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Comparison of the Functional and Anatomical Outcomes of Abdominal Sacrocolpopexy and Vaginal Sacrospinous Ligament Suspension for the Treatment of Apical Prolapse

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ABSTRACT

Background & Objective: Pelvic organ prolapse (POP) is accompanied by a remarkable decline in the quality of life. Determining the best surgical approach for women with POP is difficult because of outcome variations. We compared the outcomes of pelvic organ prolapse (POP) treatment by abdominal sacrocolpopexy (ASC) and vaginal sacrospinous ligament suspension (SSLS) for advanced apical prolapse beyond the level of the hymen (stage≥ II).

Materials & Methods: This retrospective study was conducted on a case series of 58 ASC and 48 SSLS surgeries, which were performed through the posterior approach for advance prolapse during January 2019-April 2020. Pelvic Floor Disability Index (PFDI-20) questionnaire was completed both at the first visit and a year postop. All patients were visited ten days after the procedure and re-visited after 2, 4, 6, and 12 months.

Results: Of a total of 106 women, 80 cases completed the study (n=40 in each group). Within-group analysis showed that the overall score of PFDI-20 and its subscales decreased in both evaluated groups after surgery (P<0.001). However, the between-group analysis revealed that this reduction in the ASC group was statistically significant in the total score of PFDI, POPDI-6, and UDI-6 subscales (P<0.05). In addition, vaginal length was demonstrated to improve in both groups, which was statistically significant in the ASC group (P=0.001). The stage of prolapse was improved in both groups (P<0.001), and it was more significant in the ASC group (P=0.049). There was no statistically significant difference between the SSLS and ASC in terms of the rate of satisfaction (93% vs. 100%; P=0.241).

Conclusion: According to our findings, ASC and SSLS diminished the symptoms of POP. The surgery approach should be chosen based on the condition of patients, POP stage, and the experience of surgeons.

Keywords: Aabdominal Sacrocolpopexy, Apical, Pelvic organ prolapse, Vaginal sacrospinous ligament suspensions

Introduction

Pelvic organ prolapse (POP) occurs in about 50% of parous women and is accompanied by a remarkable decline in the quality of life **(1)**. Several risk factors are correlated with this condition, such as aging, menopause, parity, obesity, congenital connective tissue disorders, neuromuscular damage, and operations, especially hysterectomy **(2)**. The estimated prevalence of POP following all the methods of hysterectomy is approximately 6%-12% **(3)**. Based on the compartment of the prolapse, different symptoms may be manifested, including urinary incontinence, hydronephrosis **(4)**, or defecatory dysfunction, such as a feeling of incomplete rectal emptying **(5)**. Diagnosis is based on the history of the patient, clinical examination, urodynamic study, MRI, CT scan, and ultrasonography **(2)**. Treatment varies depending on several factors, such as the type and stage of the prolapse, disease severity, prolapse cause, associated medical comorbidities, as well as reproductive and sexual status. Therapies encompass conservative techniques, namely pelvic floor exercises and supportive devices, such as pessaries. The previous

study demonstrated that pessary as an effective, affordable, and nonsurgical method, can be a safe treatment option, especially in older women with POP. A nonsurgical conservative approach is considered first-line therapy. The American Urogynecologic Society reported that physicians recommend vaginal pessary for approximately two-thirds of patients as a first-line treatment **(6)**. Bastani *et al.* (2017) **(7)** conducted a randomized clinical trial on 120 women concluding that pessary application for the correction of POP improved patients' quality of life and satisfaction, as well as reducing urinary signs and mass bulging. However, approximately 11% of women need surgery for pelvic floor dysfunction in their lifetime **(8)**.

Two surgical approaches for POP treatment are abdominal sacrocolpopexy (ASC) and vaginal sacrospinous ligament suspension (SSLS) **(9)**. The ASC is regarded as the optimal treatment for vaginal vault prolapse **(10)** and is accompanied by a high success rate and low recurrence rate due to the supporting role of mesh for the vagina **(11, 12)**. However, the long duration of operation and prolonged hospital stay are among the complications of this technique **(13)**. The vaginal approach is considered a superior strategy because of the less-invasive nature and the possibility of the concomitant repair of other vaginal compartments supporting defects in the same setting **(14)**. In old women, SSLS is accompanied by fewer postoperative readmissions and recurrence, compared to the use of synthetic mesh in ASC **(15, 16)**. There are contradictory results and recommendations on the usage of each surgical method. Some studies have shown that ASC is more effective than SSLS in apical prolapse treatment **(17)**, while some reported equal effectiveness for each procedure **(18)**. Some others indicated ASC technique to be associated with higher morbidity showing that in patients with medical disorders, SSLS can be a better choice **(19)**. Therefore, determining the best surgical approach for women with POP is difficult because of outcome variations **(20, 21)**. In the current study, we compared apical POP treatment by ASC and SSLS surgical methods in terms of functional and anatomical outcomes.

Materials and Methods

T Study Design and Participants

This retrospective case series study compared two surgical procedures for advanced apical vaginal prolapse in 80 women with stage ≥ II of POP during January 2019-April 2020. Ethical standards of the Declaration of Helsinki were taken into consideration for the present study. The regional ethical committee approved the study (IR.TBZMED.REC.1400.002), informed consent was taken from all individuals, and the participants were assured concerning data confidentiality.

Study Population, Inclusion Criteria, and Follow-up

During 2019-2020, ASC and SSLS operations were performed for advanced prolapsed in our educational hospital based on the clinical conditions of patients. The patients received consultation and both operation methods, as well as the advantages and disadvantages of each approach, were explained. Informed consent was obtained from all patients before surgery.

At the first visit, the Pelvic Floor Disability Index (PFDI-20) form with Persian validation **(22)** was filled out for each patient. Patients with a history of urinary incontinence received urodynamic examination and asymptomatic patients underwent cough test with full bladder after prolapse reduction. Afterwards, 58 cases underwent the ASC method and 48 patients were candidates for SSLS.

All patients were visited 10 days postop and were re-visited after 2, 4, 6, and 12 months. In addition, the PFDI-20 questionnaire was filled out for each patient in annual follow-ups and all patients were examined to determine apical compartment stage and vaginal length. Patients who did not return for face-to-face visits and examinations 12 months postop were excluded from the study. Finally, 40 patients in both groups were included in the total data analysis.

Data Collection

We collected the demographic characteristics of patients, including age, body mass index (BMI), gravida, parity, menopausal status, past medical or surgical history, and concomitant surgery from their medical records. Moreover, the staging of apical prolapse was determined by the POP quantification (POP-Q) system.

The PFDI-20 was used to determine the prolapse recurrence rate in the two groups **(22)**. The PFDI-20 questionnaire evaluated the functional dysfunctions of the pelvic floor with a focus on POP, and most importantly on urinary and fecal incontinence that influence women's quality of life.

This questionnaire was completed in two stages of pre-operation and 12 months postop. We evaluated the satisfaction of patients with the total outcome of the surgery.

Abdominal Sacrocolpopexy Surgery

We operated on all the patients under general anesthesia and in the specific lithotomy position. In the ASC method, depending on whether the patient had a uterus or not, whether she wanted to preserve the uterus or not, and based on the preference of the surgeon for preserving or removing the cervix or uterus, the cervix or vaginal cuff was attached directly to the anterior longitudinal ligament of S1 vertebra with polypropylene mesh (23) (Y-shaped mesh with two arms attached to the anterior and posterior side of the cervix or vaginal cuff). The posterior arm of the mesh

was attached as down as possible to the rectovaginal fascia. Overall, 5, 10, 24, 18, 3, and 3 patients underwent total abdominal hysterectomy with sacrocolpopexy, hysteropexy, subtotal hysterectomy sacrocervicopexy, perineal defect repair, enterocele repair by Moschcowitz procedure, and concomitant tension-free transobturator tape (TOT) surgery, respectively.

Vaginal Sacrospinous Ligament Suspension Surgery

In the SSLS method, first, an incision was made vertically in the posterior wall of the vagina to expose the rectovaginal space, and vaginal mucosa was dissected from the rectovaginal fascia posteriorly upward to the posterior cul-de-sac. In patients with the uterus, uterosacral ligaments and paracervical rings were sutured (0 Vicryl suture) and attached to the rectovaginal fascia to close the enterocele and repair the paracervical ring. The right pararectal space was bluntly opened and the ischial spine and sacrospinous ligaments were touched. Two or three non-absorbable sutures were passed into the sacrospinous ligament with Capio device in 2-finger width medial to the ischial spine (in patients with the uterus, to the right uterosacral ligament and in patients without a uterus, to the posterior vaginal wall near the vaginal cuff) and the apex was pulled up. One patient had a transvaginal hysterectomy and 34 cases underwent colporrhaphy anterior. All patients experienced posterior colporrhaphy and enterocele repair. Furthermore, seven individuals underwent TOT concomitantly.

Twelve months following the procedure, the PFDI-20 questionnaire was filled out for the patients. In addition, we evaluated vaginal length and the stage of prolapse in the follow-up period. For all the SSLS patients and those ASC cases who underwent TOT surgery, post-void residue (PVR) was checked.

Data Analysis

The data were analyzed using the SPSS software version 21 (IBM SPSS Corp., Armonk, NY, USA). Kolmogorov-Smirnov test was used to assess data normality. Chi-square and Fisher's exact test were applied for categorical variables. In addition, Student's t-test and Mann–Whitney U-test were utilized for continuous variables. P-value < 0.05 was considered statistically significant.

Results

Out of 106 candidates for POP repair surgery, 58 and 48 patients underwent ASC and SSLS, respectively. All cases were visited on day 10 postop and were revisited 2, 4, 6, and 12 months postop. However, 18 patients in the ASC group and 8 subjects in the SSLS group did not return to the hospital for a face-to-face visit. Consequently, we could not complete the questionnaire and examinations for them, and the data of 40 cases were analyzed in each group (Figure 1). The main cause of the lack of follow-up in each group was the COVID-19 pandemic. The demographic characteristics and surgical history of all 80 participants are presented in Table 1. Generally, the main demographic characteristics were similar between the SSLS and ASC groups except for the POP stage (P=0.001), age, and menopause status (P=0.041). All the patients had experienced two or more pregnancies and normal vaginal delivery (NVD). Tables 2 and 3 represent the surgery type and concomitant surgeries, as well as intraoperative outcomes in studied groups. Prior to operation, there was no statistically significant difference between the two groups in terms of PFDI-20 and its subscales (P>0.05).

The results of POP distress inventory-6 (POPDI-6), colorectal-anal distress inventory-8 (CRADI-8), total urinary distress inventory-6 (UDI-6), and also PFDI-20 pre- and post-operation in the SSLS and ASC groups are presented in Tables 4 and 5. The POPDI-6, CRADI-8, UDI-6, and PFDI-20 decreased significantly after treatment in both groups (P<0.001). Between-group analysis showed that the total score of PFDI-20, POPDI-6, and UDI-6 subscales declined significantly in the ASC group, in comparison to the SSLS approach (P<0.001 for both PFDI-20 and POPDI-6; 0.02 for UDI-6), while there was no significant difference in CARDI-8 score between the two groups (P=0.173). In addition, vaginal length was improved in both groups, especially in the ASC group (P=0.001) (Table 6).

The stage of prolapse was enhanced in both groups (P<0.001) and it was more significant in the ASC group (P=0.049). Anatomical characteristics at baseline and postop in the studied groups are presented in Tables 1 and 6. The satisfaction rate was not different between the SSLS and ASC groups (93% vs. 100%; P=0.241) (Table 6).

Wound infection was observed only in one case of the ASC group, who had diabetes and was receiving medication. No patient in the SSLS group had an infection. Urinary tract infection or major bleeding requiring transfusion were not noted in the ASC group, while three cases (7.5%) in the SSLS group needed blood transfusion (P=0.241). Ileus was observed in 5% of patients in the ASC group only (P=0.494). The duration of hospital stay was similar between the two groups. In contrast, the median hemoglobin change (P<0.001) was different between the two groups. In the SSLS group, one case had urinary retention (PVR≥150 ml), for whom a Foley catheter was implemented and kept for 24 h. Next, it was removed and the PVR was rechecked, which was higher than 150 ml requiring clean intermittent catheterization for one week leading to the resolve of her problem (Table 6).

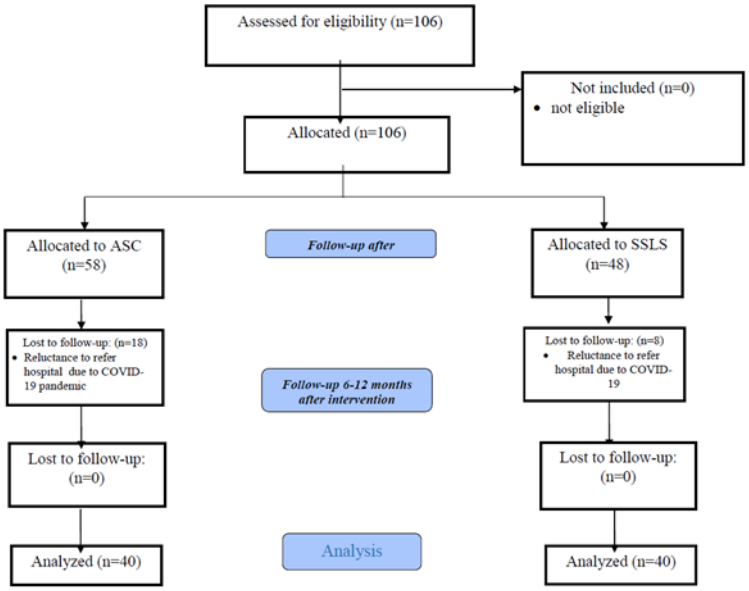

Figure 1. **Flow chart of the study**

Table 1. **The demographic and baseline characterization of patients**

Variables		SSLS (N=40)	ASC (N=40)	P-value
Age (year)		57.90 ± 9.73	49.04 ± 10.39	<0.001**
Gravida		6.15 ± 2.55	5.45 ± 2.91	0.257**
Parity		5.45 ± 2.30	4.92 ± 2.62	0.345**
NVD		5.30 ± 2.28	4.90 ± 2.63	0.471**
BMI		25.74 ± 2.71	26.15 ± 2.78	0.513**
***Previous pelvic surgery**	TAH	3 (7.5)	1 (2.5)	0.343&
	APR	4 (10)	6 (15)	
	PR	1 (2.5)	0	
Morbidity*	No	15 (37.5)	12 (30.0)	0.574&
	HTN	18 (45.0)	23 (57.5)	
	DM	6 (15.0)	2 (5.0)	
	Hypothyroididsm	1(2.5)	2 (5.0)	
	celiac	0 (0.0)	1 (2.5)	
Menopause status*	No	12 (30.0)	22 (55.0)	0.041^
	Yes	28 (70.0)	18 (45.0)	
Stage of POP* (Baseline)	II	1 (2.5)	0 (0.0)	0.001^
	III	38 (95)	24 (68.6)	
	IV	1 (2.5)	11 (31.4)	

Data is mean (±SD). * n (%), ASC: abdominal sacrocolpopexy, SSLS: sacrospinous ligament suspension, BMI Body mass index; NVD: Normal vaginal delivery, APR: Anterior and posterior compartment repair, TAH: Total abdominal hysterectomy and PR: Posterior compartment repair, HTN: hypertension, DM: diabetes mellitus,**independent-t-test; &Fisher's Exact Test; ^ chi-square

Table 2. Intraoperative complications in two groups

Variables		SSLS (N=40)	ASC (N=40)	P-value
Mean hemoglobin change gr/dL	Mean change (SD)	-2.82 (1.23)	-1.62 (0.97)	<0.001&
Major bleeding	N (%)	3 (7.5)	0 (0.0)	0.241*

ASC: abdominal sacrocolpopexy, SSLS: sacrospinous ligament suspension, *Fisher's Exact Test; & independent-t-test;

Table 3. Surgery type and concomitant surgery in two groups

Concomitant surgery	SSLS (N=40)	ASC (N=40)
TOT	7 (17.5)	3 (7.5)
TVH	1 (2.5)	0 (0.0)
prinoraphy	40 (100.0)	18(45.0)
Enterocele repair	40 (100.0)	3 (7.5)
PR	40(100.0)	0
AR	33 (82.5)	0 (0.0)
TH	0 (0.0)	5 (12.5)
STH	0 (0.0)	24(60.0)

* n (%); ASC: abdominal sacrocolpopexy, SSLS: sacrospinous ligament suspension, APR: Anterior and posterior compartment repair, TOT: Transobturator tape, TVH: Total vaginal hysterectomy and PR: Posterior compartment repair, STH: Subtotal hysterectomy, TH: Total hysterectomy.

Table 4. The score of POPDI-6, CRADI-8, UDI-6 and PFDI-20 in the studied groups

Variables	SSLS (n=40)			ASC (n=40)		
	Preoperative	Postoperative	P-value#	Preoperative	Postoperative	P-value#
POPDI-6	66.66 (16.67, (100.0)	0.0 (0, 87.50)*	<0.001	75.0 (29.17, 100))	0.00 (0)	<0.001
CRADI-8	17.18 (0.0, 40.63)	0.0 (0, 28.13)*	<0.001	21.87 (6.25, 34.38)	0.0 (0, 18.75)*	<0.001
UDI-6	22.91 (0.0, 45.83)	0.0 (0, 41.67)*	<0.001	20.83 (8.33, 54.17)	0.0 (0, 33.33)*	<0.001
PFDI-20	109.37 (68.75, 148.33)	14.58 (0, 129.17)*	<0.001	120.31 (54.17, 152.08)	0.0 (0, 33.33)*	<0.001

* Data are presented as median (range). POPDI-6, CRADI-8, UDI-6 and PFDI-20 at postoperative significantly decreased (*P*<0.001) in compare to preoperative in both groups. CRADI-8: Colorectal-anal distress inventory 8, UDI-6: Urinary distress inventory 6, POPDI-6: Pelvic organ prolapsed distress inventory 6, PFDI-20: Pelvic Floor Disability Index and SD: standard deviation, TVL: total vaginal length; #Wilcoxon Signed Ranks Test;

Table 5. Mean change (SD), and median change (range) of POPDI-6, CRADI-8, UDI-6 and PFDI-20 scores in the in the studied groups

Variables	SSLS (n=40)	ASC (n=40)	P-value*
POPDI-6			
Median change (range)	-62.50 (-٨٧.50, 0.0)	-75.0 (-100.0, -29.17)	<0.001
Mean change (SD)	-55.52 (22.01)	-68.75 (12.62)	
CRADI-8			
Median change (range)	-12.50 (-28.13, 0.0)	-12.50 (-31.25, -6.25)	0.173
Mean change (SD)	-14.51 (6.78)	-15.23 (7.39)	
UDI-6			

Variables	SSLS (n=40)	ASC (n=40)	P-value*
Median change (range)	-20.83 (-45.83, 0.0)	-20.83 (-54.17, -8.33)	0.020
Mean change (SD)	-20.00 (12.97)	-25.72 (10.02)	
	PFDI-20		
Median change (range)	-92.18 (-133.33, 0.0)	-112.50 (-152.08, -54.17)	<0.001
Mean change (SD)	-87.86 (30.64)	-109.71 (21.19)	

POPDI-6, CRADI-8, UDI-6 and PFDI-20 at postoperative significantly decreased (P<0.001) in compare to preoperative in both groups. CRADI-8: Colorectal-anal distress inventory 8, UDI-6: Urinary distress inventory 6, POPDI-6: Pelvic organ prolapsed distress inventory 6, PFDI-20: Pelvic Floor Disability Index* Mann Whitney-U-test.

Table 6. Postoperative complications or outcomes and anatomical characteristics at post operation in the studied groups

Variables		SSLS (n=40)	ASC (n=40)	P-value
***Wound infection**		0 (0.0)	1 (2.5)	1.0$
***Urinary retention**		1 (2.5)	0 (0.0)	1.0$
Hospital stay (day)**		4.15 (0.57)	4.20 (0.72)	0.734#
TVL**		7.66 ± 0.66	8.22 ± 0.42	<0.001#
***Stage of POP (Post-operation)**	0	18 (45.0)	28 (70.0)	0.049&
	I	20 (50.0)	11 (27.5)	
	II	2 (5.0)	1 (2.5)	
Satisfaction of patients (%)		92.5%	100%	0.241$

*n (%), ** mean (SD), & Chi-square Test; #independent-t-test; TVL: total vaginal length; $ Fisher's Exact Test

Discussion

Our results showed that both the abdominal and vaginal approaches for repairing POP decreased the symptoms of POP according to the statements of patients.

POP as a common problem among women can occur at any age. Aging, the number of gravida, and NVD increase the risk of POP. In recent years, the elevation in cesarean section rate and decline in family size have led to a drop in the prevalence of POP among young women **(24)**. Pelvic organs disorder has a great influence on the quality of life. According to epidemiological reports, 7%-19% of women experience surgeries for POP in their lifetime **(25)**. Restoration of the organs to their original position and supporting their normal function are the goals of reconstructive surgery. Preventive anti-incontinence surgery besides prolapse restoration may be recommended or not. For example, Bastani *et al.* **(26)** did not recommend routine prophylactic surgery for all patients and it was exclusively recommended to symptomatic patients. In the present study, ten out of 80 surgical cases underwent TOT and among the women who did not have UI surgery, de novo stress UI was not observed during the one-year follow-up.

Some types of reconstructive surgery are performed through the vagina, while others are completed through an abdominal approach or by laparoscopy. The method of surgery (i.e., abdominal or vaginal) depends on several factors, such as age, primary or recurrent POP, the history of hysterectomy, as well as the site and stage of the prolapse **(24)**.

We assessed the outcomes of SSLS and ASC surgeries regarding POP treatment. In the study conducted by Benson *et al.* (17), despite the higher rate of reoperation (40% vs. 13%), operation duration and hospital stay in the SSLS group were lower than that of the ASC approach. Our results showed that hospital stay duration was similar in both groups (P=0.734). In our study, due to the referral of patients from other cities and provinces, the patients were admitted the day before surgery and were not discharged to ensure their condition. Therefore, the duration of hospital stay was longer than the report of Koleli *et al.* **(19)** (2 days vs. 4 days).

The effect of ASC on bowel symptoms is unclear. Some studies showed the worsening of constipation **(27)**, and others reported improvement in obstructed defecation symptoms (28). In the current investigation, the score of CARDI-8 (PFDI-20subgroup) decreased postop. In terms of demographic characteristics, no statistically significant difference was observed in gravida, parity, BMI, previous surgeries, and underlying diseases (P>0.05). All patients were stage ≥ II. Obesity is a critical risk factor for POP. In our research

population, all the patients were overweight, which is consistent with the results of previous studies **(29)**.

The findings of the present study indicated that before surgery, the scores of PFDI-20 and all subgroups (i.e., POPDI-6, CRADI-8, and UDI-6) in the SSLS group were similar to those of the ASC group. Our results showed that the score of PFDI-20 and its subgroups (i.e., POPDI-6, CRADI-8, and UDI-6) significantly decreased within 12 months postop, compared to before surgery in both groups. Generally, both types of surgery reduced the main complications of POP during the follow-up period (with a range of 6-12 months). However, the scores of PFDI-20, POPDI-6, and UDI-6 in the ASC after surgery were significantly lower than those of the SSLS group. In addition, no statistically significant difference was observed between the two groups in terms of the CRADI-8 score postop.

These results are in line with the findings of Ng C *et al.* **(21)**, who indicated that ASC was more effective in POP treatment, especially in the severe POP stage. The recurrence of POP in patients who underwent ASC was lower than vaginal sacrospinous ligament fixation. However, ASC was associated with more hospitalization and higher morbidity. Our results do not support the studies of Köleli *et al.* **(19)** and Marcickiewicz *et al.* **(30)**. In the latter retrospective studies, they found that the success rate of surgery was similar between the ASC and SSLF methods.

In more detail, the lower postop score of POPDI-6 and UDI-6 in the ASC demonstrated the greater effect of ASC on urinary symptoms. The CRADI-8 score between SSLS and ASC groups was similar. Therefore, both methods can have the same impact on bowel symptoms. Some studies demonstrated that constipation and obstructed defecation symptoms improved after ASC **(31, 32)**, while other bowel symptoms are unclear **(33)**. In our study, in contrast to the previous investigations, hemoglobin declined in the SSLS group more than the ASC group because of the extended dissection in the vascular space of cul-de-sac for enterocele repair in the SSLS group **(19)**.

One of the limitations of our study was the COVID-19 pandemic making it difficult for women to return to the hospital. As a result, we were limited in following up the patients in both study groups. In addition, random allocation of patients in study groups was impossible. Further prospective randomized clinical trials are recommended in future studies.

Conclusion

In conclusion, POP is a complex condition that necessitates treatment when the symptoms become more severe. In the present study, we demonstrated that the ASC and SSLS surgeries reduced the symptoms of POP. Moreover, ASC surgery is more effective than SSLS in improving the anatomical and functional outcomes with similar hospital stay duration and lower bleeding rates. The pelvic surgeons must evaluate the condition of patients, POP stage, as well as their own experience to achieve a satisfactory result and prevent a POP recurrence.

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Author's Contributions

Parvin Bastani: Study design, review the manuscript. Malahat Ebrahimpour: Study design, manuscript writing. Fatemeh Mallah: Study design, review the manuscript. Sakineh Hajebrahimi: Study design, review the manuscript. Hanieh Salehi-Pourmehr: manuscript writing, data analysis. The manuscript has been read and approved by all the authors, and each author believes that the manuscript represents honest work.

Conflict of Interest

The authors declared no conflict of interest.

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