

Original Research

Comparison of Anterior and Posterior Approach Bilateral Sacrospinous Ligament Fixation for Vaginal Vault Prolapse

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Abstract

Background: We aimed to investigate the outcomes of anterior and posterior approaches in patients who underwent sacrospinous ligament fixation for apical prolapse. **Methods:** The study included hysterectomized women with grade ≥ 2 apical prolapse according to the Pelvic Organ Prolapse Quantification (POP-Q) system, who presented to our center between 2019 and 2022. Out of the 48 patients included in the study, 24 underwent posterior bilateral sacrospinous ligament fixation (PB-SSLF), while the other 24 underwent anterior bilateral sacrospinous ligament fixation (AB-SSLF). Postoperative anatomical recurrence of anterior vaginal wall prolapse, according to the POP-Q system, was defined as follows: cystocele $\geq$ stage II (Aa or Ba ≥ -1 cm), recurrent apical prolapse $\geq$ stage II (C ≥ -1 cm), and posterior vaginal wall prolapse $\geq$ stage II (Ap or Bp ≥ -1 cm). Postoperative follow-up visits were scheduled routinely at 1, 3, 6, and 12 months after the operation, and then annually. Complications were recorded according to the Clavien-Dindo classification. Rates in the groups were compared using the Chi-square test. Independent two-group comparisons of numerical variables were performed using the Student *t*-test when the normal distribution assumption was met and the Mann-Whitney U test when the assumption was not met. The significance level (alpha) was set at $p < 0.05$. **Results:** No significant difference was observed in terms of postoperative anterior recurrence between the groups that underwent bilateral anterior and posterior SSLF (16.7% each). Regarding the operation durations, the group that underwent AB-SSLF had longer operation times compared to the group that underwent PB-SSLF (80 minutes and 42.5 minutes, respectively). A higher incidence of postoperative urinary dysfunction was observed in patients who underwent anterior bilateral sacrospinous ligament fixation ($p = 0.012$). No grade 3b or higher complications were observed according to the Clavien-Dindo classification. **Conclusions:** AB-SSLF is an effective method in the surgical treatment of apical and anterior pelvic prolapse. However, the anterior compartment failure rate is still a limitation. Further research is required to investigate its long-term efficacy.

Keywords: apical prolapse; anterior approach; bilateral sacrospinous ligament fixation (BSSLF); pelvic organ prolapse

1. Introduction

Pelvic organ prolapse (POP) is a common condition that significantly affects the quality of life of patients [1]. With the aging population, the prevalence of women with POP is projected to increase from 3.3 million to 4.9 million in the next 40 years [2]. Sacrospinous ligament fixation (SSLF) was initially described by Richter in 1968 as a vaginal approach for the restoration of apical prolapse [3]. In addition to the advantages of repairing concomitant defects such as cystocele and rectocele, SSLF carries risks when performed with posterior surgical approaches such as pudendal nerve injury, vascular injury, chronic pain, dyspareunia, and a 30% risk of de novo cystocele [4]. In 2019, the use of vaginal mesh for anterior compartment prolapse was banned by the Food and Drug Administration (FDA), which led pelvic floor surgeons to seek alternative options, bringing vaginal SSLF back into focus [5].

The anterior approach has been less defined and studied compared to the traditional posterior approach. There is limited literature reporting surgical outcomes following the anterior approach. Particularly, the traditional posterior approach, by increasing the load on the anterior compartment,

raises the hypothesis of whether the alternative anterior approach with SSLF can prevent anterior recurrence. Based on this hypothesis, we aimed to investigate the surgical outcomes of anterior bilateral SSLF (AB-SSLF) and posterior bilateral SSLF (PB-SSLF).

2. Materials and Methods

This retrospective cohort study consisted of hysterectomized women with stage ≥ 2 apical prolapse who presented to our center and underwent vaginal pelvic surgery from March 2019 to March 2022. The study included 48 patients, with 24 undergoing bilateral posterior sacrospinous ligament fixation and 24 cases undergoing bilateral anterior sacrospinous ligament fixation. The exclusion criteria in our study were as follows: emergency cases, treatment of non-gynecological issues, malignancy, connective tissue disorders, immunodeficiency, and cases with any contraindication for pelvic surgery.

The demographic information and characteristic features of the patients (age, smoking status, duration of menopause, etc.) were recorded in the case report forms. The hysterectomy histories of the patients, including any



anterior and posterior repairs or suspension operations, were accessed from our hospital's digital system records, national e-portal systems, or previous surgical reports. All patients in our study (48 patients) had previously undergone hysterectomy for benign reasons. During the follow-up period, the following data were added to the patient records: the start and end time of anesthesia (operation duration), intraoperative blood loss documented by surgeons immediately after the surgery (in milliliters), intraoperative and postoperative complications (such as bladder injury, rectal injury, ischiorectal abscess, hematoma, paresthesia (gluteal pain), postoperative need for blood transfusion, and complications at the surgical site (such as cellulitis).

All subjects underwent preoperative standardized assessments of pelvic organ prolapse, Q-tip testing, and multichannel urodynamic testing. Resting and straining angles were recorded. Urethral hypermobility was defined as a resting or straining angle $>30^\circ$ from the horizontal. Surgeons were blinded to the results of urodynamic testing, including the cough stress test with prolapse reduction. Each clinical site was assigned two methods of prolapse reduction that they used throughout the trial (manual, large cotton swab, ring forceps, pessary, and split speculum). Pessary reduction used a ring pessary with support, with the size chosen by the research staff to be loose-fitting but large enough to be retained during Valsalva and cough provocation.

Postoperative surgical failure was assessed by a team which is independent and separate from the surgical team, using the Pelvic Organ Prolapse Quantification (POP-Q) system. Complications were recorded according to the Clavien-Dindo classification. Anatomical recurrence of anterior vaginal wall prolapse (according to the POP-Q system) was defined as follows: cystocele $\geq$ stage II (Aa or Ba ≥ -1 cm), recurrent apical prolapse $\geq$ stage II (C ≥ -1 cm), and posterior vaginal wall prolapse $\geq$ stage II (Ap or Bp ≥ -1 cm). Postoperative assessment included evaluating lower urinary tract symptoms, postoperative de novo incontinence or urinary dysfunction, as well as findings such as urinary retention. Routine postoperative follow-up visits were planned at 1, 3, 6, and 12 months after the operation, followed by annual visits. The subjective evaluation was performed according to the Patient Global Impression of Improvement (PGI-I) [6]. A low score on the PGI-I indicates an overall improvement in a woman's perception of her condition after treatment (PGI-I score of 1 or 2 = very much better and much better, respectively).

The retrospective study received ethical approval from the Istanbul Prof. Dr. Cemil Taşcıoğlu City Hospital Clinical Research Ethics Committee, with approval NO: 368. Written permission has also been obtained from the institutions where the research was conducted, and informed consent has been obtained from the patients. The study was conducted in accordance with the Principles of the Declaration of Helsinki.

2.1 Surgical Operation Methods

AB-SSLF: following the infiltration of the anterior vaginal wall, a midline anterior colpotomy was performed, extending from approximately 2 cm below the urethral meatus to approximately 2 cm before the cervix. Subsequently, the paravesical space was dissected, and bilateral openings were made to expose both sacrospinous ligaments. Vaginal fixation was performed using a pelvic floor anchor system, and after the dissection of the vesicovaginal fibromuscular tissue for anterior repair, vaginal wall repair (colporrhaphy anterior) was performed. Any additional concurrent surgeries were performed at the discretion of the surgeon and based on medical indications, including rectocele and enterocele repairs.

PB-SSLF: following infiltration of the posterior vaginal wall, after the rectum is retracted, the perirectal space is dissected to expose bilateral sacrospinous ligaments. Vaginal fixation is performed using a pelvic floor anchor system. Additional repairs such as anterior, posterior, or enterocele repairs are performed as indicated based on medical indications.

2.2 Statistical Methods

SPSS 15.0 (IBM Corp., Armonk, NY, USA) for Windows program was used for statistical analysis. Descriptive statistics were presented as numbers and percentages for categorical variables, and as mean, standard deviation, median, minimum, maximum, and median for numerical variables. The Chi-square test was used to compare proportions between groups. Independent two-group comparisons of numerical variables were performed using the Student *t*-test when the assumption of normal distribution was met, and the Mann-Whitney U test when the assumption was not met. The significance level (α) was set at $p < 0.05$.

3. Results

The mean age in the AB-SSLF and PB-SSLF groups was 59.8 ± 6.3 and 60.0 ± 6.5 , respectively. The patients' hysterectomy histories and performed surgeries are summarized in Table 1. There were no statistically significant differences in demographic and characteristic features between patients who underwent the two types of surgeries (Table 1).

There was no significant difference observed in terms of hospital stay between the two surgical procedures. The mean operation time for AB-SSLF was 80 minutes, which was significantly longer than PB-SSLF ($p \leq 0.001$). According to the Clavien-Dindo classification, no complications of Grade $>3b$ were observed in our study. Regarding postoperative urinary function, four patients in the AB-SSLF group experienced symptoms of overactive bladder, and 3 patients had difficulty in urination (retention). Two patients in the AB-SSLF group had bladder injuries. Patients with retention were managed with a catheter and re-

Table 1. Demographic and characteristic features of the patients.

		AB-SSLF	PB-SSLF	<i>p</i>
Age Mean $\pm$ SD (Min–Max)		59.8 $\pm$ 6.3 (48–69)	60.0 $\pm$ 6.5 (49–71)	0.929*
BMI Mean $\pm$ SD (Min–Max)		27.6 $\pm$ 1.4 (25–30)	28.0 $\pm$ 1.0 (26–30)	0.238 [#]
Smoker n (%)		7 (29.2)	10 (41.7)	0.365 [£]
Systemic disease n (%)	None	11 (45.8)	7 (29.2)	0.642 [£]
	DM	0 (0.0)	1 (4.2)	
	HT	8 (33.3)	9 (37.5)	
	CAD	3 (12.5)	2 (8.3)	
	DM+HT	2 (8.3)	4 (16.7)	
	COPD	0 (0.0)	1 (4.2)	
Previous operation(s) n (%)	TAH	0 (0.0)	2 (8.3)	0.226 [£]
	VAH	1 (4.2)	1 (4.2)	
	VAH+CA	1 (4.2)	2 (8.3)	
	VAH+CA+CP	17 (70.8)	11 (45.8)	
	VAH+CP	0 (0.0)	4 (16.7)	
	VAH+MC	1 (4.2)	2 (8.3)	
	TLH	1 (4.2)	1 (4.2)	
	VAH+USLS	3 (12.5)	1 (4.2)	
Menopause Duration (years) Mean $\pm$ SD (Min–Max)		13.0 $\pm$ 6.5 (2–22)	16.0 $\pm$ 5.8 (4–26)	0.094*

*Student *t* Test, [#]Mann Whitney U test, [£]Chi-squared Test.

SD, standard deviation; BMI, Body Mass Index; DM, Diabetes Mellitus; CAD, Coronary Artery Disease; HT, Hypertension; COPD, Chronic Obstructive Pulmonary Disease; TAH, Total Abdominal Hysterectomy; VAH, Vaginal Hysterectomy; CA, Colporrhaphy anterior; CP, Colporrhaphy posterior; MC, McCall culdoplasty; TLH, Total Laparoscopic Hysterectomy; USLS, Uterosacral Ligament Suspension; AB-SSLF, anterior bilateral sacrospinous ligament fixation; PB-SSLF, posterior bilateral sacrospinous ligament fixation.

Table 2. Operation Characteristics.

		Performed surgery		
		AB-SSLF	PB-SSLF	
Previous operation(s) n (%)	CA	21 (87.5)	22 (91.7)	-
	CA+CP	3 (12.5)	2 (8.3)	
Length of stay Mean $\pm$ SD (Min–Max)		2 (1–3)	1 (1–3)	0.105 [#]
Operation duration (minutes) Mean $\pm$ SD (Min–Max)		80 (45–105)	42.5 (30–65)	<0.001 [#]
Estimated amount of bleeding (mL) Mean $\pm$ SD (Min–Max)		80 (50–95)	80 (60–200)	0.059 [#]
Post-op Urination Functions n (%)	No change	17 (70.8)	24 (100)	0.012
	OAB	4 (16.7)	0	
	Difficulty in urination, retention	3 (12.5)	0	
Intraoperative/postoperative complication n (%)	Bladder injury	2 (8.3)	0	0.026
	Hematoma	0	1 (4.2)	
	Paresthesia	0	2 (8.3)	
	Dyspareunia	0	3 (12.5)	
	None	22	18 (75.0)	
Follow-up Time Median (Min–Max)		36 (7–48)	36 (4–48)	0.338
Recurrence n (%)		4 (16.7)	4 (16.7)	1.000

[#]Mann Whitney U test.

CA, Colporrhaphy anterior; CP, Colporrhaphy posterior; OAB, Overactive bladder.

turned to normal function after 5 days. In the PB-SSLF group, 2 patients developed gluteal paresthesia. The median follow-up duration for the patients was 36 months. The

recurrence rate in both groups was 16.7%, and no statistically significant difference was observed. The findings are summarized in Table 2.

Table 3a. The Ba, C, and Bp points on the POP-Q scale for both surgeries.

		AB-SSLF	PB-SSLF	$p^{\#}$
		Median (Min–Max) (cm)	Median (Min–Max) (cm)	
Ba	Pre-op	2.5 (1–6)	3 (1–6)	0.538
	Post-op	–2 (–3–3)	–2 (–3–3)	0.341
C	Pre-op	4.25 (2.5–7)	3 (1–5.5)	<0.001
	Post-op	–4.5 (–6–4)	–4 (–6–3)	0.288
Bp	Pre-op	2 (1–2)	2 (1–2)	0.118
	Post-op	–1.5 (–3–2)	–2 (–3–1)	0.327

[#]Mann Whitney U test.

POP-Q, Pelvic Organ Prolapse Quantification; Pre-op, Preoperative; post-op, Post-operative.

Table 3b. The difference in Ba, C, and Bp points on the POP-Q scale for both surgeries.

		AB-SSLF			PB-SSLF			<i>p</i>
		Mean	SD	95% CI	Mean	SD	95% CI	
Pre-op Ba	Post-op Ba	4.42	2.85	3.21 5.62	4.17	1.90	3.37 4.97	0.453
Pre-op C	Post-op C	7.67	3.51	6.18 9.15	5.92	3.14	4.59 7.24	0.028
Pre-op Bp	Post-op Bp	2.58	1.89	1.79 3.38	3.35	1.47	2.73 3.98	0.119

95% CI, 95% confidence interval.

The Ba, C, and Bp points on the POP-Q scale for both surgeries are summarized in Table 3a. There was no statistically significant difference observed in the postoperative measurements between the C points. The difference in the preoperative-to-postoperative C level was statistically significantly higher in patients who underwent AB-SSLF compared to those who underwent PB-SSLF. There was no statistically significant difference observed in the preoperative-to-postoperative Ba and Bp levels and their differences between the surgical types (Table 3a and Table 3b). Regarding functional outcomes, the patient global impression scale (PGI) showed good results with 98% of patients reporting considering themselves to be in a “very much better” or “much better” condition compared to before the operation. No significant difference was observed between the 2 groups.

4. Discussion

In our study examining the effect of anterior approach on anterior compartment prolapse compared to the posterior approach, no significant difference was observed in terms of anterior prolapse between the two groups. However, it was found that AB-SSLF was more effective than PB-SSLF in terms of apical prolapse. In particular, the posterior approach can lead to vaginal retroversion and pave the way for cystocele formation on the anterior vaginal wall. Researchers have emphasized the importance of preserving the length of the anterior vaginal wall during SSLF surgery as a key point in preventing anterior prolapse [7]. In a similar study, authors have recommended recognizing and repairing anatomical defects in the anterior wall [8]. We also support the same idea. Contrary to common knowl-

edge, the idea of whether we can prevent anterior compartment prolapse with anterior approach compared to the posterior approach has been discussed in various studies. In a pilot study, a 37% anterior prolapse rate was reported in the group of patients who underwent anterior natural tissue repair and AB-SSLF, and a 16% difficulty in resuming voiding was observed in the same study [9]. In our study, the recurrence rate in the AB-SSLF group was 16.7%, and all recurrences were observed in the anterior compartment. PB-SSLF recurrence may be due to various factors such as natural tissue weakness in older patients after surgery, neuropathy associated with significant vaginal dissection in the traditional method, or anatomical disruption inherent to the procedure. The lower rate of recurrent prolapse in our study may be attributed to the use of an anchoring system that requires less vaginal dissection compared to traditional open SSLF technique. In a study on SSLF with a 5-year follow-up, a recurrence rate of 70% for anterior prolapse was reported; although unilateral and bilateral SSLF were performed in that study, the distinction between anterior and posterior SSLF was not specified [10]. In a recently published study comparing the 5-year surgical outcomes of uterosacral ligament suspension to sacrospinous ligament fixation in women with advanced (stage III–IV) prolapse, the failure rate was found to be 71.5% [11]. In our study, with a median follow-up duration of 36 months, the success rate was 83.7%.

In SSLF, intraoperative and postoperative complications are rare. In a study comparing different routes for vaginal apical suspension (SSLF, uterosacral ligament suspension, and minimally invasive sacrocolpopexy), reoperation for complications in the short term after SSLF oc-

curred in 1.2% of cases [12]. The most common reasons for reoperation were vaginal bleeding and hematoma. In our study, urinary retention was more frequently observed in patients who underwent AB-SSLF, while pain/paresthesia in the gluteal area was more common in patients who underwent PB-SSLF. Cadaver studies have shown that injury to the branches of the sciatic nerve passing through the sacrospinous ligament, classic nerve entrapment triad (paresthesia, pain, temporary relief with local anesthetic injection), can lead to postoperative pain or nerve dysfunction [13]. Complications such as gluteal pain and paresthesia in our patients resolved after the second postoperative week with analgesic use. In a similar study involving anterior SSLF, voiding difficulties were reported in 37% of patients [14]. In our study, difficulty in urination/retention was observed in 3 patients (12.5%), and patients managed with a catheter returned to normal function after the 5th day. Preoperative urodynamic testing with prolapse reduction in patients with advanced pelvic organ prolapse is commonly used to diagnose occult stress incontinence and to attempt to predict which patients are likely to benefit from an incontinence procedure at the time of prolapse repair. The colpopexy and urinary reduction efforts (CARE) trial demonstrated that adding a Burch colposuspension in stress-continent women undergoing sacrocolpopexy for prolapse significantly reduces postoperative stress incontinence by half [15]. The incidence of new-onset urinary incontinence, especially stress urinary incontinence (SUI), is relatively high after pelvic floor surgery. In one study, a total of 220 continent women with symptomatic apical prolapse who underwent laparoscopic sacrocolpopexy were prospectively evaluated; 100 women had previously undergone a hysterectomy. The incidence of SUI following apical prolapse repair is 23.6%. Subsequent continence procedures were performed in 5.0% of patients [16].

The duration of the surgery can vary across studies. In a similar study, the operation time was 92 minutes, which is close to our operation time [17]. Using a pelvic floor anchor, we performed bilateral SSLF in all of our patients. In a study comparing unilateral and bilateral SSLF using an anchoring system, no significant difference was observed in terms of recurrence rates [18]. In a meta-analysis on apical prolapse surgery, no significant difference was found in absorbable and permanent suture materials used in vaginal suspension with natural tissue [19].

As far as we know, there is no study in the literature that compares AB-SSLF and PB-SSLF. One of the limitations of our study was the small patient cohort and the previous operations rate being that 70% *versus* 45% have already had previous anterior or posterior colporrhaphy, which may affect outcomes. However, one of the strengths of our study was the moderate follow-up duration compared to short follow-up periods in the literature. The fact that the same surgical team performed the operations and indepen-

dent team conducted the follow-ups strengthened our study. Sacrospinous vaginal fixation is a well-established surgical procedure that has been tested over time and holds a definite place in modern pelvic reconstructive surgery.

5. Conclusions

AB-SSLF is an effective method in the surgical treatment of apical and anterior pelvic prolapse.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author Contributions

FŞ—designed the research study. RA—performed the research and analyzed the data. Both authors read and approved the final manuscript. Both authors contributed to editorial changes in the manuscript. Both authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The retrospective study received ethical approval from the Istanbul Prof. Dr. Cemil Taşcıoğlu City Hospital Clinical Research Ethics Committee, with approval NO: 368. Written permission has also been obtained from the institutions where the research was conducted, and informed consent has been obtained from the patients. The study was conducted in accordance with the Principles of the Declaration of Helsinki.

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Conflict of Interest

The authors declare no conflict of interest.

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