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Research Article

Prevalence and risk factors of lower urinary tract symptoms after robotic sacrocolpopexy

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Abstract

Aims: To analyze the prevalence and risk factors for postoperative lower urinary tract symptoms (LUTS) in women submitted to robot-assisted sacrocolpopexy (RASC) for correction of pelvic organ prolapse (POP).

Methods: A longitudinal prospective study was carried out on 51 consecutive women who underwent RASC to treat POP. We recorded preoperatively the presence of LUTS urgency, symptomatic stress urinary incontinence (SUI), and voiding difficulty. We also performed an urodynamic study prior to surgical intervention including an incontinence test for overt and occult stress urinary incontinence (with POP reduction). A transobturator suburethral sling (TOT) was implanted in patients with demonstrable urodynamic SUI (overt or occult). Patients' LUTS were reassessed at 6 months after the surgical intervention. McNemar test and the Fisher exact test were used to analyzing dependent variables and Student's *t* - test for independent variables. Statistical significance was set at $p \leq 0.05$.

Results: Postoperative voiding difficulty and symptomatic SUI were significantly reduced. No significant differences were observed in the postoperative prevalence of urgency. The presence of preoperative urinary urgency was the only significant risk factor of postoperative urgency, whereas TOT placement was the only significative factor associated with postoperative symptomatic SUI. TOT placement in patients with occult SUI significantly reduced postoperative Symptomatic SUI.

Conclusion: RASC reduces the prevalence of voiding difficulty but not urgency. Concomitant implantation of TOT in patients with preoperative urodynamic SUI (overt or occult) is useful to reduce symptomatic postoperative SUI.

More Information

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Introduction

Pelvic organ prolapse (POP) is an anatomical dysfunction characterized by the descent of the pelvic organs from their normal positions. This dysfunction is associated with several symptoms such as a bulge in the vagina, pelvic or suprapubic discomfort, mucosal ulcerations, urinary tract infections, or back pain. Moreover, the presence of functional storage and voiding lower urinary tract symptoms (LUTS) is not uncommon [1].

The goal of surgical treatment of POP is to restore the pelvic floor anatomy. However, it has been described that surgical correction influences LUTS. Sometimes surgical treatment leads to the appearance of de novo stress urinary incontinence (SUI) and urgency, whereas other times an improvement of LUTS is described [1].

Laparoscopic sacrocolpopexy (LSC) is a technique initially designed for apical correction of POP [2] but it is also useful for anterior vaginal wall prolapses with Pelvic Organ Quantification System (POP-Q) grade ≥ 2. [3]. Its influence on LUTS is controversial. Some authors consider that LSC increases the postoperative prevalence of urgency [4] and voiding difficulties like urinary retention [5], while others report that LUTS decrease after LSC [6].

Perivesical dissection is necessary for the suspension of the sacrospinous ligament. However, if this dissection is excessive, it may damage the innervation of the bladder leading to the appearance of urgency and voiding difficulties [5]. This type of injury may be reduced by performing a robot-assisted sacrocolpopexy (RASC) due to improved ergonomic conditions [7].

Another controversy is the need to add an incontinence technique to avoid the de novo SUI. Because when a POP is corrected, occult stress urinary incontinence (OSUI) may appear [8].

Our objective is to describe the changes in urgency and voiding difficulty symptoms after RASC and to analyze the risk factors for the postoperative prevalence of these symptoms. As a secondary objective, we evaluate if the simultaneous transobturator tension-free mesh (TOT) placement in patients with a positive OSUI test will reduce postoperative symptomatic SUI.

Materials and methods

A prospective longitudinal cohort of 51 consecutive women undergoing RASC performed at a single institution from November 2010 to May 2015 was analyzed. The average age of the sample (± standard deviation) was 66 ± 9.0 years. The average Body Mass Index was 26 ± 3.3 Kg/M2. The total UDI-6 score, was 39 ± 12.5 Irritative 37 ± 23.2, stress 50 ±23.5, and 31 ± 24.2 obstructive/discomfort. The comorbidities were high blood pressure (HBP): 16 patients (31%), obesity (O): 1 patient (2%), diabetes (D): 2 patients (4%), HBP+ D: 5 patients (10%), HBP + O; 2 patients (10%), HBP+O+ d: 1 patient (2%). Four patients (8%) had previous surgery for stress urinary incontinence (three abdominal and one vaginal), another four patients had previous surgery for anterior vaginal POP (colpoplasty) and 2 (4%) concomitant surgery for POP and SUI Inclusion criteria were an age: over 18 years old and symptomatic grade ≥ 2 POP. Exclusion criteria were the presence of neurogenic lower urinary tract dysfunction, active urinary tract infection, bladder stones, or genitourinary neoplasia.

The study obtained approval from the Institutional Review Board Approval of Hospital Clínico San Carlos, Madrid, Spain.

Robotic sacrocolpopexy was performed following the previously described technique [9]. In short: a transperitoneal four-trocar technique with the Da Vinci robotic system using two polypropylene meshes (Pelvitex®) for fixation to the sacral promontory. The posterior mesh is fixed to the elevator of the anus muscle and posterior vaginal wall. The anterior mesh is fixed to the anterior vaginal wall and vaginal vault. Both meshes are fixed with a non-absorbable suture to the anterior vertebral ligament of the promontory. Tran's obturator tension-free mesh (TOT) was concomitantly placed when a preoperative urodynamic SUI (overt or occult) was demonstrated.

Preoperative LUTS were recorded by applying the Urinary Distress Inventory-6 (UDI-6) questionnaire. The presence of urgency, stress urinary incontinence, and voiding difficulty (hesitancy)—considered if patients answered positively in the questionnaire about the presence of these symptoms. A gynecological examination was performed on all patients to assess the type and grade of POP according to IUGA [1]. (Table 1). The same symptoms were evaluated 6 months after surgery and a POP grade of 2 or higher was considered to demonstrate surgical failure.

Table 1: Preoperative POP.

	Grade 1	Grade 2	Grade 3	Total*
Anterior	3	37	10	51
Apical	1	12	2	15
Posterior	0	16	1	17

*21 patients presented more than 1 compartment affected: Anterior and apical; 4 patients: Anterior and posterior; 6 patients: All compartment affected; 11 patients: POP: Pelvic Organ Prolapse

A urodynamic preoperative study (UDS) was performed on 46 patients following ICS indications [10] and the protocols of the Good Urodynamic Practice [11]. A Solar® (MMS Enshede the Netherlands) device was used. All patients underwent uroflowmetry, cystomanometry, and a pressure-flow test. Detrusor contractility was measured with the bladder contractility index (BCI; $P_{det}Q_{max} + 5Q_{max}$) and urethral outflow resistance with the bladder outflow obstruction index (BOOI; $P_{det}Q_{max} - 2Q_{max}$). The urodynamic diagnosis of SUI was performed with the patient in an upright position and if it was negative by reducing her prolapse using a pessary (occult SUI test).

Statistical analyses were performed with SPSS v20. Qualitative dependent variables were analyzed by the Mcnemar test, qualitative independent variables by the exact Fisher test, and the T-student test for independent parametric variables. The normality of the quantitative variable distribution was checked by the Kolmogorov-Smirnov test. All statistical analyses were two-sided, and probability values < 0.05 were considered statistically significant.

Theory/calculation

We hypothesize that RASC reduces urgency and voiding symptoms and that an incontinence technique is necessary when preoperative occult SUI is demonstrated.

Sample size calculation was performed using the Leruth, et al. [12], study as a reference. Assuming a prevalence of symptomatic preoperative SUI of 54% and a postoperative SUI of 24%, using these data, with an alpha error of 5% and a statistical power of 80% the sample size was estimated in 46 patients.

Results

Preoperative results

Symptomatic SUI occurred in 23 patients (45%), urgency in 29 (57%) and voiding difficulty was found in 23 patients (45%).

The maximum flow determined by free flowmetry was 17 ml/s ± 9.2 ml/s. (mean ± standard deviation), and postvoiding residual urine was 23 ml ± 61.8 ml. Cystometric bladder capacity was 230 ml ± 93.4 ml, filling pressure was 6 cm ± 4.9 cm H_2O, detrusor overactivity was found in 16 patients (35%,

overt SUI in 13 patients (28%) and occult SUI in 20 patients (43%). BOOI determined by pressure-flow in a study was 7.2 ± 33,48 and BCI: 87.6 ± 36.87.

Postoperative results

Anatomical correction after six months of intervention was obtained in 63% of the women. Preoperatively all patients had anterior POP, 29% apical POP and 33% posterior POP. Postoperatively 43% had anterior POP, 4% apical POP, and 12% posterior POP. The differences were statistically significant, except for posterior POP (p = 0.180).

Symptomatic SUI was corrected in 15 patients, de novo SUI was observed in 4 cases, and postoperative 8 patients continued to suffer symptomatic SUI, the differences were statistically significant (p = 0.008). Eleven patients with urgency symptoms were asymptomatic after surgery, and 3 patients developed a de novo urgency, in 18 patients the postoperative urgency persisted, but the differences were not statistically significant (p = 0.057). Voiding difficulty was resolved in 13 patients and appears in three, postoperative voiding difficulty persisted in 10 cases, the differences were statistically significant (p = 0.021).

Preoperative risks factors

Preoperative risk factors for SUI are shown in Table 2. The only statistically significant factor was preoperative TOT implantation. Of 36 patients with preoperative urodynamic SUI and TOT implantation only three patients had symptomatic postoperative SUI (8%), while of 12 patients with no preoperative urodynamic SUI and consequently no TOT implantation, 5 had postoperative SUI (42%). (Table 3). The differences were statistically significant (p = 0.017).

Table 2: Relationship between preoperative risk factors/ postoperative symptomatic SUI.

Preoperative risk factors for SUI	Postoperative SUI	Postoperative SUI absence	p
Grade 3 anterior POP	2/8 (25%)	8/ 40 (20%)	0.666
Apical POP	4/8 (50%)	10/40 (25%)	0.208
Posterior POP	3/8 (37%)	13/40 (32%)	1.000
Prolapse recurrence	3/7 (43%)	23/39 (59%)	0.682
Symptomatic SUI	5/8 (62%)	15/40 (37%)	0.251
Urgency	4/8 (50%)	22/40 (55%)	1.000
Voiding difficulty	5/8 (62%)	17/29 (59%)	1.000
Maximum flow rate (ml/s)*	14 ± 9.8	18 ± 9.3	0.853
Postvoid residual urine (ml)*	12 ± 23.2	28 ± 69.8	0.330
Cystometric bladder capacity (ml)†	205 ± 69.1	235 ± 93.4	0.523
Detrusor pressure at cystometric capacity (cm H_2O)*	6 ± 4.5	6 ± 5.1	0.400
Detrusor overactivity	4/8 (50%)	11/35 (31%)	0.429
Overt urodynamic SUI†	2/8 (25%)	9/35 (26%)	1.000
Occult urodynamic SUI	1/8 (12%)	19/35 (54%)	0.051
BOOI*	-5.2 ± 24.60	7.5 ± 29.64	0.269
BCI*	94.5 ± 24.06	84.1 ± 39.71	0.483
TOT placement	3/8 (37%)	33/40 (82%)	0.017‡

SUI: Stress Urinary Incontinence; BOOI: Bladder Outflow Obstruction Index; BCI: Bladder Contractility Index: TOT: Trans Obturator Tension-Free Mesh; *Mean ± SD. ‡p < 0.05; †Without POP eduction

Preoperative risk factors for postoperative urgency are shown in Table 4. The only statistically significant factor was the presence of preoperative urgency. No preoperative risk factors for voiding difficulty were observed (Table 5).

Table 3: Relationship between TOT placement/ postoperative symptomatic SUI.

	Postoperative SUI	Postoperative SUI absence	Total
Preoperative urodynamic SUI and TOT placement	3	33	36
Negative urodynamic SUI and no TOT placement	5	7	12
Total	8	40	48

SUI: Stress Urinary Incontinence; TOT: Trans Obturator Tension-Free Mesh

Table 4: Relationship between preoperative risk factors/ postoperative urgency.

Preoperative risk factors for SUI	Postoperative urgency	Postoperative urgency absence	p
Grade 3 anterior POP	6/19 (32%)	4/ 28 (14%)	0.276
Apical POP	7/19 (37%)	7/28 (25%)	0-518
Posterior POP	7/19 (37%)	9/28 (32%)	0.763
Prolapse recurrence	14/19 (74%)	12/28 (43%)	0.077
Symptomatic SUI	9/19 (47%)	11/28 (39%)	0.764
Urgency	16/19 (84%)	11/28 (39%)	0.003‡
Voiding difficulty	6/15 (40%)	15/22 (68%)	0.107
Maximum flow rate (ml/s)*	16 ± 8.1	18 ± 10.4	0.631
Postvoid residual urine (ml)*	39 ± 93.5	15 ± 26.3	0.323
Cystometric bladder capacity (ml)†	220 ± 72.1	237 ± 102.1	0.552
Detrusor pressure at cystometric capacity (cm H_2O)*	7 ± 4.5	6 ± 5.4	0.445
Detrusor overactivity	5/14 (36%)	8/25 (32%)	1.000
Overt urodynamic SUI†	5/14 (36%)	6/25 (24%)	0.469
BOOI*	6.5 ± 32.94	5.1 ± 25.84	0.881
BCI*	83.4 ± 25.35	85.5 ± 39.71	0.897
TOT placement	15/19 (79%)	20/28 (71%)	0.737

SUI: Stress Urinary Incontinence; BOOI: Bladder Outflow Obstruction Index; BCI: Bladder Contractility Index; TOT: Trans Obturator Tension-Free Mesh; *Mean ± SD; ‡p < 0.05; †Without POP reduction

Table 5: Relationship between preoperative risk factors/ postoperative voiding difficulties.

Preoperative risk factors for SUI	Postoperative urgency	Postoperative urgency absence	p
Grade 3 anterior POP	2/8 (25%)	5/ 25 (20%)	1.000
Apical POP	3/8 (37%)	8/25 (32%)	1.000
Posterior POP	5/8 (62%)	7/25 (28%)	0.106
Prolapse recurrence	7/8 (87%)	13/24 (54%)	0.204
Symptomatic SUI	6/8 (75%)	9/25 (36%)	0.101
Urgency	5/8 (62%)	13/25 (52%)	0.699
Voiding difficulty	3/6 (50%)	13/24 (54%)	1.000
Maximum flow rate (ml/s)*	16 ± 3.0	18 ± 10.1	0.636
Postvoid residual urine (ml)*	62 ± 125.0	24 ± 64.9	0.346
Cystometric bladder capacity (ml)†	193 ± 51.9	221 ± 92.2	0.436
Detrusor pressure at cystometric capacity (cm H_2O)*	7 ± 4.6	7 ± 5.6	0.767
Detrusor overactivity	2/7 (29%)	10/24 (42%)	0.676
Overt urodynamic SUI†	1/7 (14%)	8/24 (33%)	0.639
BOOI*	20.5 ± 47.62	6.0 ± 25.09	0.311
BCI*	82.3 ± 48.91	86.1 ± 38.38	0.841
TOT placement	7/8 (87%)	18/25 (72%)	0.643

SUI: Stress Urinary Incontinence; BOOI: Bladder Outflow Obstruction Index; BCI: Bladder Contractility Index; TOT: Trans Obturator Tension-Free Mesh; *Mean ± SD. †Without POP reduction

Discussion

We observed in our study that urgency did not vary significantly after RASC, unlike voiding difficulty which was significantly reduced. The only significative risk factor for both postoperative symptoms was the preoperative presence of urgency that increments the risk of postoperative urgency.

Changes in the urgency symptom after sacrocolpopexy are controversial. In this study we did not find any improvement after RASC However, Abdullah, et al. [13], found a statistically significant improvement in urgency after laparoscopic sacrocolpopexy but other studies such as Song, et al. [14], also did not find any improvement, whereas Ramanah, et al. [15], noted an improvement in urinary obstruction but not in urgency. These later authors also remark that the laparoscopic approach is a better option than a transvaginal approach to reduce voiding dysfunction.

It is not very clear why urgency would decrease after POP correction. Urgency has been related to the urodynamic finding of detrusor overactivity. In addition, detrusor overactivity may be due to bladder outlet obstruction caused by POP. Therefore, this decrease could be the consequence of a decrease in detrusor overactivity after obstruction resolution by surgical correction of POP. However, Vecchioli-Scaldazza, et al. [16], after having studied an anterior colporrhaphy series observed that the improvement in clinical urgency is not related to a reduction in detrusor overactivity. It is thought that sometimes the urgency symptom could be associated with a urodynamic sensorial urgency without involuntary detrusor contractions [17].

In our study, preoperative urgency was the only risk factor related to the presence of postoperative urgency. No other clinical or urodynamic parameter was related to the risk of developing this postoperative LUTS. Risk factors for postoperative urgency also known as overactive bladder syndrome are conflicting. For instance, Long, et al. [19], describe age and detrusor overactivity as risk factors but Fletcher, et al. [18], did not find that these variables were related to the risk of developing overactive bladder syndrome. None of these articles considers the presence of preoperative urgency as a risk factor

In this study, we found an improvement in voiding after RASC. This improvement has been described by other authors. Song, et al. [14], observed a decrease in the frequency of voiding dysfunction from 33% to 9% three months after surgery and Abdullah, et al. [13], also observed a decrease from 28% to 10% six months after the intervention. Both groups reported an improvement in urodynamic parameters with increased peak flow rate and a decrease in detrusor pressure. It can be assumed that this voiding symptom improvement is due to a decrease in urinary obstruction after anatomical correction of the POP. However, this decrease has not been yet demonstrated urodynamically.

We did not find any preoperative parameter related to the risk of postoperative voiding difficulty. However, other studies have found some parameters. For instance, Song, et al. [14], identified a preoperative low maximum flow rate and an elevated postvoid residual urine volume as risk factors for urodynamic voiding dysfunction, but they did not study which factors affect the postoperative occurrence of LUTS. In our study, neither the flow rate nor the postvoid residual urine influenced the presence of postoperative voiding symptoms. Unfortunately, we cannot prove this hypothesis due to the small number of postoperative urodynamic studies in our series.

Our study found that concomitant placement of a trans-obturator tape (TOT), when urodynamic SUI (overt or occult) was present, reduced postoperative symptomatic SUI. The importance of diagnosing occult SUI is confirmed by the fact that if we had only placed a TOT in patients with overt urodynamic SUI, postoperative symptomatic SUI would not have been significantly reduced (Table 2). Balci, et al. [20], also consider that preoperative diagnosis of OSUI allows an anti-incontinence procedure to be associated with POP surgery, to reduce postoperative SUI.

However, although most patients with negative preoperative urodynamic SUI and consequently without concomitant TOT placement did not have postoperative symptomatic SUI, the frequency of this symptom among these patients was significantly higher that the frequency in those with TOT implantation (Table 3). This fact implies that the sensitivity of this method is not very accurate (several false negative cases). The alternative is to add a concomitant anti-incontinence technique to all patients submitted to RASC without considering the presence of preoperative SUI, as proposed by some authors [21]. However, we must be aware that TOT surgery increases the risk of obstruction by 8% [22]. Furthermore, in our study seven out of 12 patients did not need this technique.

The main limitation of our study is the lack of postoperative urodynamics. Unfortunately, only 24 patients completed postoperative UDS. The main strength of our study is its prospective nature and having analyzed for the first-time variations in preoperative and postoperative LUTS and the utility of associated TOT in patients with occult who underwent RASC.

Conclusion

From the findings from our study, we can draw the following conclusions: RASC is an effective method to treat POP. It also improves the voiding difficulty associated with POP. However, it does not change urgency, perhaps because this symptom is multifactorial. Finally, the association of a TOT with RASC is useful when occult SUI is demonstrated in order to prevent postoperative symptomatic SUI.

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