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Robot-assisted sacro(hystero)colpopexy with anterior and posterior mesh placement: impact on lower bowel tract function and clinical outcomes at mid-term follow-up

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Abstract

Background: Robotic sacrocolpopexy (RSCP) is an established option for the treatment of apical, anterior, and proximal posterior compartment pelvic organ prolapses (POP). However, there is lack of evidence investigating how lower bowel tract symptoms (LBTS) may change after RSCP.

Methods: Data from consecutive patients treated with RSCP for stage 3 or higher POP from 2012 to 2019 at a single tertiary referral center with at least 1 year of follow-up were prospectively collected and retrospectively analyzed. RSCP was performed following a standardized technique which always employed both anterior and posterior hand-shaped meshes. Outcomes were collected at follow-up and analyzed. LBTS were evaluated through the Wexner questionnaire.

Results: Overall, 114 women underwent RSCP. Eleven were excluded for missing data, whereas 12 had insufficient follow-up. Thus, 91 (79.8%) patients were included in this cohort. Median follow-up was 42 [interquartile range (IQR), 19–62] months. Mean age was 65 ± 10 years. In our series, RSCP was mainly performed for anterior and apical/medium stage 3 POP (in 95.6% of patients). Anatomic success rate of RSCP was 97.8%, with 89 patients with POP stage 0–1 at 12-month follow-up. Two patients (2.2%) experienced POP recurrence and were treated with redo-SCP. No patient experienced clinically significant posterior vaginal wall prolapse after RSCP. When analyzing LBTS, there was no significant change in postoperative total Wexner's score as compared to the preoperative value ($p > 0.05$). However, the manual assistance subscore was statistically significantly lower within the first-year follow-up ($p = 0.04$), but it spontaneously improved during the follow-up ($p = 0.12$).

Conclusion: RSCP with simultaneous placement of both anterior and posterior mesh is safe and successful to treat high-stage POP in carefully selected patients. Of note, LBTS appear unaffected by posterior mesh placement, supporting its routine use to prevent posterior POP recurrence. Larger prospective studies are needed to confirm our results.

Keywords: bowel symptoms, mesh, minimally invasive, POP, robotic, sacrocolpopexy

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Introduction

Pelvic organ prolapse (POP) refers to a condition described as a loss of support for pelvic organs, including uterus, bladder, and bowel, thus leading to the descent of one or more compartments into the vagina, involving up to 50% of women with an extremely heterogeneous clinical presentation.[1]

Surgical management of POP may differ according to the clinical stage and site involved.[2] To

date, sacrocolpopexy (SCP) is a valid option for the treatment of apical, anterior, and proximal posterior compartment prolapses in women with active lifestyle, and it is considered the gold standard treatment for apical prolapse.[3] In fact, SCP guarantees better anatomical results when compared to transvaginal POP repair.[4] However, for elderly patients, the vaginal procedure is the most common approach, but abdominal surgery is increasing as a mini-invasive method.[5,6]

In fact, the use of robotic sacrocolpopexy (RSCP) is exponentially growing thanks to the well-known benefit of minimally invasive surgery with the possibility to easily perform reconstructive techniques. According to evidence in literature, RSCP was found to be safe and effective for the management of multicompartmental POP or apical prolapse.[7]

Despite its rising adoption, RSCP has not been fully standardized yet, and several technical nuances with a potential clinically relevant impact on patient outcomes are still matter of debate, such as the type of meshes used for RSCP (either commercially available as pre-shaped or hand-shaped according to the surgeons' preferences and experience). Second, since the International Continence Society (ICS) does not recommend transvaginal mesh placement in posterior compartment POP, it is not fully understood whether posterior mesh placement during RSCP may differ in benefits and harms.[8] In particular, there is lack of evidence investigating how lower bowel tract symptoms (LBTS) may change after RSCP,[9] especially if a posterior mesh is routinely placed.

To address these unmet needs, we relied on our prospectively collected institutional database including consecutive patients treated with RSCP and anterior and posterior mesh placement to (1) clarify how LBTS might have been influenced by mesh placement in RSCP and (2) evaluate perioperative and postoperative safety and efficacy of RSCP, specifically focusing on complications rate, anatomical and patients' subjective outcomes of POP, as well as POP recurrence rate.

Materials and methods

Patients and dataset

The study collected anonymized, de-identified information only. All patients gave written informed consent to prospectively collect their clinical data in our Institutional database, according to the Declaration of Helsinki.[10]

Consecutive female patients treated with RSCP from January 2012 and November 2019 at a single tertiary referral center were included in the study.

According to our clinical practice, only women having a POP-Q stage $\geqslant 3$ in one or more compartments were offered the opportunity of surgical POP correction. Patients with a follow-up <12 months were excluded.

Preoperative evaluation and follow-up were codified according to our Institutional protocols. A careful counseling was preoperatively given to patients. In detail, in patients who have not undergone previous hysterectomy, a thorough gynecological evaluation was conducted, thus they were additionally evaluated by transvaginal ultrasound and PAP-test to rule out any risk of malignancy or further indications for radical or simple hysterectomy. In case of no relevant gynecological abnormalities, uterus-sparing RSCP was offered. In patients with POP and concomitant stress urinary incontinence (SUI), the potential need of deferred placement of mid-urethral sling (MUS) was carefully discussed with all patients during the preoperative counseling. Concomitant placement of an MUS at the time of RSCP was offered only to women complaining severe SUI before surgery, especially those who had significant SUI at POP repositioning test, by finger during the preoperative evaluation. In some cases, even a further urodynamic evaluation was conducted to fully address masked SUI presence.

Postoperative follow-up evaluations were scheduled at months 1, 6, and 12 and then yearly after surgery.

Outcomes assessment

Follow-up data included clinical symptoms; voiding parameters; surgical, medical, and mesh-related complications; anatomical and subjective outcomes; and recurrence rate of POP.

LBTS before and after RSCP were evaluated by the Wexner's questionnaire.[11] Primary endpoint was thus assessed by any change of total Wexner score at follow-up.

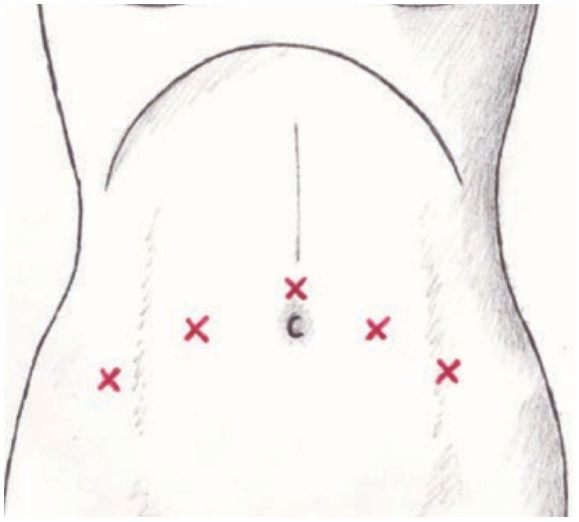

Figure 1. Port placement for robot-assisted sacrocolpopexy.

Regarding secondary endpoint, POP stage was evaluated through Pelvic Organ Prolapse Quantification (POP-Q). A successful POP repair was anatomically defined as POP stage 0–1 at follow-up.[2] Subjective improvement was measured through Patient Global Impression of Improvement (PGI-I) at follow-up[12] (PGI-I questionnaire is reported in Supplementary File 1). Recurrence was defined as a Stage 3 POP-Q prolapse at follow-up in any vaginal compartment and if not present preoperatively it was classified as *de novo*. Postoperative pain was evaluated through visual analogue scale (VAS) score. Complications were assessed according to the Clavien–Dindo scale.[13] Mesh-related complications were reported according to International Urogynecological Association (IUGA) and ICS classification.[14]

Surgical technique

RSCP was performed by two highly experienced robotic surgeons following an established technical principle. Our RSCP technique with concomitant placement of both an anterior and posterior mesh has been described in detail in a previous publication.[15] Robotic surgery was performed using the Xi or Si Da Vinci surgical system (Intuitive Surgical, Sunnyvale, CA, USA), in a four-arm configuration. Concomitant hysterectomy was not routinely performed, except for two cases where supracervical hysterectomy was done for fibroid uterus. Surgical steps are the following.

Port placement and mesh configuration. Patient is placed in 25°–30° Trendelenburg position and a bladder catheter is inserted. Pneumoperitoneum is created using a standard mini-open access. Port placement is shown in Figure 1. Anterior and posterior meshes are configured from a rectangular nonabsorbable monofilament polypropylene mesh as shown in Figure 2. Nonabsorbable coated 2/0 Ti-Cron sutures are placed on the tip of the anterior mesh and on the two tips of the posterior mesh.

Sacral promontory exposure and posterior mesh placement. Uterus, if present, is preliminarily suspended with a straight needle through the skin or simply using the fourth arm. RSCP begins with sacral promontory exposure. Sigma is mobilized medially and sacral promontory is exposed by monopolar cautery. The peritoneum incision is then extended from sacral promontory to vaginal posterior fornix medially to the ureter, avoiding hypogastric nerve and thus creating an extraperitoneal fold to place mesh posteriorly. A straight vaginal spatula is placed in the posterior fornix, to facilitate its exposure as shown in Figure 3. Peritoneum is then incised to reach the rectovaginal space and Levator Ani fascia bilaterally. Incision is lateral to avoid rectum. With sacral promontory and endopelvic fascia exposed, the previously configured posterior mesh is inserted through 12 mm assistant port and fixed with a nonabsorbable 2/0 Ti-Cron stitch to Levator Ani fascia bilaterally (Figure 4), similar to other authors.[16] The posterior mesh is then fixed to the sacral promontory with a 2/0 Ticron suture, avoiding

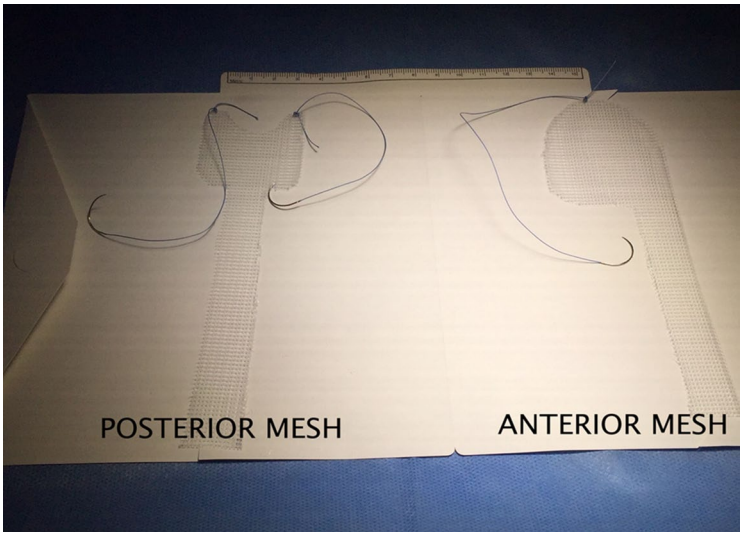

Figure 2. Posterior and anterior mesh shape.

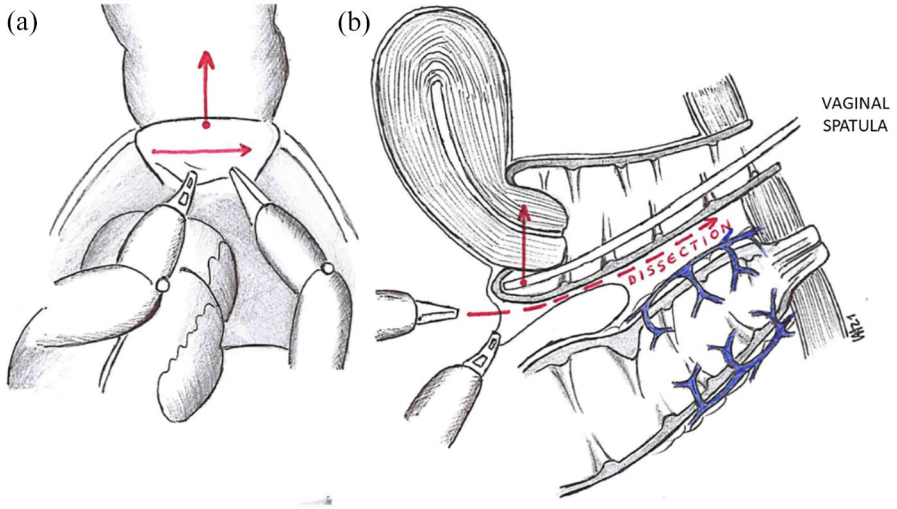

Figure 3. (a) Posterior peritoneal incision. (b) Vaginal spatula lift up uterus, thus outlining dissection plane.

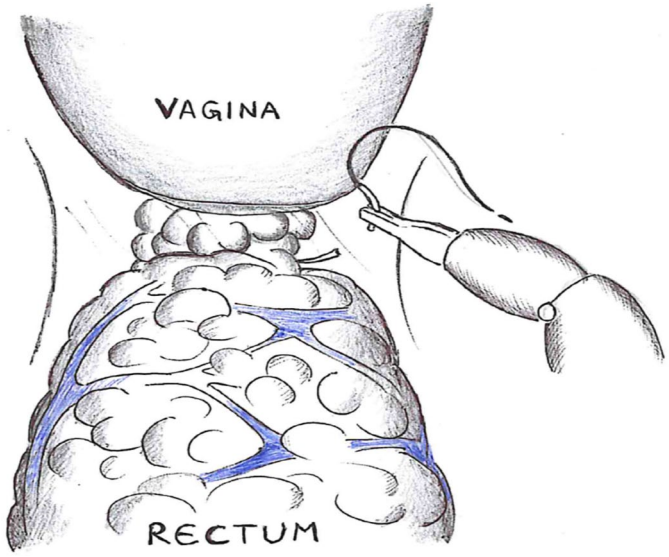

Figure 4. Posterior mesh fixation stitch is given laterally to the rectum to endopelvic fascia, carefully avoiding rectum vascularization, which is preserved.

excessive tension on the mesh. Two main surgical tips should be followed for bowel preservation: (1) careful isolation taking care of the rectal vascularization and (2) the mesh is then sutured distally to the posterior vaginal wall to lift the mesh closer to the vagina, thus avoiding possible interferences with rectal ampulla as shown in Figure 5.

Anterior mesh placement. Uterus suspension is removed and a vaginal spatula is then positioned in the anterior fornix. Thus, the plane between bladder and vagina is developed using monopolar careful dissection, hence exposing the anterior vaginal wall. When the exposure is complete, a right extraperitoneal tunnel to allow the passage of the anterior mesh to the sacral promontory is created through peritoneum. The anterior mesh is then inserted through 12 mm assistant port and two nonabsorbable 2/0 Ti-Cron running sutures are placed to fix the mesh to anterior vaginal wall. The needle should not cross the complete thickness of the vaginal wall to preserve its integrity.

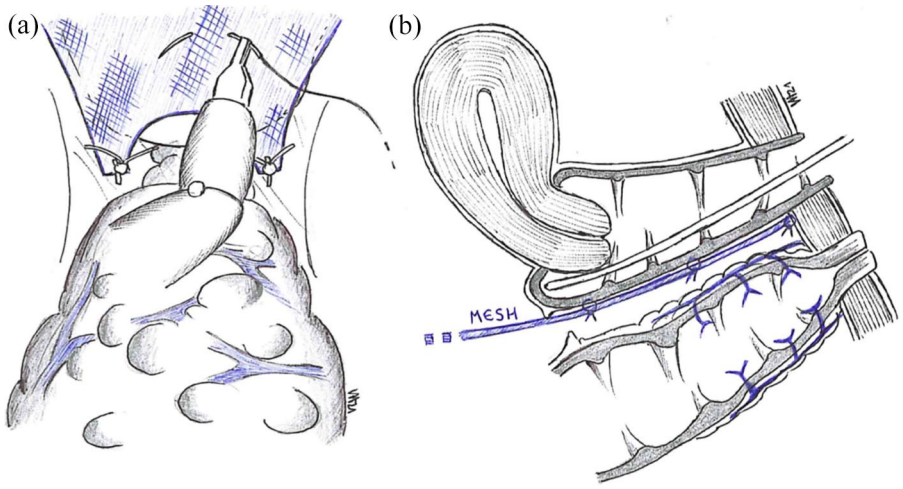

Figure 5. The mesh is sutured distally to the posterior vaginal wall to lift the mesh closer to the vagina, thus avoiding possible interferences with rectal ampulla (a) Surgeon view (b) Sagittal view.

The running sutures are then tied together to the vaginal apex or to the cervix. One further suture is passed through the cervix to avoid the slipping of the uterus behind the anterior mesh. Finally, the anterior mesh is passed through the previously configured tunnel and both meshes are placed and tied to the sacral promontory with a nonabsorbable 1 Ti-Cron suture, while simultaneously the organs are kept in place by the bedside assistant with the vaginal spatula. Whenever redundant, the mesh in excess is removed. The peritoneum is then closed with V-Lock running sutures.

Statistical analysis

First, descriptive statistics were obtained reporting medians (and interquartile ranges, IQRs) for continuous variables, and frequencies and proportions for categorical variables. A comparison in RSCP outcomes according to baseline patients' characteristics and previous hysterectomy was carried out through independent sample *t*-test, chi-square test, Fisher's exact test, and independent sample Mann–Whitney *U* test, as appropriate. A Wilcoxon signed-rank test was performed to evaluate changes in bowel function (Wexner's questionnaire) during follow-up. A comparison between bowel outcomes and subjective satisfaction according to previous posterior POP presence was conducted through independent sample Mann–Whitney *U* test. Statistical analyses were performed using SPSS v. 24 (IBM SPSS Statistics for Mac, Armonk, NY, IBM Corp). Statistical significance was set at $p < 0.05$.

Results

Overall, 114 women underwent RSCP during the study period. Of these, 11 (9%) were excluded due to incomplete perioperative data, whereas 12 (11%) due to a follow-up shorter than 12 months. As such, 91 (80%) patients with complete clinical data and at least 1 year of follow-up were included in the analytic cohort. Median follow-up time was 42 (IQR, 19–62) months.

Preoperative patient characteristics are reported in Table 1. Mean age was 65 ± 10 years and mean body mass index (BMI) was $26.1 \pm 4.1\,kg/m^2$ at surgery. All the patients enrolled who had previous hysterectomy underwent a total hysterectomy.

In our series, RSCP was mainly performed for anterior and apical/medium stage 3 POP, as it was present in 87 (95.6%) patients. Posterior vaginal wall prolapse was found in 17 patients (18.6%). Overall, 25 (27.4%) patients had undergone previous hysterectomy.

Perioperative and postoperative outcomes are reported in Table 2. Median operative time was 145 (IQR, 125–195) min. Eleven (12.1%) women were concomitantly treated with MUS at the time of RSCP. Median length of stay was 3 (IQR, 3–4) days. No clinically significant intraoperative complications were recorded.

Overall, 14 (15.3%) postoperative complications were recorded; of these, 3 were surgical and 11 medical, and none exceeded Clavien–Dindo grade 2. At first month of follow-up, no patients reported

Table 1. Clinical and demographic characteristics of patients treated with robotic sacrocolpopexy for pelvic organ prolapse.

Preoperative characteristics ($n = 91$)		
Age (years), mean (SD)		64.7 (10.1)
BMI (kg/m^2), mean (SD)		26.1 (4.1)
Anterior compartment prolapse stage (POP-Q), *n* (%)	3–4	87 (95.6%)
Medium compartment prolapse stage (POP-Q), *n* (%)	3–4	89 (97.8%)
Posterior compartment prolapse stage (POP-Q), *n* (%)	3–4	17 (18.6%)
Urinary incontinence, *n* (%)		18 (19.7%)
Stress urinary incontinence, *n* (%)		11 (61.1%)
Mixed urinary incontinence, *n* (%)		2 (11.1%)
Urgency urinary incontinence, *n* (%)		5 (27.8%)
Previous hysterectomy, *n* (%)		25 (27.4%)
Previous pelvic organ prolapse surgery, *n* (%)		15 (16.5%)

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

pain. As regards POP subjective improvement, median PGI-I was 1 (IQR, 1–2), while anatomic success rate of RSCP was 97.8%, with 89 patients with POP-Q stage 0–1 at 12-month follow-up. Voiding parameters were unaltered, except for post void residual, being 20 (IQR, 0–120) ml before and 0 (IQR, 0–0) ml after RSCP ($p = 0.02$). Six (7.3%) patients developed *de novo* SUI at follow-up, thus requiring trans-obturator MUS placement in four (4.9%) cases. Overall, two (2.4%) anterior-medium compartment recurrences were registered and treated in one case with open SCP and in another case in a redo RSCP with the complete correction of the POP at long-term follow-up. A comparison of perioperative and postoperative outcomes according to previous hysterectomy is reported in Table 3.

When analyzing mesh-related complications, at long-term follow-up, only one (1.2%) mesh vaginal extrusion was recorded (3AaT4S2 according to IUGA/ICS classification), ultimately requiring transvaginal surgical excision of the extruded mesh.

When analyzing bowel symptoms, no statistical difference emerged between preoperative and postoperative total Wexner's score. However, at a subanalysis of the single parameters, manual assistance subscore was statistically significantly lower within the first-year follow-up ($p = 0.04$), but a spontaneous recovery was documented at later follow-up ($p = 0.12$). Total Wexner's scale values and its relative subscores are reported in Table 4.

A further subanalysis to compare changes in LBTS and PGI-I according to posterior POP presence before RSCP was conducted, thus finding no difference in all the inquired variables (see Table 5). Moreover, also uterus-sparing RSCP did not affect bowel function ($p > 0.05$).

Discussion

In our series, RSCP with anterior and posterior mesh placement was confirmed to be a safe and successful minimally invasive treatment option for POP repair, with satisfactory and durable results at a medium-term follow-up. A main key finding of our study is that the routine use of a posterior mesh prevented *de novo* posterior vaginal wall prolapse after POP correction, regardless of its presence at preoperative evaluation, and showed remarkable medium-term outcomes. Second, with the adoption of specific technical precautions, the impact of posterior mesh placement on bowel function was almost irrelevant according to the total Wexner score evaluated before and after surgery. As such, our findings provide a foundation toward a more conservative and tailored approach for minimally invasive sacro(hystero)colpopexy.

Undeniably, it is still debated whether to preserve or not the uterus during POP surgery and particularly during RSCP. Recent evidence confirmed that preserving uterus is safe and feasible.[17] In addition, when non-inferior outcomes are guaranteed, it is widely accepted how women do prefer to avoid concomitant hysterectomy.[18,19] Third, treating uterine prolapse by removing the organ could be detrimental, as it may raise the complications rate, while it just represents a passive element of POP pathogenesis, rather than its cause.[20] In our experience, uterus-sparing RSCP provided perioperative and functional outcomes consistent with those reported in current literature.[21] Also, in accordance with our findings, recent single Institutional prospective studies reported POP correction being not influenced by concomitant hysterectomy.[17,22] Moreover, a systematic review

Table 2. Intraoperative and perioperative outcomes of patients treated with robotic sacrocolpopexy for pelvic organ prolapse.

Intraoperative and perioperative outcomes (*n* = 91)			
Operative time, min			165 (125–195)
Concomitant mid-urethral sling			11 (12.1%)
Complications rate	Total		14 (15.3%)
	Surgical	Overall	3 (3.3%)
		Bleeding treated with transfusion	1 (1.1%)
		Pelvic hematoma managed conservatively	1 (1.1%)
		Delayed wound healing	1 (1.1%)
	Medical	Overall	11 (12.1%)
		Acute urinary retention	2 (2.2%)
		Ileus	1 (1.1%)
		Fever	8 (8.8%)
Length of stay, days			3(3–4)
Pain at first follow-up, visual analogue scale			0 (0–1)

Table 3. Patients' characteristics and outcomes of patients treated with robotic sacrocolpopexy for pelvic organ prolapse according to the previous hysterectomy.

Patients' characteristics and outcomes	**No hysterectomy (*n* = 66, 72.6%)**	**Hysterectomy (*n* = 25, 27.4%)**	***p***
Age, years	66 (11)	65 (9)	0.789
Body mass index, kg/m^2	25.9 (4.0)	26.7 (4.3)	0.815
Operative time, min	164 (41)	185 (72)	0.306
Concomitant mid-urethral sling	8 (12.1%)	3 (12.0%)	0.799
Complications rate	11 (16.7%)	3 (12.0%)	0.819
Recurrence rate	1 (1.5%)	1 (4.0%)	0.478
PGI-I	1(1–2)	2 (1–3)	0.156
Mesh erosion	1 (1.5%)	0 (0%)	0.867
Preoperative Wexner score	1 (0–1)	1 (0–2)	0.539
Wexner score month 3	1 (0–1)	1 (0–2)	0.839
Wexner score month 12	1 (0–1)	1 (0–3)	0.790
Wexner score last follow-up	1 (0–2)	1 (0–3)	0.580

PGI-I, Patient Global Impression of Improvement.
Variables are reported as mean (standard deviation), median (interquartile range), and *n* (%) as appropriate. Statistical analysis is independent sample *t*-test, chi-square test, Fisher's exact test, and Mann–Whitney *U* test for independent samples as appropriate.

Table 4. Changes in bowel function patients treated with robotic sacrocolpopexy for pelvic organ prolapse.

Bowel function	Preoperative ($n=91$)	Month 3 ($n=91$)	p	Month 12 ($n=91$)	p	Last follow-up ($n=82$)	p
Frequency	0 (0–0)	0 (0–0)	0.285	0 (0–0)	0.073	0 (0–0)	0.206
Completeness	0 (0–1)	0 (0–1)	0.187	0 (0–1)	0.856	0 (0–2)	0.388
Difficulty	0 (0–2)	0 (0–2)	0.407	0 (0–1)	0.604	0 (0–1)	0.398
History	0 (0–2)	0 (0–2)	1	0 (0–1)	1	0 (0–1)	1
Time	0 (0–0)	0 (0–0)	0.124	0 (0–0)	0.361	0 (0–1)	0.317
Failure	0 (0–0)	0 (0–0)	0.236	0 (0–0)	0.791	0 (0–0)	1
Assistance	0 (0–0)	0 (0–0)	0.057	0 (0–0)	**0.043**	0 (0–0)	0.117
Pain	0 (0–1)	0 (0–1)	0.579	0 (0–1)	0.529	0 (0–1)	0.979
Score	1 (0–2)	1 (0–2)	0.270	1 (0–2)	0.830	1 (0–2)	0.277

All variables are reported as median (interquartile range). Statistical analysis is Wilcoxon signed-rank test and comparisons were made with preoperative values. In bold statistically significant differences.

Table 5. Changes in bowel function according to posterior vaginal wall prolapse before and after surgery in patients treated with robotic sacrocolpopexy for pelvic organ prolapse.

Changes in bowel function	No posterior compartment prolapse stage $\geqslant 3$ ($n=74$)	Posterior compartment prolapse stage $\geqslant 3$ ($n=17$)	p
Wexner score preoperative	1 (0–2)	1 (0–1)	0.701
Wexner score month 3	1 (0–2)	1(1–1)	0.893
Wexner score month 12	1 (0–2)	1 (0–1)	0.719
Wexner score last follow-up	1 (0–2)	1 (0–1)	0.468
Assistance score preoperative	0 (0–0)	0 (0–0)	0.703
Assistance score month 3	0 (0–0)	0 (0–0)	0.743
Assistance score month 12	0 (0–0)	0 (0–0)	0.654
Assistance score last follow-up	0 (0–1)	0 (0–1)	0.571
PGI-I	1(1–2)	1(1–3)	0.339

PGI-I, Patient Global Impression of Improvement.
All variables are reported as median (interquartile range). Statistical analysis is Mann–Whitney *U* test for independent samples.

and meta-analysis in 2016 reported concomitant hysterectomy for POP repair as a risk factor for mesh erosion.[23] In this regard, Powell *et al.* in their series reported a higher rate of erosions and mesh-related complications after RSCP, maybe secondary to a higher percentage of patients previously hysterectomized or undergoing concomitant hysterectomy.[24] The reason might be ascribed to a deeper vaginal dissection often necessary in hysterectomized patients and to the more challenging development of the vescico-vaginal space at its beginnings, associated with the concomitant risk of damaging both bladder and vaginal wall, thus increasing the risks of mesh erosion.[25] Moreover, a further distinction should be made, as total hysterectomy, such as in our cases, might

be associated with higher complication rate compared to sub-total hysterectomy, because vagina is routinely opened in such procedures.[26,27]

In our study, the Wexner scale was comparable before and after surgery, with only a single subscore (manual assistance) being different at 3- and 12-month evaluation and recovered at later follow-up. Notably, in our series, posterior compartment POP was present in 18.6% of cases. In the hypothesis that the latter could influence bowel function, we performed a subanalysis investigating Wexner scale and PGI-I changes according to the presence of preoperative posterior POP, thus finding no differences between the two groups. A single Institutional series by McNanley *et al.*[28] raised some concerns on bowel symptoms onset after RSCP. Also, the CARE prospective trial, which involved more than 300 patients, reported that nearly 5% of patients treated with open SCP reported gastrointestinal postoperative complications.[29] Geomini *et al.*[30] and Crane *et al.*[31] reviewed a single center experience following abdominal SCP and reported *de novo* constipation/defecation problems in approximately 11% of study cohort. Such evidence was furtherly confirmed by Watadani *et al.*[32] in 2013.

In our study, posterior mesh placement seemed not to affect bowel function, consistently with Fox and Stanton[33] Moreover, our technique, which avoids any damage to hypogastric nerve, reduces *de novo* bowel symptoms occurrence.[34] Conversely, Baessler *et al.*[35] reported nearly 30% of patients perceiving an altered defecation after open SCP with high outlet constipation. Certainly, the high heterogeneity in literature regarding SCP techniques, surgical approach, and meshes does not enable us to draw definite conclusions. However, we believe that our surgical technique, through the careful isolation of rectum to avoid its devascularization, and the posterior mesh suture in the vaginal wall, can reduce patients' LBTS postoperatively.

In our center, we offered concomitant treatment of SUI and POP in carefully selected patients, as previously reported by different groups.[36] Although the treatment of SUI can be achieved by using both autologous and synthetic slings, we routinely employ the latter ones due to surgeon preference and experience.

A major strength of our study is the thorough standardization of the surgical technique and meshes, allowing a trustworthy comparison of outcomes after surgery for different POP-Q $\geqslant$3 stages. In particular, according to our technique, only the pararectal space is developed and the mesh is configured to limit its possible detrimental effect on both rectum and defecation, thus providing a reliable support to correct or avoid *de novo* posterior POP. Another strength of our study is the report of bowel function through Wexner scale, which is specific for bowel domain and easily understandable. Third, the long follow-up does reinforce the reliability of our findings.

Limitations of our study include the retrospective design, although data were prospectively collected. In addition, the study lacks a comparison group (i.e. RSCP with only anterior mesh placement) and therefore the complete impact of a posterior mesh RSCP on bowel function could not be fully evaluated. Moreover, robotic procedures were all performed in a tertiary referral center; as such, our results might not be applicable to all providers.

Acknowledging these limitations, the current study represents one of the largest series so far investigating perioperative and postoperative outcomes, as well as LBTS, after RSCP with anterior and posterior mesh placement.

Although our results on Wexner scores in medium-term follow-up suggest the negligible influence of posterior mesh placement on bowel function, larger prospective well-designed studies with longer follow-up are needed to confirm our findings and further clarify this issue.

Conclusion

In experienced hands, robot-assisted sacro (hystero)colpopexy with concomitant placement of an anterior and posterior mesh is a safe and successful surgical technique to correct high-stage POP. While this technique allows to effectively prevent *de novo* posterior vaginal wall prolapse after surgery, notably bowel function seems to be relatively unaffected by posterior mesh placement at a mid-term follow-up. Further prospective studies with longer follow-up are needed to confirm our results.

Author contributions

Vincenzo Li Marzi: Conceptualization; Methodology; Project administration; Supervision; Writing – original draft; Writing – review & editing.

Simone Morselli: Conceptualization; Formal analysis; Investigation; Methodology; Writing – original draft; Writing – review & editing.

Fabrizio Di Maida: Data curation; Formal analysis; Writing – original draft.

Stefania Musco: Data curation; Writing – original draft.

Luca Gemma: Data curation.

Francesco Bracco: Data curation.

Riccardo Tellini: Data curation; Formal analysis.

Gianni Vittori: Data curation; Formal analysis.

Andrea Mari: Data curation; Writing – original draft.

Riccardo Campi: Data curation; Formal analysis; Writing – original draft.

Marco Carini: Project administration; Supervision.

Sergio Serni: Methodology; Supervision; Writing – original draft.

Andrea Minervini: Conceptualization; Methodology; Project administration; Supervision; Writing – original draft.

Conflict of interest statement

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Supplemental material

Supplemental material for this article is available online.

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