



# Medium-term outcomes of laparoscopic sacropexy on symptoms and quality of life. Predictive factors for postoperative dissatisfaction

Anne-Cécile Pizzoferrato<sup>1,2</sup> · Marion Fermaut<sup>3</sup> · Catalina Varas<sup>4</sup> · Arnaud Fauconnier<sup>2,4</sup> · Georges Bader<sup>4</sup>

Received: 17 December 2018 / Accepted: 5 March 2019 / Published online: 19 March 2019  
© The International Urogynecological Association 2019

## Abstract

**Introduction and hypothesis** We aimed to evaluate the medium-term results of laparoscopic sacropexy (LSP) with validated self-administered questionnaires of symptoms and quality of life and to identify pre-, intra-, and postoperative predictors of postoperative dissatisfaction.

**Methods** The study included 152 women who had LSP for stage 2 or higher pelvic organ prolapse (POP). The study population comprised women who had completed the preoperative symptom questionnaire (including the PFDI-20 and ICIQ-SF). Postoperative questionnaires included those questionnaires as well as the PFIQ-7 and EQ-5D questionnaires, PISQ-12 sexual function questionnaire, and PGI-I questionnaire (to assess patient satisfaction).

**Results** In all, 92 women (60.5%) responded in the postoperative period; 75 (81.5%) had anterior and posterior mesh and 17 (18.5%) anterior mesh alone. Moreover, 14 women (15.2%) had a concomitant suburethral sling and 18 (19.6%) a concomitant subtotal hysterectomy. The mean follow-up time was 50.5 ( $\pm$  20.3) months (4.2 years). PFDI-20 scores had improved significantly at 4 years (median: 47.4 before surgery vs. 34.4 afterwards,  $p$  = 0.002), and patient satisfaction was quite clear (PGI-I score =  $1.8 \pm 1.1$ ). Nine women (9.8%) described recurring vaginal bulge symptoms, and 12 patients were reoperated during follow-up. Recurrence [odds ratio (OR) 8.11, 95% confidence interval (95% CI) 2.28–28.9] and postoperative constipation (OR = 3.47, 95% CI 1.02–11.8) were strongly associated with poorer postoperative satisfaction, as was concomitant UI surgery (OR = 12.5, 95% CI 2.32–67.0).

**Conclusions** LSP improved women's symptoms and quality of life. Postoperative constipation, sensation of prolapse recurrence, and concomitant UI surgery were strongly associated with postoperative dissatisfaction.

**Keywords** Laparoscopic sacropexy · Pelvic organ prolapse · Symptoms · Satisfaction · Quality of life

This work was presented at the 42th congress of the CNGOF (Collège National des Obstétriciens et Gynécologues Français), 4–7 December 2018, Strasbourg, France

✉ Anne-Cécile Pizzoferrato  
acpizzofe@gmail.com

<sup>1</sup> Department of Gynecology and Obstetrics, University Hospital Center of Caen, Avenue Côte de Nacre, 14000 Caen, France

<sup>2</sup> Research Unit EA 7285 “Risk and Safety in Clinical Medicine for Women and Perinatal Health”, Versailles-Saint-Quentin University (UVSQ), 78180 Montigny-le-Bretonneux, France

<sup>3</sup> Paris 13 University, Sorbonne Paris Cité, AP-HP, Jean-Verdier Hospital, Department of Obstetrics and Gynecology, Bondy, France

<sup>4</sup> Department of Gynecology and Obstetrics, Intercommunal Hospital Center of Poissy-Saint-Germain-en-Laye, 78103 Poissy, France

## Introduction

Pelvic organ prolapse (POP) is a major public health problem worldwide. A review by Barber and Maher of studies dealing with POP surgery prevalence found that surgery for prolapse is performed twice as commonly as continence surgery, and prevalence varies widely from 6 to 18% [1]. Studies that involve surgical repair are conducted in developed nations. POP seriously impairs women's quality of life because of symptoms including but not limited to chronic pelvic pain, urinary or anal incontinence (UI/AI), constipation, and defecatory dyssynergia.

The standard surgical technique for apical vaginal vault prolapse has been sacrocolpopexy by the abdominal route [2], which has also become a surgical standard for primary cystocele repair in several European countries [3]. In recent years, laparoscopic sacropexy (LSP) has supplanted the open

abdominal route because it offers the same anatomical results with lower morbidity rates [4]. Using questionnaires of symptoms and quality of life, several studies have shown that LSP provides a significant improvement in pelvic symptoms at 1 year after surgery [5–7]. However, data on symptoms and long-term quality of life are lacking, and few studies have evaluated factors associated with medium- and long-term postoperative dissatisfaction.

The main objective of this study was to evaluate the medium-term results of LSP by using validated self-administered questionnaires of symptoms and quality of life. The secondary objective was to search for factors predictive of postoperative dissatisfaction.

## Materials and methods

Between January 2004 and December 2011, we conducted an observational single-center study of women who had LSCP for stage 2 or higher POP according to the POP-Q classification [8] and who had completed the preoperative questionnaire. We collected general data such as age, weight, height, gynecologic and obstetric history, and questions concerning pelvic, urinary, and digestive symptoms; we also included the Pelvic Floor Distress Inventory (PFDI-20) to evaluate the severity of relevant symptoms [9] and the International Consultation of Incontinence Questionnaire-Urinary Incontinence Short form (ICIQ-UI SF) to evaluate symptoms of urinary incontinence [10]. Both are self-administered questionnaires that have been validated in French. Since 2004, our hospital has routinely asked patients referred for urogynecological symptoms to complete the entire preoperative questionnaire and has kept it in the medical file.

The postoperative questionnaire was sent by mail to women in late 2013 and remained if no response had arrived in early 2014. This questionnaire included the PFDI-20 and ICIQ-UI SF questionnaires as well as the Pelvic Floor Impact Questionnaire (PFIQ-7) evaluating the impact of POP symptoms [9]. A general quality of life questionnaire, EuroQol5D (EQ-5D) [11], and the POP Urinary Incontinence Sexual Questionnaire (PISQ-12), a sexual quality of life questionnaire [12], were added. The median total PFDI-20 score and the median score for each of its subquestionnaires [urinary distress inventory (UDI-6), pelvic organ prolapse distress inventory (POPDI-6), and colorectal-anal distress inventory (CRADI-8)] were recorded. Patient satisfaction was assessed with the validated Patient Global Impression of Improvement (PGI-I) questionnaire [13], which asks patients to evaluate their condition now, compared with before starting treatment, on a scale of 1 (very much improved) to 7 (very much worse). Surgical complications were reported according to the Clavien-Dindo classification [14].

The surgical procedure, performed by two experienced surgeons, attached an anterior and/or posterior synthetic mesh to the sacral promontory. The meshes used were made of polypropylene. The anterior mesh was fixed by three nonabsorbable sutures on the vaginal wall (Ethibond 2.0) and two on the uterine isthmus (Ethibond 0). The posterior mesh was fixed by one absorbable suture on the posterior vaginal wall (Vicryl 2.0) and two nonabsorbable sutures on the uterine isthmus (Ethibond 0, Ethicon). A posterolateral dissection to the levator ani muscles was performed when there was a posterior colpocele. The posterior mesh was attached laterally to levator ani muscles, but not to the perineal body.

In women with urodynamic stress urinary incontinence, a concomitant suburethral sling was also placed. Subtotal hysterectomy was performed in the presence of benign uterine pathology, and the cervix was used for suspension.

This study does not include women who did not complete a preoperative questionnaire or who could not have the laparoscopic technique.

Student's *t* test was used to compare preoperative data with follow-up results for all symptoms, quality of life, and sexual function scores, while we used  $\chi^2$  or Fisher exact tests to compare qualitative data. Statistical significance was defined as  $p < 0.05$  and good postoperative satisfaction by  $\text{PGI-I} \leq 2$ . The best possible postoperative satisfaction was defined as  $\text{PGI-I} = 1$ .

- To define risk factors for postoperative dissatisfaction, four binary logistic regression models were constructed according to a step-by-step descending method: one model compared satisfied women to those less satisfied ( $\text{PGI-I} > 2$ ) according to pre- and intraoperative factors (model A) and another according to postoperative factors (model C);
- two other models compared very satisfied patients ( $\text{PGI-I} = 1$ ) to all others, according to pre- and intraoperative (model B) and then to postoperative factors (model D).

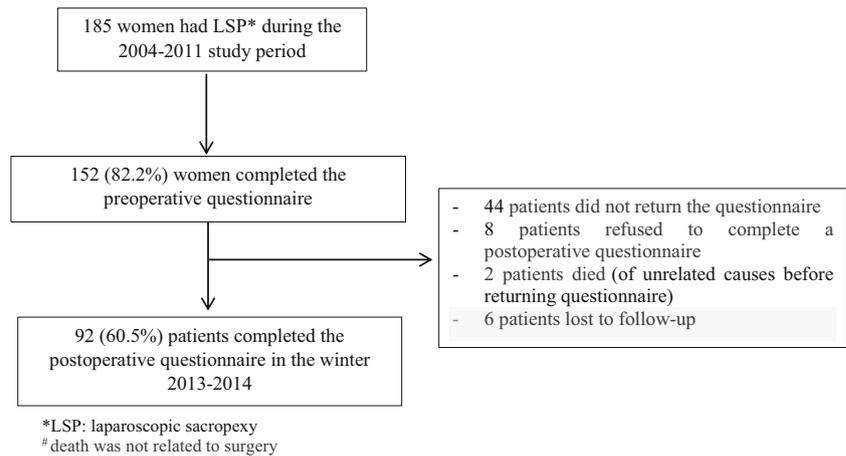
SPSS software version 22 was used for the statistical analysis (SPSS Inc., Chicago, IL, USA).

All patients consented to participate in writing, and the Institutional Review Board (Comité de Protection des Personnes Ile-De-France XI, no. 13082) approved the study. The French National Data Protection Agency (CNIL, no. 1721030 v0) approved the data handling for this study.

## Results

During the study period, 185 women underwent LSP. Of these, 152 were included in the study population, and 92 (60.5%) responded to the postoperative questionnaire (flow chart, Fig. 1); the respondents did not differ significantly in

Fig. 1 Flow chart



their general characteristics from the nonrespondents (data not shown). The average follow-up time was 50.5 ( $\pm 20.3$ ) months (or 4.2 years).

The mean age of the study population at surgery was 57.9 ( $\pm 8.9$ ) years and their mean body mass index (BMI) was 24.4 ( $\pm 2.8$ ) kg/m<sup>2</sup>. There were 27 (29.4%) women with stage 2 POP and 65 (70.6%) at stage 3 or 4 (Table 1).

Overall, 75 women (81.5%) had mesh placed both anteriorly and posteriorly, while 17 (18.5%) had anterior mesh only; 14 women (15.2%) also had a suburethral sling placed, and 18 (19.6%) underwent a subtotal hysterectomy (Table 1). No intraoperative complications were reported. Two serious postoperative complications were treated surgically (stage IIIB of the Clavien-Dindo classification): one compartment syndrome of a leg treated by a fasciotomy and one umbilical hernia. Of the 51 stage II complications, 9 were lower urinary tract infections, 38 residual constipation treated by laxatives, and 4 abdominopelvic or chronic dorsal pain that justified analgesic medication. Seven women reported de novo constipation, not treated by laxatives, 7 de novo dyspareunia, and 21 de novo UI (stage I of the Clavien-Dindo classification).

At a mean of > 4 years after the operation, the PFDI-20 score had improved significantly (median scores 47.4 vs. 34.4,  $p = 0.002$ ), as had the POPDI-6 and UDI-6 subscores. Only the CRADI8 subscore was significantly higher in the postoperative period (Table 2). Nine women (9.8%) described a sensation of vaginal bulge, perceived as a symptom of recurrence. Twelve women were reoperated for a prolapse recurrence during follow-up.

Postoperative satisfaction was good: 53.3% of the respondents reported they were “much improved” after the LSP and 27.8% “improved.” In addition, 88.0% would repeat the same procedure if necessary and 87.0% would recommend this operation to a friend or relative (Table 3).

Preoperatively, 40 (43.5%) women had reported dyspareunia and 19 (20.6%) no sexual activity. Of the 66 women sexually active before surgery, 18 were unhappy with their sexual lives because of POP, and 14 had dyspareunia due to it.

Among these 66 women, 52 (78.8%) remained sexually active after the procedure, and 3 (15.8%) patients returned to sexual activity. Of the six women with de novo dyspareunia, two had had LSP placing both anterior and posterior mesh as well as a suburethral sling, two LSP with anterior and posterior mesh placement but no suburethral sling, and two LSP with anterior mesh alone. The total PISQ-12 score was significantly correlated with the PFDI-20 score, but the correlation was moderate (Pearson correlation coefficient,  $r = -0.52$ ,  $p < 0.05$ ).

Women’s quality of life also improved notably. Preoperatively, 27.9% reported moderate problems in walking and only 5.9% postoperatively (NS). Preoperatively, 38.0% were not anxious or depressed, 49.6% were moderately anxious or depressed, and 12.4% extremely so, while the respective percentages postoperatively were 72.6, 23.8, and 3.6% ( $p = 0.0001$ ).

In the analysis of risk factors for dissatisfaction, univariate analyses did not find a significant association with age, BMI, menopausal status, or parity in any model. Preoperative UI significantly increased postoperative dissatisfaction in model A (OR = 4.7, 95% CI 1.52–14.3), while the preoperative sensation of vaginal bulge significantly decreased postoperative dissatisfaction (model A: 0.19, 95% CI 0.04–0.86; model B: 0.11, 0.01–0.93). Preoperative anal incontinence (AI) also increased postoperative dissatisfaction in one model (model A: OR = 4.58, 95% CI 0.89–23.6) (Table 4). The postoperative risk factors significantly associated with dissatisfaction in the two postoperative models were postoperative constipation (model C: OR = 3.27, 95% CI 1.01–10.9; model D: 3.60, 1.14–11.3) and prolapse recurrence (model C: 6.32, 1.94–20.6; model D: 4.93, 1.47–16.6) (Table 5). No significant association was found between postoperative constipation and the use of a posterior mesh ( $p = 0.11$ ) or between the occurrence of a postoperative complication and postoperative dissatisfaction.

In the multivariate models for pre- and intraoperative risk factors of PGI  $\leq 2$ , only the presence of preoperative AI remained significant (OR = 7.71, 95% CI 1.30–45.9). In the

**Table 1** Pre- and perioperative characteristics of patients who responded to the postoperative questionnaire (n = 92)

	N (%) Mean ( $\pm$ SD)
Age (years)	57.9 (8.9)
Body mass index (kg/m <sup>2</sup> )	24.4 (2.8)
Smoking	
No	82 (89.1)
Yes	10 (10.9)
Diabetes	
No	90 (97.8)
Yes	2 (2.2)
Pelvic surgery history	
Pelvic organ prolapse surgery	4 (4.3)
Suburethral sling	5 (5.4)
Parity	
0 or 1	13 (14.1)
$\geq 2$	79 (85.9)
Menopausal status	
No	19 (20.7)
Yes	73 (79.3)
Preoperative POP* stage according to the POP-Q classification	
2	27 (29.4)
3 or 4	65 (70.6)
Symptoms related to POP*	
Urinary incontinence	33 (35.9)
Vaginal bulge	85 (92.4)
Severe constipation <sup>a</sup>	12 (12.0)
Anal incontinence <sup>b</sup>	15 (16.3)
Dyspareunia	40 (43.5)
Operative time (min)	175 (49)
Type of surgery	
Anterior and posterior mesh	75 (81.5)
Anterior mesh alone	17 (18.5)
Concomitant suburethral sling	
No	78 (84.8)
Yes	14 (15.2)
Concomitant subtotal hysterectomy	
No	74 (80.4)
Yes	18 (19.6)

\*POP Pelvic organ prolapse

<sup>a</sup>Requiring laxatives<sup>b</sup>Gas and stool

model comparing very satisfied with other women (PGI-I = 1), preoperative overweight or obesity (BMI > 25) and concomitant UI surgery were associated with lower postoperative satisfaction (respectively, OR = 2.87, 95% CI 1.02–8.05 and 12.5, 2.32–66.97). A POP score of stage  $\geq 3$  also predicted postoperative satisfaction (OR = 0.33, 95% CI 0.11–0.97) (Table 4).

**Table 2** Symptom scores before surgery and at follow-up (n = 92)

	Before surgery Median (min–max) N (%)	At follow-up Median (min–max) N (%)	p
PFDI-20 (/300)	47.4 (0–123)	34.4 (0–176)	0.002
POPDI-6 (/100)	20.8 (0–58)	8.3 (0–62)	0.002
CRADI-8 (/100)	6.3 (0–44)	14.1 (0–72)	< 10 <sup>-3</sup>
UDI-6 (/100)	12.5 (0–58)	12.5 (0–100)	0.07
ICIQ-UI SF (/21)	1.0 (0–18)	3.0 (0–17)	0.003
PFIQ-7 (/300)	.	4.8 (0–185)	.
PISQ 12 (/48)	.	37.0 (7–45)	.

*PFDI 20* Pelvic Floor Disorder Inventory, *POPDI-6* Pelvic Organ Prolapse-Distress Inventory, *CRADI-8* Colo-Rectal-Anal Distress Inventory, *UDI-6* Urinary Distress Inventory, *ICIQ-UI SF* International Consultation on Incontinence Questionnaire Short Form, *PFIQ-7* Pelvic Floor Impact Questionnaire, *PISQ 12* Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire

The two multivariate models analyzing postoperative factors both showed that prolapse recurrence was associated with postoperative dissatisfaction (model C: OR = 5.39, 95% CI 1.31–22.18; model D: 8.11, 95% CI 2.28–28.94) (Table 5). Postoperative constipation was also a predictor of postoperative dissatisfaction, as shown in one model (model D: OR = 3.47, 95% CI 1.02–11.8) and suggested by another (model C: 3.44, 0.91–12.97,  $p = 0.07$ ).

## Discussion

Our study demonstrated that 4 years afterwards, LSP patients were clearly satisfied with their surgery, reporting persistent improvement in pelvic floor symptoms and quality of life as well as a low complication rate.

**Table 3** Patient satisfaction

	At follow-up Mean ( $\pm$ SD) N (%)
PGI-I (1–7)	1.8 (1.1)
Satisfaction assessed by VAS (/10)	7.3 (2.9)
Would you recommend the surgery?	
No	5 (5.4)
Yes	80 (87.0)
Missing	7 (7.6)
Would you do the operation again if necessary?	
No	6 (6.5)
Yes	81 (88.0)
Missing	5 (5.4)

*PGI-I* Patient Global Impression Improvement

**Table 4** Pre- and intraoperative factors associated with women’s dissatisfaction. Model A: factors associated with PGI-I ≤ 2 (satisfied patients vs. the others)/ model B: factors associated with PGI-I = 1 (very satisfied patients vs. the others)

	Model A		Model B	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age (years)				
< 60	1		1	
≥ 60	4.15 (0.88–19.6)		0.77 (0.34–1.77)	
BMI (kg/m <sup>2</sup> )				
< 25	1		1	1
≥ 25	0.82 (0.28–2.46)		2.43 (1.02–5.79)*	2.87 (1.02–8.05)
Parity				
0–1	1		1	
≥ 2	3.15 (0.38–26.0)		1.48 (0.44–4.93)	
Menopausal status				
No	1		1	
Yes	4.95 (0.61–40.1)*		2.06 (0.70–6.09)	
History of POP surgery				
No	1		1	
Yes	0.8 (0.72–0.90)		1.15 (0.16–8.54)	
Vaginal bulge				
No	1		1	
Yes	0.19 (0.04–0.86)**		0.11 (0.01–0.93)**	
Urinary incontinence				
No	1		1	
Yes	4.7 (1.52–14.3)**		1.97 (0.82–4.75)*	
Constipation				
No	1		1	
Yes	1.71 (0.51–5.78)		3.54 (1.29–9.73)**	
Anal incontinence				
No	1	1	1	
Yes	4.58 (0.89–23.6)**	7.71 (1.30–45.9)	1.63 (0.34–7.80)	
Dyspareunia				
No	1		1	
Yes	1.67 (0.56–5.00)		0.97 (0.41–2.29)	
POP stage				
2	1		1	1
3–4	0.76 (0.25–2.31)		0.40 (0.16–1.01)*	0.33 (0.11–0.97)
Anterior and posterior mesh				
No	1		1	
Yes	0.52 (0.16–1.73)		1.12 (0.39–3.16)	
Levator ani fixation during surgery				
No	1		1	1
Yes	0.44 (0.15–1.28)		0.31 (0.13–0.74)**	0.40 (0.15–1.10)
Concomitant subtotal hysterectomy				
No	1		1	
Yes	0.76 (0.67–0.87)*		0.90 (0.32–2.53)	
Concomitant suburethral sling				
No	1		1	1
Yes	1.21 (0.30–4.91)		9.20 (1.92–44.0)**	12.5 (2.32–67.0)

BMI Body mass index, POP pelvic organ prolapse, OR odds ratio

\*Variables included in the multivariate model with  $p < 0.15$  in univariate analysis

\*\*Variables included in the multivariate model with  $p < 0.05$  in univariate analysis

Most published studies, especially those before 2010, describe an average follow-up of 1 to 3 years, and many describe their results according to anatomical success. For example, in a series of 138 patients with vaginal vault prolapse and a 43-month mean follow-up, Granese et al. observed a 94.9% success rate for the apical compartment but an 11.6% rate of

failure or de novo prolapse for the anterior and 12.3% for the posterior compartment [15].

Since 2010, published studies have focused more on functional and sexual results. Thus, Thibault et al. examined the effect of LSP on symptoms, sexual function, and health-related quality of life in a prospective analysis of 148 women

**Table 5** Postoperative factors associated with women's dissatisfaction. Model C: factors associated with PGI-I  $\leq 2$  (satisfied patients)/model D: factors associated with PGI-I = 1 (very satisfied patients)

	Model C		Model D	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Urinary incontinence				
No	1		1	
Yes	2.47 (0.79–7.71)*		1.60 (0.69–3.70)	
De novo urinary incontinence				
No	1		1	
Yes	0.67 (0.17–2.61)		0.90 (0.33–2.44)	
Constipation				
No	1	1	1	1
Yes	3.27 (1.01–10.9)**	3.44 (0.91–13.0)	3.60 (1.14–11.3)**	3.47 (1.02–11.8)
Dyspareunia				
No	1		1	
Yes	2.27 (0.53–9.65)		1.35 (0.40–4.59)	
Postoperative anal incontinence				
No	1		1	
Yes	2.36 (0.40–14.4)		1.34 (0.25–7.10)	
Prolapse recurrence				
No	1	1	1	1
Yes	6.32 (1.94–20.6)**	8.11 (2.28–28.9)	4.93 (1.47–16.6)**	5.39 (1.31–22.2)
Complication (all types)				
No	1		1	1
Yes	1.92 (0.55–6.67)		2.27 (0.74–7.01)*	3.24 (0.95–11.0)
Chronic pain				
No	1		1	
Yes	1.35 (0.38–4.82)		1.00 (0.35–2.88)	

BMI Body mass index; POP pelvic organ prolapse; OR odds ratio

\*Variables included in the multivariate model ( $p < 0.15$  in univariate analysis)

\*\*Variables included in the multivariate model ( $p < 0.05$  in univariate analysis)

with symptomatic POP [5]. The mean PFDI-20 score was 94.31 (5.64) before surgery, 32.24 (3.44) at 3 months, and 38.06 (8.15) at 12 months after surgery. The improvement was significant ( $p < 0.05$ ) for all scores compared with the preoperative results. Sexual function also improved significantly; the mean preoperative PISQ-12 score of 32.07 ( $\pm 7.36$ ) improved to 36.56 ( $\pm 6.50$ ,  $p < 0.05$ ) at 12 months. The POP-Q stage was not significantly associated with the overall preoperative PISQ-12 score ( $p = 0.24$ ).

Sergent et al. published results for 116 women with a mean follow-up of 34 months. They too found significant improvements in the PFDI-20, PFIQ-7, and PISQ-12 scores [16]. More recently, Chevrot et al. studied LSCP results among 82 women at 36 months after surgery and found a mean PFDI-20 score of 42.2 ( $\pm 42.15$ ), a mean PFIQ-7 score of 24.7 ( $\pm 48.7$ ), and a PISQ-12 score of 38.5 ( $\pm 5.1$ ) [17]. All symptom scores

(PFDI-20, POPDI-6, UDI-6, DDI-8, PFIQ-7, and PISQ-12) were significantly improved from baseline at 3, 12, and 36 months. The results at 12 and 36 months did not differ significantly for PFDI-20 (36.8 vs. 42.2,  $p > 0.05$ ) or PFIQ-7 (18.4 vs. 24.7,  $p > 0.05$ ).

These studies show an improvement in both the symptoms and the quality of life of women after LSP but also an improvement of the sexual function scores, persisting at least through 3 years after the intervention. We were not able to compare the PISQ-12 score before and after surgery, but our results confirmed the negative impact of genital prolapse on sexual function. In our population, 43.5% women complained of dyspareunia before surgery, and 20.6% had no sexual activity. Of the 66 women sexually active before surgery, 27% were unhappy with their sexual activity because of POP, and 21% had dyspareunia due to it. Of the women sexually active

before surgery, 52 (78.8%) remained so after the procedure. Moreover three women (16%) resumed sexual activity after surgery.

Our study shows improvement in all symptom scores except the CRADI-8 score, which increased significantly 4 years after surgery. This may be because our cohort comprised women with predominant anterior and uterine/vaginal vault prolapse, who had generally reported few digestive symptoms before intervention. For Chevrot et al., the improvement for digestive symptoms was very low 36 months after surgery (average score divided by 1.3) [17].

The originality of our study lies in its identification of preoperative and long-term postoperative factors of dissatisfaction. Thus, we showed that a preoperative POP stage  $\geq 3$  appears to predict better postoperative satisfaction. This finding might be explained by a greater difference in vaginal symptoms between the two periods, which would lead to better satisfaction.

We identified an association between postoperative constipation and decreased patient satisfaction. This complication is common in short-term postoperative studies, with reported postoperative constipation rates of 5.5 to 47% [18] and de novo constipation of 10% or 14% [19]. It persisted in our population for at least 4 years after surgery, with a negative impact on the success of the surgery. This finding should reinforce the information given to women about the risk of postoperative constipation.

We found no significant association between postoperative constipation and the use of a posterior mesh, contrary to the results reported by Lucot et al. [3]. This result is likely due to the smaller number of women and consequent lack of power.

We also showed that having a BMI  $> 25$  kg/m<sup>2</sup> preoperatively is a predictor of postoperative dissatisfaction. The literature reports conflicting results about obesity and its relation to both POP prevalence and POP symptoms [20–22]. Some authors consider obesity to be an independent risk factor for POP onset, while others find no association or only one based on anorectal scores [23]. Moreover, Wasserberg et al., who examined the impact of weight loss after bariatric surgery on POP symptoms, found that symptoms improved significantly on the PFDI-20 and PFIQ-7 questionnaires [24]. This finding may explain the greater dissatisfaction of overweight/obese women in our study, for their symptoms, especially anorectal, may be more marked.

We also identified recurrence of POP symptoms as a postoperative predictor of patient dissatisfaction. This factor was previously identified by Barber et al., who reported “the absence of vaginal bulge” and “the lack of new surgical treatment” were factors associated with the success of surgery in 92.7 and 97.2% of cases [25].

Finally, we showed that concomitant UI surgery was associated with poorer patient satisfaction 4 years after surgery. This question is often raised in current clinical practice and

debated in the literature. In a meta-analysis of randomized trials, Van der Ploeg et al. demonstrated a reduction in the risk of stress UI in case of concomitant prolapse and UI surgery, but also found that performing these procedures simultaneously leads to postoperative complications and more frequent dysuria. A conclusion of the meta-analysis was that the complication rate and severity were not so severe that they would recommend against combination surgery [26]. The clinical practice recommendations for POP published in 2016 in France state that it is not required to treat stress UI at the same time as prolapse, as long as the woman is informed of the possibility of surgery in two stages [27]. Our results show poorer satisfaction in case of concomitant procedures and thus add evidence to the recommendation of a two-stage surgery.

The major strength of our study lies in its long follow-up (4.2 years) and the use of validated questionnaires. Despite the duration of follow-up, the response rate to the postoperative questionnaire was satisfactory, and we found no differences between respondents and nonrespondents. Our evaluation used validated and specific questionnaires, which limits potential classification bias and makes our results comparable to those in other studies. The evaluation of the functional results seems essential to us since POP causes functional discomfort and impairs women’s quality of life. For this reason, we chose not to evaluate the clinical stage of prolapse by physical examination. Confirmation of prolapse recurrence by physical examination would have added to the strength of the study.

We also found a higher rate of postoperative recurrence (20.7%) than in other studies. This is probably due to the definition we chose and to the duration of our follow-up, longer than in other studies.

This study presents limitations related to its nature as both a single-center and retrospective study. The long duration of inclusion might have resulted in heterogeneity of surgical practices over time as well as greater experience among the practitioners.

## Conclusions

This study demonstrated that 4 years after LSP women were clearly satisfied with their surgery, reporting persistent improvement of their symptoms and quality of life.

The functional evaluation showed a nontrivial recurrence rate (20.7%) and the presence of postoperative symptoms, including severe chronic constipation (12.0%) and de novo stress incontinence (22.8%). Postoperative recurrence and chronic postoperative constipation were strongly associated with lower postoperative satisfaction, as was concomitant UI surgery. A preoperative POP stage  $\geq 3$  appears to predict better postoperative satisfaction.

These findings should encourage practitioners to stress to women considering prolapse surgery the potential risks of de

novo constipation and an increase in pre-existing constipation. Similarly, they should be encouraged to moderate the concomitant management of UI.

Other studies with longer follow-up are needed to confirm these results over the long term.

## Compliance with ethical standards

**Conflicts of interest** None.

## References

- Barber MD, Maher C. Epidemiology and outcome assessment of pelvic organ prolapse. *Int Urogynecol J*. 2013;24:1783–90.
- Maher C, Feiner B, Baessler K, Schmid C. Surgical management of pelvic organ prolapse in women. *Cochrane Database Syst Rev*. 2013;(4):CD004014.
- Lucot JP, Cosson M, Bader G, Debodinance P, Akladios C, Salet-Lizée D, et al. Safety of vaginal mesh surgery versus laparoscopic mesh sacropexy for cystocele repair: results of the prosthetic pelvic floor repair randomized controlled trial. *Eur Urol*. 2018;74(2):167–76.
- Ganatra AM, Rozet F, Sanchez-Salas R, Barret E, Galiano M, Cathelineau X, et al. The current status of laparoscopic sacrocolpopexy: a review. *Eur Urol*. 2009;55:1089–103.
- Thibault F, Costa P, Thanigasalam R, Seni G, Brouzyne M, Cayzergues L, et al. Impact of laparoscopic sacrocolpopexy on symptoms, health-related quality of life and sexuality: a medium-term analysis. *BJU Int*. 2013;112(8):1143–9.
- Bovbjerg VE, Trowbridge ER, Barber MD, Martirosian TE, Steers WD, Hullfish KL. Patient-centered treatment goals for pelvic floor disorders: association with quality-of-life and patient satisfaction. *Am J Obstet Gynecol*. 2009;200(5):568 e1–6.
- Bui C, Ballester M, Chereau E, Guillo E, Darai E. [Functional results and quality of life of laparoscopic promontofixation in the cure of genital prolapse]. *Gynecol Obstet Fertil*. 2010;38(10):563–8.
- Bump RC, Mattiasson A, Bø K, Brubaker LP, DeLancey JO, Klarskov P, et al. The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. *Am J Obstet Gynecol*. 1996;175(1):10–7.
- de Tayrac R, Deval B, Fernandez H, Mares P, Mapi Research I. Development of a linguistically validated French version of two short-form, condition-specific quality of life questionnaires for women with pelvic floor disorders (PFDI-20 and PFIQ-7). *J Gynecol Obstet Biol Reprod*. 2007;36:738–48.
- Avery K, Donovan J, Peters TJ, Shaw C, Gotoh M, Abrams P. ICIQ: a brief and robust measure for evaluating the symptoms and impact of urinary incontinence. *Neurourol Urodyn*. 2004;23:322–30.
- Brooks R. EuroQol: the current state of play. *Health Policy*. 1996;37:53–72.
- Fatton B, Letouzey V, Lagrange E, Mares P, Jacquetin B, de Tayrac R. [Validation of a French version of the short form of the pelvic organ prolapse/urinary incontinence sexual questionnaire (PISQ-12)]. *J Gynecol Obstet Biol Reprod*. 2009;38:662–7.
- Srikrishna S, Robinson D, Cardozo L. Validation of the patient global impression of improvement (PGI-I) for urogenital prolapse. *Int Urogynecol J*. 2010;21(5):523–8.
- Clavien PA, Barkun J, de Oliveira ML, Vauthey JN, Dindo D, Schulick RD, et al. The Clavien-Dindo classification of surgical complications: five-year experience. *Ann Surg*. 2009;250(2):187–96.
- Granese R, Candiani M, Perino A, Romano F, Cucinella G. Laparoscopic sacro-colpopexy in the treatment of vaginal vault prolapse: 8 years experience. *Eur J Obstet Gynecol Reprod Biol*. 2009;146:227–31.
- Sergent F, Resch B, Loisel C, Bisson V, Schaal JP, Marpeau L. Mid-term outcome of laparoscopic sacrocolpopexy with anterior and posterior polyester mesh for treatment of genito-urinary prolapse. *Eur J Obstet Gynecol Reprod Biol*. 2011;156(2):217–22.
- Chevrot A, Droupy S, Linares E, de Tayrac R, Costa P, Wagner L. [Impact of laparoscopic sacrocolpopexy on symptoms, health-related quality of life and sexuality: a 3-year prospective study]. *Prog Urol*. 2016;26(10):558–65.
- Golfier F, Sesques A, Benayoun D, Krauth JS, Lunel Potencier A, Benchaib M, et al. [Laparoscopic promontofixation: defining early morbidity using a standardized method]. *Gynecol Obstet Fertil*. 2014;42(6):378–82.
- Rivoire C, Botchorishvili R, Canis M, Jardon K, Rabischong B, Wattiez A, et al. Complete laparoscopic treatment of genital prolapse with meshes including vaginal promontofixation and anterior repair: a series of 138 patients. *J Minim Invasive Gynecol*. 2007;14(6):712–8.
- Bradley CS, Kenton KS, Richter HE, Gao X, Zyczynski HM, Weber AM, et al. Obesity and outcomes after sacrocolpopexy. *Am J Obstet Gynecol*. 2008;199(6):690 e1–8.
- Wasserberg N, Haney M, Petrone P, Ritter M, Emami C, Rosca J, et al. Morbid obesity adversely impacts pelvic floor function in females seeking attention for weight loss surgery. *Dis Colon Rectum*. 2007;50(12):2096–103.
- Washington BB, Erekson EA, Kassis NC, Myers DL. The association between obesity and stage II or greater prolapse. *Am J Obstet Gynecol*. 2010;202(5):503 e1–4.
- Thubert T, Deffieux X, Letouzey V, Hermieu JF. [Obesity and urogynecology: a systematic review]. *Prog Urol*. 2012;22(8):445–53.
- Wasserberg N, Petrone P, Haney M, Crookes PF, Kaufman HS. Effect of surgically induced weight loss on pelvic floor disorders in morbidly obese women. *Ann Surg*. 2009;249(1):72–6.
- Barber MD, Brubaker L, Nygaard I, Wheeler TL 2nd, Schaffer J, Chen Z, et al. Defining success after surgery for pelvic organ prolapse. *Obstet Gynecol*. 2009;114(3):600–9.
- van der Ploeg JM, van der Steen A, Oude Rengerink K, van der Vaart CH, Roovers JP. Prolapse surgery with or without stress incontinence surgery for pelvic organ prolapse: a systematic review and meta-analysis of randomised trials. *BJOG*. 2014;121(5):537–47.
- Le Normand L, Cosson M, Cour F, Deffieux X, Donon L, Ferry P, et al. [Clinical practice guidelines: synthesis of the guidelines for the surgical treatment of primary pelvic organ prolapse in women by the AFU, CNGOF, SIFUD-PP, SNFCP, and SCGP]. *J Gynecol Obstet Biol Reprod*. 2016;45(10):1606–13.

**Publisher's note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.