		1.0 (1.0; 1.0)	1.0 (1.0; 1.0)	1.0 (1.0; 1.0)	1.0 (1.0; 1.0) ^a
Parity	≤2	Ref.	Ref.	Ref.	Ref.
	>2	0.9 (0.6; 1.5)	0.7 (0.5; 1.2) ^a	0.7 (0.4; 1.2) ^a	1.1 (0.7; 1.7)
Body mass index (kg/m ²)		1.1 (1.0; 1.1)	1.0 (1.0; 1.1)	1.0 (1.0; 1.1)	1.1 (1.0; 1.1) ^a
Postmenopausal status ^b	Yes	1.0 (0.5; 2.0)	1.4 (0.6; 3.1)	0.8 (0.4; 1.8)	1.3 (0.6; 2.8)
	No	Ref.	Ref.	Ref.	Ref.
Previous urogynaecological surgery					
Prolapse surgery ^c	Yes	1.0 (0.7; 1.6)	1.3 (0.8; 2.0) ^a	1.2 (0.7; 2.1)	1.4 (0.9; 2.2) ^a
	No	Ref.	Ref.	Ref.	Ref.
Hysterectomy ^d	Yes	1.3 (0.8; 2.1) ^a	1.9 (1.1; 3.2)	1.3 (0.7; 2.4)	0.9 (0.6; 1.5)
	No	Ref.	Ref.	Ref.	Ref.
Incontinence surgery ^e	Yes	1.7 (0.96; 3.1) ^a	1.2 (0.7; 2.3)	2.1 (1.1; 4.2)	1.4 (0.7; 2.7) ^a
	No	Ref.	Ref.	Ref.	Ref.
Type of surgery					
Anterior compartment	Yes	0.7 (0.4; 1.1) ^a	0.5 (0.3; 0.8)	0.6 (0.3; 1.0)	0.9 (0.6; 1.5)
	No	Ref.	Ref.	Ref.	Ref.
Posterior compartment	Yes	0.9 (0.5; 1.6)	1.1 (0.6; 1.9)	1.0 (0.5; 2.0)	0.6 (0.4; 1.0) ^a
	No	Ref.	Ref.	Ref.	Ref.
Central compartment	Yes	0.5 (0.3; 1.1) ^a	0.7 (0.3; 1.2) ^a	0.3 (0.1; 0.8)	0.6 (0.3; 1.3) ^a
	No	Ref.	Ref.	Ref.	Ref.
Concomitant stress incontinence surgery	Yes	1.4 (0.5; 3.82)	1.9 (0.7; 5.1) ^a	1.9 (0.6; 5.8) ^a	0.5 (0.1; 2.3)
	No	Ref.	Ref.	Ref.	Ref.
Mesh	Yes	0.9 (0.6; 1.4)	0.6 (0.4; 0.9)	1.2 (0.7; 2.0)	0.9 (0.6; 1.5)
	No	Ref.	Ref.	Ref.	Ref.
Preoperative POP-Q stage					
Anterior	0/1	Ref.	Ref.	Ref.	Ref.
	2	0.7 (0.4; 1.2)	0.5 (0.3; 0.9)	0.7 (0.4; 1.4)	0.7 (0.4; 1.3)
	3/4	0.5 (0.3; 0.9)	0.3 (0.2; 0.5)	0.4 (0.2; 0.9)	0.7 (0.4; 1.2)
Posterior	0/1	Ref.	Ref.	Ref.	Ref.
	2	0.6 (0.36; 1.0)	0.8 (0.4; 1.4)	0.6 (0.3; 1.2)	0.6 (0.3; 1.0)
	3/4	1.1 (0.6; 1.9)	1.5 (0.8; 2.6)	1.3 (0.6; 2.54)	0.9 (0.5; 1.5)
Central	0/1	Ref.	Ref.	Ref.	Ref.
	2	0.4 (0.1; 1.5)	1.0 (0.4; 2.6)	0.2 (0.0; 1.7)	0.7 (0.2; 2.2)
	3/4	1.1 (0.6; 2.2)	0.6 (0.3; 1.3)	0.6 (0.2; 1.7)	1.4 (0.7; 2.7)
Moderate to severe bother preoperative OAB symptoms					
Frequency	Yes	9.52 (5.6; 16.1)	6.4 (3.8; 10.6)	4.6 (2.6; 8.43)	3.7 (2.3; 6.1)
	No	Ref.	Ref.	Ref.	Ref.
Urgency	Yes	6.0 (3.7; 9.8)	7.4 (4.4; 12.5)	3.9 (2.2; 7.0)	2.5 (1.5; 4.0)
	No	Ref.	Ref.	Ref.	Ref.
Urge incontinence	Yes	4.4 (2.7; 7.15)	2.8 (1.7; 4.6)	5.5 (3.1; 9.8)	2.4 (1.5; 4.1)
	No	Ref.	Ref.	Ref.	Ref.
Nocturia	Yes	4.4 (2.7; 7.0)	3.5 (2.2; 5.6)	2.1 (1.2; 3.7)	8.45 (5.0; 14.0)
	No	Ref.	Ref.	Ref.	Ref.
Other preoperative micturition symptoms					
Stress incontinence	Yes	7.9 (4.5; 14.0)	6.2 (3.5; 11.0)	22.0 (11.5; 42.3)	2.4 (1.3; 4.4)
	No	Ref.	Ref.	Ref.	Ref.

Table 5 (continued)

		Frequency OR (95% CI)	Urgency OR (95% CI)	Urge incontinence OR (95% CI)	Nocturia OR (95% CI)
Urinary retention	Yes	<i>16.5 (8.9; 30.8)</i>	<i>10.4 (5.7; 18.7)</i>	<i>10.2 (5.4; 19.1)</i>	<i>7.5 (4.2; 13.5)</i>
	No	Ref.	Ref.	Ref.	Ref.

All values with $P < 0.05$ are illustrated in italics

^a $P < 0.3$; the factors with $P < 0.3$ were included in the multivariate logistic regression analysis

^b Note that data on 19 patients are missing

^c Note that data on 18 patients are missing

^d Note that data on 15 patients are missing

^e Note that data on 21 patients are missing

Table 6 Predictors for moderate to severe bother on the several OAB symptoms after multivariate analysis

		Frequency	Urgency	Urge incontinence	Nocturia
Follow-up (months)				0.9 (0.9; 1.0) ^a	
Previous urogynaecological surgery					
Hysterectomy ^b	Yes		2.3 (1.2; 4.3)		
	No		Ref.		
Type of surgery					
Anterior	Yes			0.5 (0.2; 1.0)	
	No			Ref.	
Mesh	Yes		0.4 (0.2; 0.8)		
	No		Ref.		
Preoperative POP-Q stage					
Anterior	0/1	Ref.	Ref.		
	2	0.8 (0.4; 1.5)	0.5 (0.3; 1.0)		
	3/4	0.4 (0.2; 0.8)	0.3 (0.2; 0.7)		
Posterior	0/1	Ref.			
	2	0.5 (0.2; 0.9)			
	3/4	0.9 (0.4; 1.9)			
Moderate to severe bother preoperative OAB symptoms					
Frequency	Yes	6.1 (3.3; 11.3)	2.9 (1.4; 5.9)	2.8 (1.3; 6.1)	
	No	Ref.	Ref.	Ref.	
Urgency	Yes		4.1 (2.0; 8.4)		
	No		Ref.		
Urge incontinence	Yes	2.1 (1.11; 3.7)		4.1 (1.9; 8.7)	2.4 (1.2; 4.8)
	No	Ref.		Ref.	Ref.
Nocturia	Yes	1.8 (1.0; 3.2)			7.4 (4.2; 13.2)
	No	Ref.			Ref.
Other preoperative micturition symptoms					
Stress incontinence	Yes				0.4 (0.2; 0.8)
	No				Ref.
Urinary retention	Yes				2.0 (1.1; 3.6)
	No				Ref.
Variance explained by the model ^c		32.1%	31.8%	21.7%	26.2%

All factors of the univariate analysis with $P < 0.3$ are included in the multivariate logistic regression analysis

^a Not significant $P > 0.05$

^b Note that data on 15 patients are missing

^c Nagelkerke R^2

Conflicts of interest None.

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