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Robot-assisted laparoscopic sacrocolpopexy with autologous fascia lata: technique and initial outcomes

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Abstract

Introduction and hypothesis Pelvic reconstructive surgery is increasingly being performed with autologous grafts to avoid complications of synthetic mesh and improve the durability of a native tissue repair. Autologous fascia lata (AFL) provides a reliable source of robust connective tissue to improve surgical outcomes. We present our technique and initial experience with performing robotic sacrocolpopexy (RSC) augmented with AFL.

Methods A retrospective review was conducted of patients who underwent RSC with AFL between January 2015 and November 2017. Outcomes evaluated include recurrence of prolapse on physical examination, prolapse symptoms, urinary incontinence, patient satisfaction based on the Patient Global Impression of Improvement (PGI-I) and complications.

Results Twelve patients were identified with a median age of 68 years (range, 46–77 years) at the time of RSC with AFL. Eleven patients had a history of prior sling and/or vaginal mesh. The median operative time was 225 min (177–302 min). There were no intra- or postoperative complications. After a median follow-up of 14.7 months (5.7 to 39 months), the median PGI-I response was 2 (range, 1–3, very much to a little better). No recurrent or persistent apical prolapse was observed. Three patients (25%) reported recurrence of sensation of a vaginal bulge, which were all due to anterior vaginal wall prolapse.

Conclusions RSC can be performed with AFL and should be considered in patients with a history of mesh complications. Overall patient satisfaction was high. While these short-term outcomes are encouraging, further studies are needed to assess long-term durability of anatomic results.

Keywords Robot-assisted laparoscopic sacrocolpopexy · Fascia lata

Abbreviations

ASC abdominal sacrocolpopexy
AFL autologous fascia lata
FL fascia lata
PGI-I Patient Global Impression of Improvement
POP pelvic organ prolapse
RSC robotic-assisted laparoscopic sacrocolpopexy
SUI stress urinary incontinence

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Introduction

Management of mesh-related complications related to pelvic reconstructive surgery remains challenging. The physician and patient must engage in informed discussion to assess the damages attributable to mesh and then decide whether or not to remove the mesh, how much of it to remove and when to remove it. Furthermore, many patients experience physical and emotional pain, in addition to the original pelvic floor dysfunction, that require a holistic treatment approach [1]. There must also be serious consideration of development of recurrent or de novo urinary and prolapse symptoms [2], which may be more difficult to correct after mesh removal.

The task of delivering a durable repair for patients with stress urinary incontinence (SUI) or pelvic organ prolapse (POP) after mesh removal is substantial and not a rarely encountered problem. One series reported a reoperation rate of 35% for patients who underwent initial vaginal mesh removal, with 40% of these patients requiring POP repair and 16%

undergoing surgical repair of SUI [3]. Another cited a rate of 38% for prolapse recurrence after transvaginal mesh removal, with 15% of these patients undergoing reoperation for POP repair [4].

The use of an autologous fascia graft with sacrocolpopexy for apical prolapse in patients with a relative contraindication to synthetic mesh, particularly as a salvage operation for patients who have undergone mesh removal, seems appropriate. There is increasing awareness of risk factors for mesh complications, including patients at risk for poor wound healing due to prior radiation therapy, the presence of significant scarring, poor tissue quality and smoking at the time of surgery [5, 6]. In these groups, a graft alternative to synthetic mesh may be desired by both the patient and surgeon. An autologous fascia graft is also a good option for patients who wish to avoid the risk of mesh-related complications and decide against a transvaginal native tissue repair. The risk of vaginal mesh erosion after SC for patients undergoing primary repair of apical prolapse is not insignificant, with the Colopopexy and Urinary Reduction Efforts (CARE) trial demonstrating the risk of vaginal mesh exposure to be 6% at 2 years and 10% at 7 years [7]. It is the authors' practice to offer robot-assisted laparoscopic sacrocolpopexy (RSC) with autologous fascia graft as well as the standard synthetic mesh graft to these groups of patients.

While the use of autologous fascia pubovaginal slings for patients who undergo transvaginal and midurethral sling mesh removal has been shown to be effective and safe [8, 9], the literature regarding the use of autologous fascia to augment prolapse repair in this same population remains sparse. We have reported our short-term outcomes after complete ASC mesh excision with concomitant ASC using autologous rectus fascia, which showed the procedure to be safe with a low rate of major complications [10].

To our knowledge, at present, RSC with autologous fascia has not been described. We present our technique and initial experience with performing RSC with autologous fascia lata (AFL) as a salvage procedure to address recurrent apical prolapse after mesh removal and as a primary repair for apical prolapse in select patients.

Materials and methods

Approval for this study was obtained from the University of California Los Angeles Institutional Review Board. A retrospective review was conducted examining the records of all patients who underwent RSC with AFL between January 2015 and November 2017. All operations were performed by a single surgeon who is fellowship-trained in female pelvic medicine and reconstructive surgery.

For harvest of the fascia lata (FL), the patient was placed in an oblique position with the hip and knee joints gently flexed.

Our preference is to harvest fascia from the nondominant leg. Relevant anatomic landmarks were identified, and a 4–5-cm transverse incision was made 10 cm cephalad to the patella over the iliotibial band (Fig. 1a). A Crawford fascial stripper was used to harvest a 1 cm × 12–15 cm segment of FL (Fig. 1b). If a Crawford fascial stripper is not available, fascia may be harvested with Bovie electrocautery using a long tip or mayo scissors. If the fascial stripper is not used, a counter incision cephalad to the original incision may be required to obtain a piece of fascia with adequate length.

The harvested graft was placed in duobiotic solution, and the patient was repositioned in lithotomy position. The robot was docked in the standard fashion after moving the patient into a steep Trendelenburg position, and RSC was performed using FL as the graft secured to the cuff of the vagina or cervix in a transverse orientation with five to six 2–0 PDS sutures (Fig. 1c). The anterior vaginal dissection was limited to 2–4 cm proximal to the vaginal cuff or cervix to allow for this attachment. The tail end was then secured to the sacral promontory with two 2–0 PDS sutures creating an "L" shape. This technique was previously described using rectus fascia in an abdominal sacrocolpopexy after mesh removal [10].

Patient records were reviewed to retrieve clinical and perioperative data. Outcomes evaluated include patient demographics, perioperative data, complications, and subjective and objective outcomes. In general, patients were evaluated in the clinic at 3 weeks postoperatively, 3 months, 1 year and then annually. Patient satisfaction was measured by the Patient Global Impression of Improvement (PGI-I) questionnaire for urogenital prolapse and administered to patients following surgery by telephone interview conducted at a minimum of 2 months after surgery. Prolapse severity on physical examination was assessed by the Baden-Walker (BW) grading system.

The primary outcome measures evaluated were subjective recurrence of prolapse, anatomic failure and need for re-operation. Anatomic failure was defined as prolapse BW grade 2 and above. Secondary outcomes included patient satisfaction measured by PGI-I, intra- and postoperative complications, and postoperative urinary incontinence. Descriptive statistics were used. Mean and median values were calculated and reported with ranges of values, as appropriate.

Results

Twelve patients were identified with a median patient age of 68 years (46–77). The median BMI was 25.3 (20–37), mean American Society of Anesthesiologists class was 2.5 (2–3), and the median parity of patients included in this study was 3 (0–5). Ten patients (83.3%) had undergone prior hysterectomy. The preoperative BW grade of apical prolapse was grade 3 or higher in 11 patients and grade 0 in 1 patient who elected
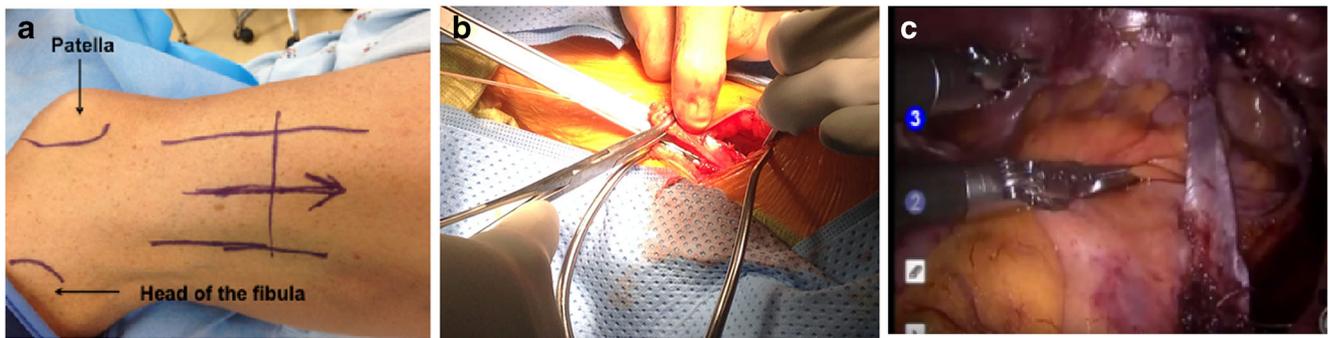
Fig. 1 a Anatomic landmarks used to plan harvest of fascia lata. **b** Harvest of fascia lata using a Crawford stripper. **c** Fascia lata graft secured to anterior vagina and sacral promontory

to undergo concomitant removal of SC mesh and RSC with AFL (Table 1). Eleven patients had a history of pelvic reconstructive surgery utilizing a graft, for which six had undergone prior graft removal and three elected to undergo concomitant graft removal at the time of RSC with AFL. The other two patients had undergone prior pelvic reconstructive surgery but had no apparent complications related to these procedures and thus had no indication for graft revision surgery. One patient had no history of pelvic reconstructive surgery. These three patients, elected AFL for RSC as a repeat and primary procedure, respectively, because of concerns about mesh complications and patient preference. Clinical characteristics for all 12 study patients, including the indication for graft removal and the type of graft removal procedure performed for the 11 patients with prior reconstructive surgery, are detailed in Table 1.

All patients were offered RSC with synthetic mesh and with an AFL graft. They were counseled extensively about the risks and benefits of each option. Patient counseling and consent included the limited data on efficacy and durability of prolapse repair with RSC using AFL.

The median operative time was 225 min (177–302 min) with a mean of 45 min required for harvest of fascia lata and repositioning of the patient. The median estimated blood loss was 150 cc (100–150) and median length of hospital stay was 2 days (1–11). One patient had a prolonged hospital stay of 11 days because of an ileus, which resolved without intervention.

There was one anterior vaginotomy, which was closed primarily, and the case proceeded without any issues. There were no other intraoperative complications. There were no FL harvest site complications, with no hematoma, seroma or hernias identified.

It is common practice for the surgeon who performed the RSC with an AFL operation to perform anterior and/or posterior colporrhaphy and perineorrhaphy after the completion of RSC, as needed, to repair any remaining prolapse. Eleven patients underwent concomitant anterior colporrhaphy, nine underwent posterior colporrhaphy, and five underwent perineorrhaphy. Additionally, two patients underwent

supracervical hysterectomy and one underwent pubovaginal sling with AFL at the time of RSC with AFL.

Eleven of the 12 patients returned to clinic for at least one postoperative visit. The patient who did not return to clinic postoperatively was from another state, but was contacted by telephone at the time of retrospective review.

After a median follow-up of 14.7 months (5.7 to 39 months), there were no anatomic recurrences of apical prolapse BW grade 2 or above. Nine patients (75%) reported subjective cure of bulge symptoms. Three patients (25%) reported a recurrent sensation of a vaginal bulge (Table 2). All three experienced symptomatic anterior vaginal wall prolapse with one of the three patients also reporting symptomatic posterior vaginal wall prolapse. Two additional patients developed BW grade 2 anterior vaginal wall prolapse but remained asymptomatic.

Nine patients (75%) reported any degree of urge urinary incontinence (UUI) and six (50%) patients reported any degree of SUI, preoperatively (Table 1). Of these patients, five reported mixed urinary incontinence (MUI). The one patient with bothersome preoperative SUI underwent concomitant AFL sling at the time of RSC. Her SUI improved but did not resolve completely postoperatively, which was not unexpected given her history of urethrovaginal fistula due to mesh sling erosion requiring removal and reconstruction prior to RSC with AFL.

At postoperative follow-up, four patients (33%) reported MUI, with three of the four reporting preoperative MUI as well (Table 1). Of the four patients with MUI, one elected to undergo a subsequent pubovaginal sling with FL harvested from the opposite leg for bothersome de novo SUI and three initiated an anticholinergic for treatment of bothersome UUI. This was the only patient who reported de novo SUI postoperatively. Her anterior vaginal wall prolapse improved from BW grade 3 to BW grade 2. Three patients reported UUI alone postoperatively, but declined therapy after undergoing RSC because of minimal bother of symptoms. All three of these patients reported UUI preoperatively as well.

The telephone response rate for patient PGI-I at the time of retrospective review of records was 67% at a median follow-

Table 1　Patient clinical characteristics and postoperative outcomes

Patient	Age at time of RSC with AFL (years)	Prior graft surgery	Indication for graft removal	Type of graft removal procedure	BW A Post-op (pre-op)	BW Aa Post-op (pre-op)	BW P Post-op (pre-op)	UI Post-op (pre-op)
1	73	Suprapubic arch (SPARC) mesh sling and RSC with mesh graft	Hx of osteomyelitis of the sacrum and vaginal mesh exposure	Removal of SPARC sling and RSC mesh at the time of RSC w/AFL	2(1)	1(0)	2(3)	UUI (UUI)
2	55	Tension-free vaginal tape (TVT)	Obstructive voiding symptoms	Time of RSC w/AFL	*(3)	*(3)	*(1)	None* (UUI)
3	67	Prolene mesh sling	Vaginal pain and obstructive voiding symptoms	Time of RSC w/AFL	1(1)	0(3)	0(1)	MUI (MUI)
4	69	Lynx bladder suspension tape	Bladder filling and obstructive voiding symptoms, vaginal pain	Mesh sling removal prior to RSC w/AFL	2(3)	0(3)	0(0)	UUI (MUI)
5	77	None	–	–	0(3)	0(3)	0(2)	None (SUI)
6	54	Retropubic bone anchor sling with cadaveric fascia	Bladder filling symptoms and vaginal pain	Staged sling removal × 2 prior to RSC w/AFL	0(2)	0(3)	0(2)	UUI (MUI)
7	66	RSC mesh with transobturator (TOT) sling	Groin pain, leg pain and systemic rash	Robotic removal of RSC mesh and transvaginal removal of TOT with groin dissection	2(3)	2(3)	2(2)	MUI (none)
8	46	Anterior vaginal mesh	Vaginal exposure, vaginal pain and dyspareunia	Staged mesh removal × 2	0(1)	0(3)	0(2)	None (none)
9	56	Uretrex midurethral sling	Mesh erosion causing urethrovaginal fistula	Mesh removal with fistula repair prior to RSC w/AFL	3(4)	0(4)	0(2)	MUI (MUI)
10	76	Anterior Elevate mesh, MiniArc sling and posterior cadaveric graft	Mesh exposure and dyspareunia	Removal of anterior mesh, MiniArc sling and posterior cadaveric graft prior to RSC w/AFL	2(2)	0(3)	0(2)	None (UUI)
11	72	Anterior vaginal mesh	Not removed	Not removed	0(2)	0(3)	0(1)	MUI (MUI)
12	74	TVT sling	Not removed	Not removed	0(2)	0(3)	0(3)	None (UUI)

BW Baden-Walker grading, *A* anterior, *Ap* apical, *P* posterior, *UI* urinary incontinence, *UUI* urge urinary incontinence, *MUI* mixed urinary incontinence, *SUI* stress urinary incontinence

*This patient did not return to clinic postoperatively for an examination but denied UI and sensation of vaginal bulge on telephone follow-up

Table 2 Patient characteristics and management of the three patients who experienced recurrent symptomatic prolapse after RSC with AFL

Age (years)	Prior mesh	Indication for mesh removal	Concomitant procedures w/RSC	F/u (months)	Post-op (Pre-op) BW A	Post-op (Pre-op) BW Ap	Post-op (Pre-op) BW P	Sensation of vaginal bulge, Interventions	Time to sensation of recurrence (months)
73	MUS, SC	Osteomyelitis of sacrum and vaginal mesh exposure	Removal of SC mesh and MUS, C, R	39	2 (1)	1 (0)	2 (3)	Minimally bothersome, no intervention	10.4
56	MUS	Mesh erosion causing urethrovaginal fistula	AFL sling, C, R, PR	11.8	3 (4)	0 (4)	0 (2)	Bothersome, fitted with pessary	1.3
76	A, MUS, PC	Vaginal mesh exposure causing dyspareunia and pain	C, R, PR	7	2 (2)	0 (3)	0 (2)	Bothersome, underwent anterior colporrhaphy w/AF 7 months after RSC	4

BW Baden-Walker grading, *A* anterior, *Ap* apical, *P* posterior, *F/U* follow-up, *MUS* midurethral sling, *SC* sacrocolpopexy mesh, *A* anterior vaginal mesh, *PC* posterior cadaveric graft, *RSC* robotic sacrocolpopexy, *C* cystocele repair, *R* rectocele repair, *AFL* autologous fascia lata sling, *PR* perineal reconstruction 2

up of 14.7 months (5.7 to 39 months). The median PGI-I response was two out of five (range, 1–3, very much to a little better). The lowest satisfaction score reported was a 3 (a little better), with no patients reporting no change or being worse after surgery.

Discussion

The goals of POP surgery include correction of anatomy and function, improvement of patient satisfaction and avoidance of complications. It is clear that the use of graft material, particularly synthetic mesh, to augment prolapse repair improves anatomic outcome and decreases the rate of repeat surgery for prolapse compared with native tissue repair [11]. However, it is associated with risks including mesh exposure and erosion. For patients who are at high risk of mesh erosion or desire a primary or salvage repair without a mesh graft, options include native tissue repair or a repair augmented with autologous fascia or biologic graft. We present the first description of the technique for minimally invasive RSC with AFL performed as a salvage procedure and for primary repair, along with initial outcomes.

After a median follow-up of 14.7 months, there were no anatomic recurrences and persistence of apical prolapse BW grade 2 or above. Nine patients (75%) reported subjective cure of bulge symptoms, and three (25%) reported a recurrent sensation of a vaginal bulge. All three experienced symptomatic anterior vaginal wall prolapse with only one of the three (8.3%) electing to undergo reoperation for recurrent anterior vaginal wall prolapse. Two additional patients developed BW grade 2 anterior vaginal wall prolapse but remained asymptomatic. Patient satisfaction was high with a median PGI-I response of 2 (much better) and all patients reporting at least slight improvement. No patients experienced symptomatic postoperative leg hematoma or hernia at the graft harvest site, and there were no significant intraoperative complications.

In a large systematic review and meta-analysis of outcomes after RSC, objective and subjective cure rates were found to be between 84 and 100% and 92 to 95%, respectively [12]. The reoperation rate for apical prolapse after RSC has been reported at 0–1.4% and 2.5–7.8% for non-apical prolapse [13–15]. We report comparable rates of apical prolapse cure; however, our series demonstrated recurrent anterior vaginal wall prolapse of grade 2 or above in 5 patients (41.7%). The subjective cure rate was 75% and our re-operation rate for recurrent prolapse was 8.3%. Given that RSC with AFL was performed as a salvage procedure in 9 out of 12 of our patients, these outcomes appear appropriate, particularly given the high satisfaction reported by patients and very low complication rate. Treatment of recurrent prolapse can be very challenging and has been shown to have lower success rates, even when augmented with a graft [16].

The median operative time of 225 min reported in this study included the time from skin incision to closure, including harvest of AFL, repositioning of the patient, docking of the robot and various other concomitant procedures. In addition to RSC, 2 patients also underwent concomitant supracervical hysterectomy, 1 underwent pubovaginal sling with AFL, 3 underwent concomitant mesh removal, and 11 underwent vaginal repair of anterior and posterior vaginal wall prolapse as well as perineorrhaphy. This operative time is appropriate when compared with the time reported for RSC with mesh for primary repair reported in the literature of 125–251 min [17–19].

When considering modifications that could be made to improve the anatomic outcomes of our technique for RSC with AFL, the use of a wider strip of fascia and the use of a longer strip to allow for configuration into a "Y" shape with attachment to the anterior and posterior vaginal walls, as opposed to our "L" shape attached only to the anterior vaginal wall, should be evaluated. These modifications could improve the tensile strength of the graft and may provide more optimal support to all three compartments of the vagina. A study on evaluation of optimal mesh grafts on cadaver models showed that mesh widths of 2–3 cm provide improved repair strength for sacrocolpopexy compared with 1 cm [20]. To reduce the operative time, the FL could also be harvested with the patient already in the lithotomy position prior to docking the robot. We have successfully done this in several patients with favorable anatomy.

We use delayed absorbable suture rather than permanent suture to secure the graft in place to avoid the potential risk of suture erosion into the bladder or vagina. In our experience, patients who select a fascial graft over mesh have a strong aversion to permanent suture as well. Research has shown similar failure rates for ASC performed with delayed absorbable and permanent sutures [21].

Prior studies comparing cadaveric fascia lata with mesh in abdominal SC suggest that cadaveric fascia has anatomic cure rates vastly inferior to mesh and therefore is not likely to provide equivalent or better outcomes than AFL [22, 23]. The objective anatomic success rate for abdominal SC at 5 years was reported to be 93% compared with 62% for cadaveric fascia in one study [22] and 89% with mesh and 61% with irradiated cadaveric fascia lata at mean follow-up of 26.3 months and 21.1 months, respectively [23]. One retrospective review comparing outcomes of apical prolapse recurrence after ASC among different grafts found a recurrence rate of 11% with Pevicol graft, 7% with autologous fascia and 1% with synthetic mesh at a mean follow-up of 1.1 years ($p = 0.011$) [24].

There is no established standard of care for mesh removal and concomitant prolapse repair. Some argue for a staged approach in which patients undergo mesh removal first, allowing tissue to heal primarily, followed by possible reoperation to address recurrent or persistent prolapse in the same location as where the mesh was removed or in a different compartment [4]. An alternative approach is to remove mesh and perform prolapse repair with native tissue or graft augmentation at the same time. The rate of prolapse recurrence has been reported to be higher with complete mesh removal compared with partial removal [25, 26].

There is also some controversy as to whether or not sacrocolpopexy can adequately address multi-compartment prolapse. Anterior vaginal wall prolapse is strongly associated with apical prolapse and deficient level I support [27, 28]. Sacrocolpopexy alone should therefore restore adequate anterior vaginal wall support in many women. However, given that anterior vaginal wall prolapse has been shown to be the most common site of prolapse recurrence or persistence after sacrocolpopexy [28], it is not unreasonable to address the anterior compartment with transvaginal repair in the attempt to augment support provided by the restoration of apical support at the time of sacrocolpopexy. Surgeons also disagree as to whether or not a concomitant posterior repair at the time of sacrocolpopexy is necessary to repair posterior vaginal wall prolapse at the time of sacrocopopexy, with both techniques reported in the literature [29, 30]. In the cohort of patients at high risk for prolapse recurrence described in this study, it has been our practice to perform transvaginal repair of anterior and posterior vaginal wall prolapse with perineorrhaphy at the time of RSC with AFL in select patients.

This study is limited by its retrospective nature, lack of validated questionnaires to assess pre- and postoperative patient symptoms, small cohort and short-term follow-up. The use of the BW scale, rather than Pelvic Organ Prolapse Quantification System (POP-Q), to report examination findings and the lack of surgeon blinding on postoperative examination are additional limitations of the study design. The BW scale was used because of surgeon preference based on training.

RSC can be performed with AFL and should be considered in patients with a history of mesh complications who desire a minimally invasive repair. Overall patient satisfaction was high, and the subjective and objective cure rates were appropriate. While these short-term outcomes are encouraging, further studies are needed to assess the long-term durability of anatomic results.

Compliance with ethical standards

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