

Research Article

Perioperative Morbidity and Short-Term Surgical Outcomes Following Sacrospinous Ligament Fixation in Women with Advanced Uterovaginal Prolapse: A Prospective Observational Study

Dr Chandana M H¹, Dr Chandrashekar K²

Associate professor, department of anaesthesiology, BMCRC, Ballari

Associate professor, department of obg, BMCRC, Ballari

Corresponding Author: Dr Chandrashekar K

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Abstract

Background

Advanced uterovaginal prolapse is a common pelvic floor disorder requiring surgical correction in women with severe pelvic support defects. Vaginal hysterectomy combined with sacrospinous ligament fixation (SSLF) has gained acceptance as an effective vaginal reconstructive procedure that restores apical support while minimizing the risk of postoperative vaginal vault prolapse. Although the anatomical efficacy of SSLF has been extensively reported, perioperative morbidity remains an important determinant of surgical success. Understanding the spectrum of intraoperative and early postoperative complications is essential for surgical planning, patient counselling, and quality improvement in pelvic reconstructive surgery. Prospective Indian data describing perioperative outcomes of SSLF remain limited.

Objective

To evaluate the perioperative morbidity and short-term surgical outcomes associated with prophylactic sacrospinous ligament fixation performed during vaginal hysterectomy for advanced uterovaginal prolapse.

Methods

This prospective observational study included 30 women with Grade III uterovaginal prolapse or procidentia who underwent vaginal hysterectomy with unilateral sacrospinous ligament fixation between October 2023 and July 2025. Operative duration, estimated blood loss, blood transfusion, hospital stay, intraoperative complications, postoperative morbidity, and short-term recovery were prospectively assessed during hospitalization and follow-up.

Results

The mean operative duration was approximately **2.20 hours**, while the mean estimated blood loss was **345 mL**. Seventeen women (56.7%) required no blood transfusion, whereas 12 (40.0%) received one unit and one (3.3%) required two units of packed red blood cells. Intraoperative hemorrhage occurred in one patient (3.3%). Postoperative complications included fever in three patients (10.0%), urinary tract infection in three (10.0%), buttock pain in three (10.0%), and wound infection in one (3.3%). Most patients (66.7%) experienced an uncomplicated postoperative recovery. The mean duration of hospital stay ranged from five to ten days.

Conclusion

Prophylactic sacrospinous ligament fixation performed during vaginal hysterectomy demonstrated an acceptable perioperative safety profile with low intraoperative morbidity and manageable postoperative complications. The procedure can be safely incorporated into vaginal reconstructive surgery for advanced uterovaginal prolapse in appropriately selected patients.

Keywords: Sacrospinous ligament fixation; Vaginal hysterectomy; Perioperative morbidity; Pelvic organ prolapse; Surgical complications; Pelvic reconstructive surgery.

Introduction:

Pelvic organ prolapse (POP) is a very common benign disorder of the pelvic floor in women. The prevalence increases with age, multiparity and menopause. The advanced uterovaginal prolapse typically presents with a protruding vaginal mass, urinary dysfunction, bowel symptoms, pelvic discomfort and a marked decrease in quality of life, requiring surgical treatment in many women.[1,2]

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Vaginal hysterectomy remains the procedure of choice for women with advanced uterovaginal prolapse who have completed childbearing. However, increasing attention has been paid to preservation of apical vaginal support as poor suspension of the vaginal vault is associated with recurrent prolapse and further reconstructive surgery.[3] Sacrospinous ligament fixation (SSLF) is one of the most commonly performed vaginal apical suspension procedures due to its technical simplicity, avoidance of laparotomy, and favorable anatomical outcomes.[4,5]

However, despite these advantages, SSLF is performed in close proximity to major pelvic neurovascular structures. Perioperative morbidity such as hemorrhage, blood transfusion, buttock pain, urinary tract infection, wound infection, and febrile morbidity remains a major concern for surgeons. While these complications are rare, their occurrence affects patient recovery, hospital stay, postoperative satisfaction, and overall surgical success.[6,7]

Prior studies have reported widely varying rates of complications after SSLF, which is attributed to differences in patient characteristics, surgical experience, concomitant pelvic floor surgery, and definitions of peri-operative morbidity. Moreover, most of the available evidence has been from the Western populations, while prospective studies evaluating the perioperative outcomes in Indian women undergoing prophylactic SSLF are relatively few.

Hence, the present prospective observational study was conducted to assess perioperative morbidity and short-term surgical outcome following prophylactic sacrospinous ligament fixation during vaginal hysterectomy in women with advanced uterovaginal prolapse. Operative features, bleeding, transfusion requirement, postoperative complications, time of hospitalization, early postoperative recovery were carefully considered.

Materials and Methods

Study Design

This prospective observational study was conducted to evaluate the perioperative morbidity and short-term surgical results of prophylactic sacrospinous ligament fixation (SSLF) at the time of vaginal hysterectomy for advanced uterovaginal prolapse in women. **The study was conducted in Department of Obstetrics and Gynecology, Vijayanagar Institute of Medical Sciences, Ballari and its**

attached teaching hospitals, Ballari, Karnataka, India from October 2023 to July 2025.

Study Population

Thirty consecutive women with advanced uterovaginal prolapse underwent vaginal hysterectomy combined with unilateral sacrospinous ligament fixation. All eligible patients presenting during the study period were prospectively included after informed consent. The main focus of this manuscript was the evaluation of perioperative surgical outcomes, and not long-term anatomic success. Patients were followed during hospitalization and later for assessment of early postoperative morbidity.

Eligibility Criteria

Inclusion Criteria

Women who fulfilled all of the following criteria were included:

- Uterovaginal prolapse – grade 3.
- Procidentia.
- Proposal for vaginal hysterectomy with sacrospinous ligament fixation.
- Availability for surgery and post-operative follow-up.

These eligibility criteria were consistent with the study objective of assessing prophylactic sacrospinous ligament fixation in women with severe pelvic organ prolapse.

Exclusion Criteria

The exclusion criteria were:

- Past pelvic reconstructive surgery.
- Suspected malignancy, genital tract.
- Active pelvic infection.
- A serious medical condition that prevents surgery.
- Refused to take part in the study.

Preoperative Assessment

A full pre-operative assessment was performed in all patients. Demographic data such as age, parity, duration of symptoms, menopausal status and obstetric history were recorded. Each patient was subjected to general physical examination and systemic examination. Pelvic examination was performed to evaluate the extent of uterovaginal prolapse and concomitant anterior or posterior compartment defects. Objective anatomic assessment was performed preoperatively with the Pelvic Organ Prolapse Quantification (POP-Q) system.

The routine laboratory investigations were:

- Complete blood count.
- Blood grouping and Rh typing

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- Urine analysis.
- Blood glucose estimation.
- Test for renal function.
- Electrocardiography
- Chest x-ray when clinically indicated.

All patients underwent pre-anesthetic evaluation before surgery.

Surgical Procedure

All procedures were carried out under regional or general anesthesia, depending on the appropriateness of anesthesia and institutional practice.

Associated pelvic floor defects were repaired with anterior colporrhaphy, posterior colpoperineorrhaphy, or additional vaginal reconstructive procedures as indicated after vaginal hysterectomy. The right sacrospinous ligament was accessed thru the pararectal space. Then, permanent polypropylene sutures were passed thru the medial portion of the ligament under direct palpation, avoiding injury to adjacent neurovascular structures. The sutures were then passed thru the vaginal vault for secure apical suspension before closure of the vaginal cuff. Hemostasis was achieved meticulously before the completion of the operation.

Assessment of Perioperative Outcomes

The main outcome measures in this study were related to perioperative morbidity and included:

Operational Variables

- Operative duration (hours).
- Estimated blood loss intraoperative (mL)
- Blood transfusion requirement.
- Bleeding during surgery.
- Procedure performed as planned.

Early Postoperative Outcomes

Patients were followed daily with discharge data for:

- Fever.
- Urinary tract infection;
- Pain in the buttocks.
- Infection of the wound.
- Difficulty in urinating.
- Post-operative bleeding.
- Any additional surgical complications.

The length of stay in hospital was recorded for each patient.

Follow-up Patients were seen at routine postoperative visits. Clinical assessment included

Patient Characteristics

wound healing, urinary symptoms, vaginal vault examination and assessment of early postoperative complications. Follow up included assessment for vault granulation tissue and recurrent prolapse if present. The mean follow-up period was 12 months (range, 6 to 18 months).

Outcome Measures

Primary Outcome

In this manuscript, the primary endpoint was perioperative surgical morbidity after sacrospinous ligament fixation.

Secondary Outcomes

Secondary outcome measures were:

Time of operation.

- Approximate volume of blood loss.
- Blood transfusion required.
- Duration of hospitalization.
- Fever.
- Bladder infection
- Buttock pain.
- Infection of the wound.
- General recovery after surgery.

Statistical Analysis

Data were entered prospectively in the study database and were analyzed by descriptive statistical methods. Continuous variables are presented as mean $\pm$ standard deviation (SD) or range and categorical variables as frequencies and percentages. Due to the observational nature of the study and the relatively small sample size, statistical analysis was limited to descriptive reporting of perioperative outcomes. Where appropriate, categorical data are expressed as proportions of the study population. $P < 0.05$ was considered statistically significant for the 2-sided test.

Results

A total of **30 women** with advanced uterovaginal prolapse underwent vaginal hysterectomy with prophylactic unilateral sacrospinous ligament fixation during the study period. All procedures were completed successfully without conversion to an abdominal approach. The analysis presented in this manuscript focuses specifically on perioperative morbidity, operative characteristics, postoperative complications, and short-term recovery.

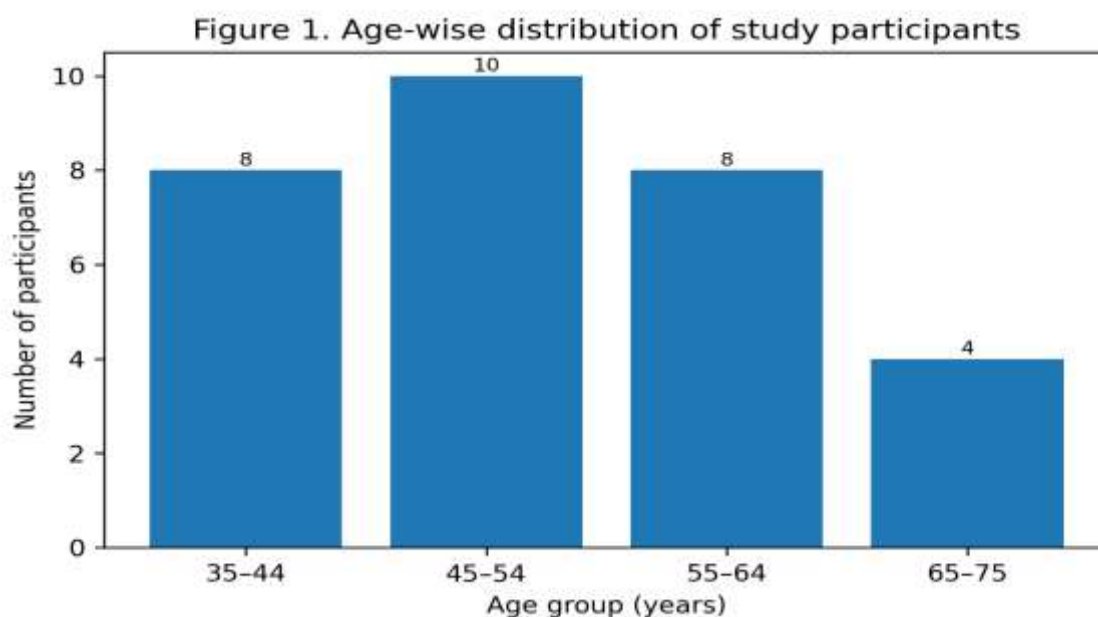
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Table 1. Baseline characteristics of the study population (n = 30)

Variable	n (%)
Age (years)	
35–44	8 (26.7)
45–54	10 (33.3)
55–64	8 (26.7)
65–75	4 (13.3)
Parity	
P1	3 (10.0)
P2	6 (20.0)
P3	8 (26.7)
P4	9 (30.0)
≥P5	4 (13.3)
Degree of prolapse	
Grade III uterovaginal prolapse	26 (86.7)
Procidentia	4 (13.3)

The majority of patients belonged to the **45–54-year age group (33.3%)**, while multiparity was common, with parity four representing the largest subgroup

(30.0%). Most women presented with Grade III uterovaginal prolapse, whereas procidentia was observed in four patients (13.3%).



Operative Characteristics

Table 2. Surgical procedures performed

Procedure	n (%)
Vaginal hysterectomy + Mayoward's repair + SSLF	25 (83.3)
Vaginal hysterectomy + anterior colporrhaphy + SSLF	1 (3.3)
Vaginal hysterectomy + BSO + anterior colporrhaphy + posterior colpoperineorrhaphy + SSLF	4 (13.3)

Most women underwent vaginal hysterectomy with Mayoward's repair in combination with sacrospinous ligament fixation. Additional pelvic floor reconstruction was performed whenever clinically indicated.

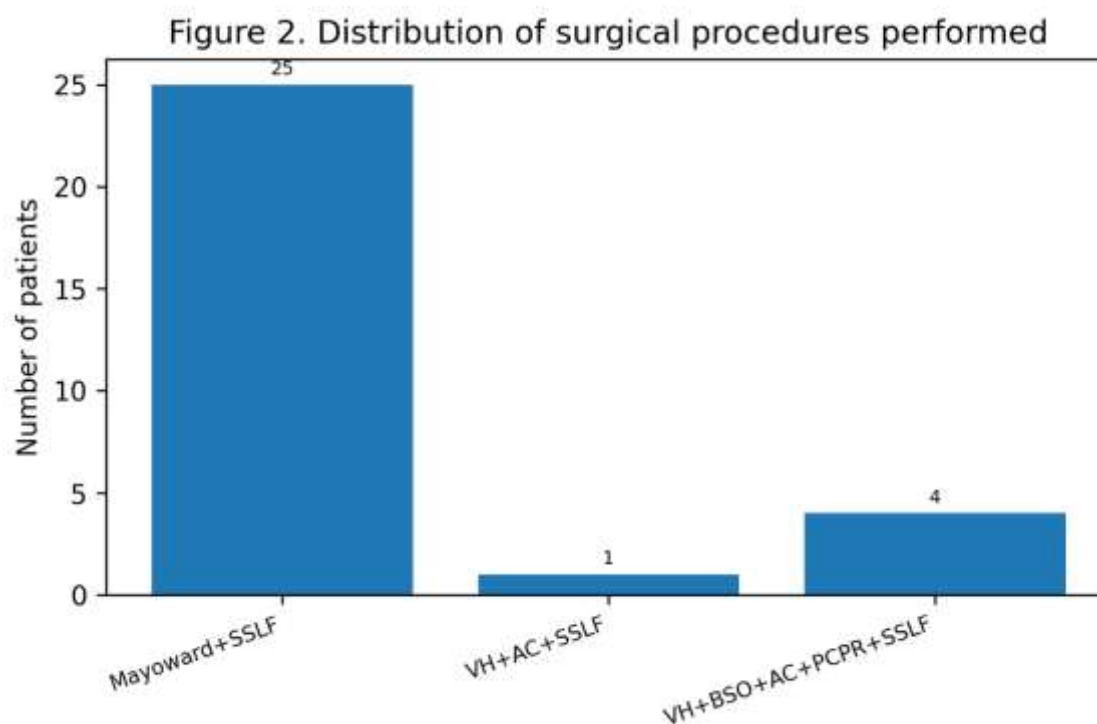
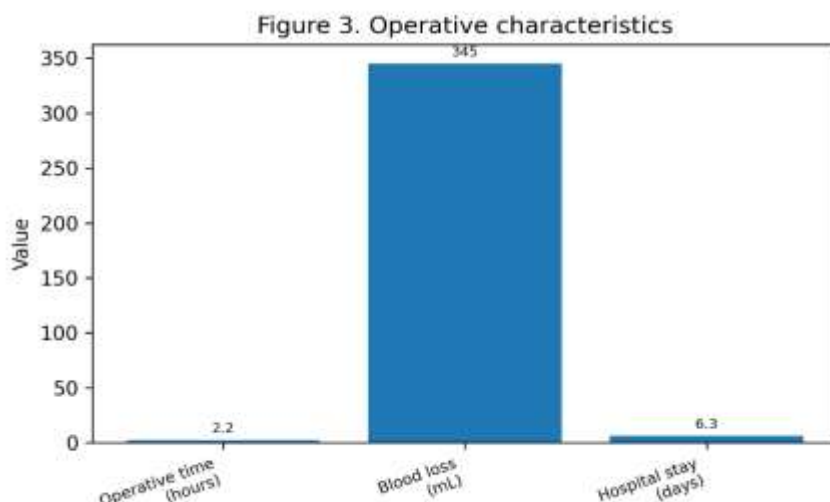


Table 3. Operative outcomes

Variable	Value
Mean operative duration (hours)	2.20 ± 0.40
Range (hours)	1.67–3.08
Mean blood loss (mL)	345 ± 95
Range (mL)	280–750

The mean operative duration was **2.20 ± 0.40 hours**, reflecting the combined vaginal hysterectomy and pelvic reconstructive procedures. Mean intraoperative blood loss was **345 ± 95 mL**, with blood loss ranging from **280 to 750 mL**. No patient required conversion to laparotomy.



Blood Transfusion Requirement

Table 4. Perioperative blood transfusion

Blood transfusion	n (%)
None	17 (56.7)
One unit	12 (40.0)
Two units	1 (3.3)

More than half of the patients (**56.7%**) did not require perioperative blood transfusion. Twelve women (40.0%) received one unit of packed red blood cells, whereas one patient (3.3%) required transfusion of two units because of increased

Hospital Stay

Table 5. Duration of hospital stay

Hospital stay	Value
Mean duration (days)	6.3
Range (days)	5–10

The average postoperative hospital stay ranged between **5 and 10 days**, reflecting satisfactory postoperative recovery in most patients. No patient

Perioperative Morbidity

Table 6. Intraoperative and postoperative complications

Complication	n (%)
Intraoperative hemorrhage	1 (3.3)

intraoperative blood loss. Overall, transfusion requirements remained modest and were consistent with the complexity of combined vaginal reconstructive surgery.

required prolonged hospitalization due to major surgical complications.

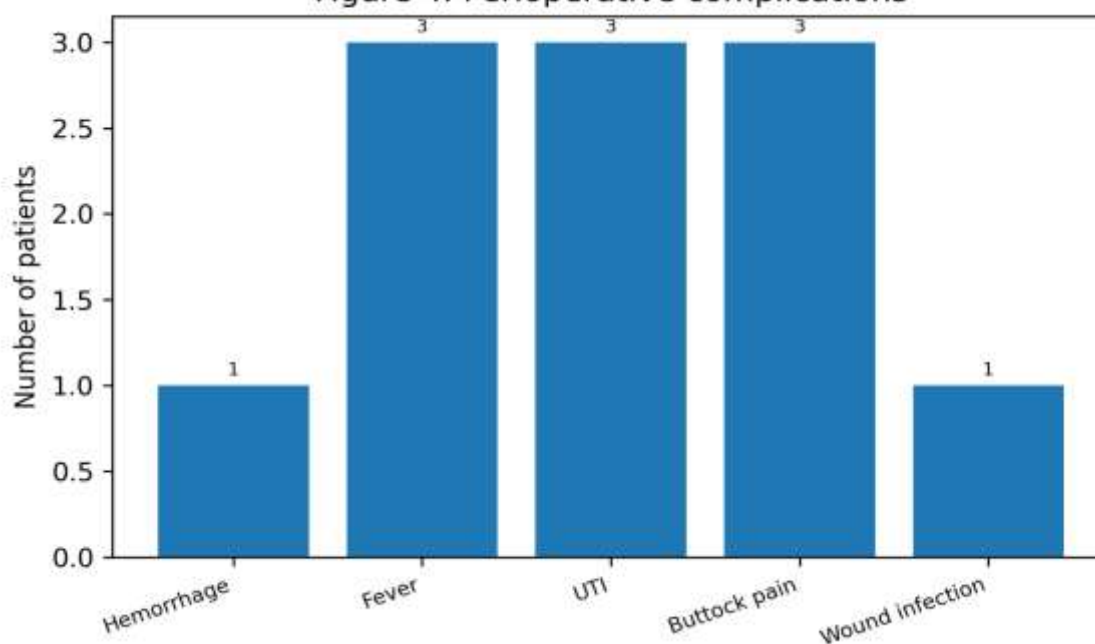
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Fever	3 (10.0)
Urinary tract infection	3 (10.0)
Buttock pain	3 (10.0)
Wound infection	1 (3.3)
No complication	20 (66.7)

Only **one patient (3.3%)** experienced intraoperative hemorrhage. No rectal injury, bladder injury, ureteric injury, vascular injury requiring reoperation, or anesthetic complications were reported in the study. Overall, **66.7%** of women experienced an uncomplicated postoperative recovery. Postoperative fever occurred in three women (10.0%) and responded to conservative management. Urinary tract infection was diagnosed in three patients (10.0%) and was managed successfully with

antibiotic therapy. Buttock pain was reported by three women (10.0%) during the early postoperative period; symptoms gradually resolved with analgesic treatment and none required suture removal. Wound infection occurred in one patient (3.3%) and healed with local wound care and antibiotics. No patient developed pelvic abscess, fistula formation, thromboembolic events, or mortality during the perioperative period.

Figure 4. Perioperative complications



Early Recovery

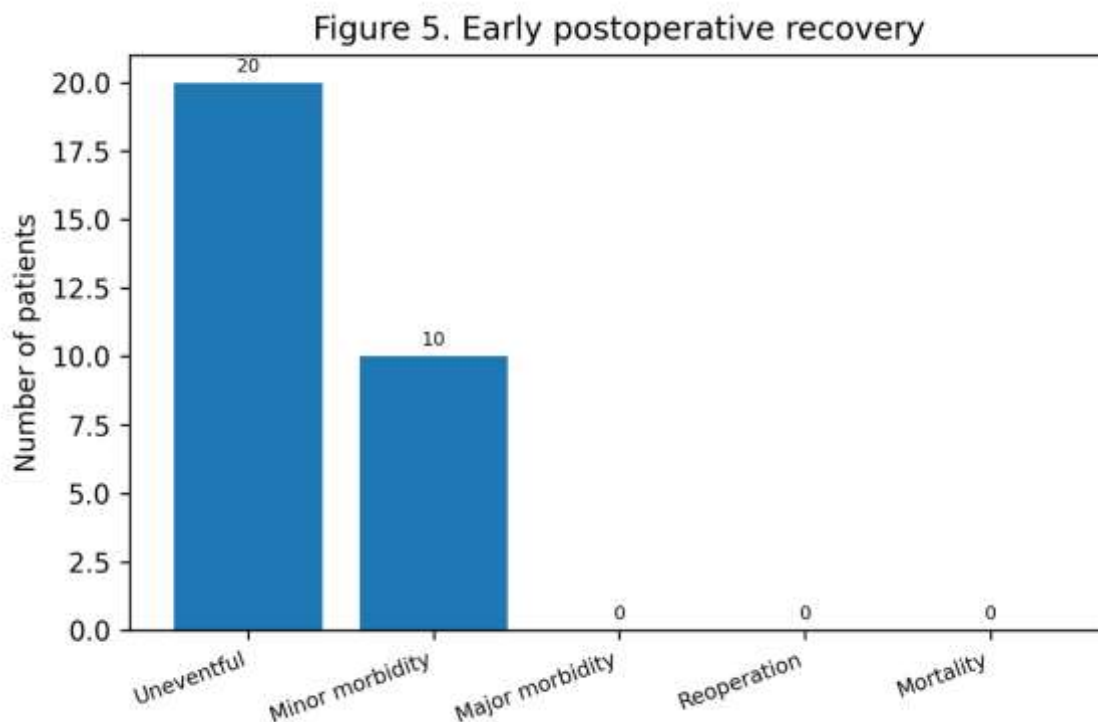
Table 7. Early postoperative recovery

Outcome	n (%)
Uneventful recovery	20 (66.7)
Minor postoperative morbidity	10 (33.3)
Major postoperative morbidity	0 (0)
Reoperation	0 (0)

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Mortality	0 (0)
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Most women experienced an uneventful recovery and were discharged after satisfactory wound healing and restoration of normal bladder function. One-third of the study population experienced only minor postoperative morbidity, which was managed conservatively without additional surgical intervention. No patient required reoperation during the perioperative period, and there were no deaths attributable to surgery.

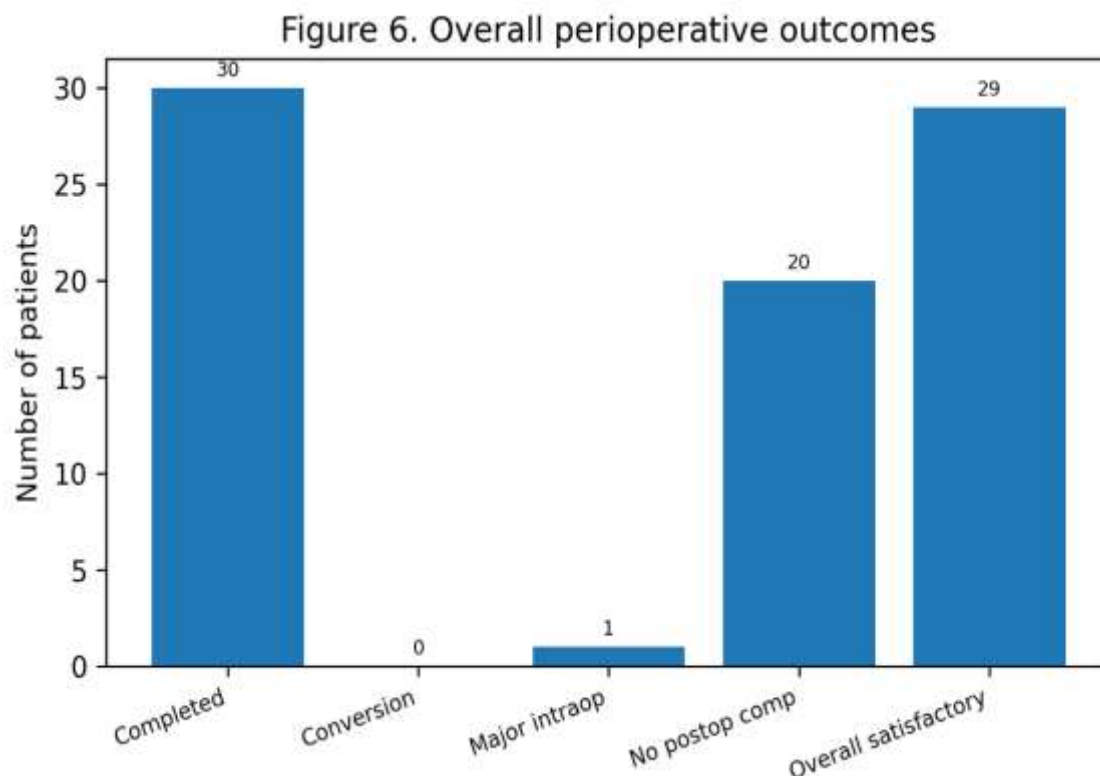


Short-Term Surgical Outcome

Table 8. Overall perioperative surgical outcome

Parameter	Result
Completion of planned surgery	30 (100%)
Conversion to laparotomy	0 (0%)
Major intraoperative complication	1 (3.3%)
Patients without postoperative complication	20 (66.7%)
Overall satisfactory perioperative outcome	29 (96.7%)

The planned vaginal reconstructive procedure was successfully completed in all 30 women. There were no conversions to abdominal surgery. Intraoperative morbidity was limited to one episode of hemorrhage. Most postoperative complications were minor and resolved with conservative treatment. These findings indicate that prophylactic sacrospinous ligament fixation can be incorporated safely into vaginal hysterectomy with acceptable perioperative morbidity in women with advanced uterovaginal prolapse.



Discussion

We conducted a prospective observational study to evaluate the perioperative morbidity and short-term surgical outcomes of prophylactic sacrospinous ligament fixation (SSLF) during vaginal hysterectomy for advanced uterovaginal prolapse. The study showed that the procedure could be performed safely with acceptable operative time, moderate blood loss, low incidence of intraoperative complications, and satisfactory postoperative recovery. The majority of women had an uneventful peri-operative course and the complications encountered were minor and amenable to conservative management. The results support the use of SSLF in vaginal reconstructive surgery for women with advanced pelvic organ prolapse.

Operator Safety

One of the main objectives of this study was to evaluate the perioperative safety profile of prophylactic SSLF. The average operative time was 2.20 ± 0.40 hours and included vaginal hysterectomy, sacrospinous ligament fixation and any concomitant pelvic floor repair procedures. The mean estimated blood loss was 345 ± 95 mL, which is within the range for combined vaginal reconstructive

procedures. These data suggest that the addition of SSLF did not significantly increase operative

complexity beyond what is expected for advanced pelvic reconstructive surgery.

Nieminen et al. compared sacrospinous fixation performed concurrently with vaginal hysterectomy and reported a modest increase in operative time due to the additional apical suspension procedure, but the complication rates were comparable to those seen with isolated prolapse surgery.[11] In a similar way, Ozcan et al. reported acceptable operative time and blood loss with transvaginal sacrospinous fixation, which supports the feasibility of the procedure as a vaginal reconstructive technique.[12] The perioperative results of the present study are consistent with these observations.

The fact that no conversion to laparotomy occurred in the current series further highlights the technical feasibility of performing SSLF exclusively via the vaginal route. Vaginal surgery is particularly suitable for women with advanced prolapse because it offers several advantages such as less postoperative pain, earlier mobilization, shorter recovery and avoidance of abdominal incision.[3,5]

Blood Loss and Transfusion Needs

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Blood loss is an important measure of surgical morbidity in pelvic reconstructive surgery. Dissection is performed in the vicinity of the pelvic venous plexus and large vascular structures. The mean estimated blood loss was 345 ml in this study, with only one patient experiencing significant intraoperative hemorrhage. 13 patients required transfusion but most received only a single unit of packed red blood cells, suggesting a precautionary perioperative management rather than severe hemorrhage.

The blood loss in the present study was relatively minor in comparison with previous reports. Ozcan et al. reported an average blood loss of about 126 mL in isolated SSLF, whereas Nieminen et al. reported a higher blood loss when sacrospinous fixation was associated with vaginal hysterectomy and pelvic floor repair.[11,12] These differences are mainly because of differences in associated reconstructive procedures, patient characteristics, and methods of estimating blood loss.

The low incidence of significant hemorrhage in the present study emphasizes the need for meticulous identification of the sacrospinous ligament and careful placement of sutures within the medial portion of the ligament, thus minimizing injury to adjacent pudendal and inferior gluteal vessels.

Complications in Surgery

One patient (3.3%) in the study cohort had intraoperative hemorrhage and no reports of rectal injury, bladder injury, ureteric injury, bowel injury or anesthetic complications.

Hemorrhage is the most well-known major intraoperative complication of SSLF due to the anatomic proximity of the sacrospinous ligament to the pudendal vessels and the inferior gluteal vessels.[13] Rare perforations of the rectum and vascular complications have been seen in the learning curve of the procedure in earlier studies.[7,12] The low rate of major intraoperative complications in the current study suggests satisfactory surgical expertise and careful compliance with operative principles.

Postoperative complications

In the present series the postoperative morbidity was mostly minor. Fever, urinary tract infection and buttock pain occurred in 10% of patients each, wound infection in 3.3%. Two-thirds of the study

population did not have postoperative complications. Importantly, no reoperation was performed during the postoperative period in any patient.

These results compare favorably with those of previous clinical series. A urinary tract infection was one of the most common postoperative complications of SSLF as reported by Nieminen et al., and Dalal et al. also noted low rates of febrile morbidity and wound infection following sacrospinous colpopexy during vaginal hysterectomy.

The relatively low incidence of infectious complications in the present study may be due to the routine peri-operative antibiotic prophylaxis, careful surgical technique and adequate post-operative care.

Pain in buttocks

Transient buttock pain is a recognized complication of sacrospinous ligament fixation due to the proximity of the sacrospinous ligament to branches of the sacral plexus and the pudendal nerve. In the present study, buttock pain was seen in 3 (10%) patients which subsided with conservative treatment without any neurological sequelae.

Barksdale et al. described intraligamentous nerves in the sacrospinous ligament and suggested that transient nerve irritation is a contributor to postoperative gluteal pain.[13] Most published series report spontaneous resolution over several weeks which is consistent with the findings in the present study.

Hospitalization and Early Recovery

The hospital stay varied from 5-10 days. This showed satisfactory post-op recovery in majority of the patients. None of the patients required a long hospital stay due to major complications.

Most women had an uncomplicated postoperative course without the need for further intervention. The favorable recovery profile observed in the study was probably due to early mobilization, adequate analgesia, antibiotic prophylaxis, bladder care, and careful postoperative monitoring.

Vaginal surgery has consistently been associated with shorter hospitalization, less postoperative pain, and earlier return to routine activities compared with abdominal pelvic reconstructive procedures.[3,5] These benefits are further confirmed by the present findings

Comparison with Prior Studies

Table 9. Comparison of perioperative outcomes with selected published studies

Study	Sample size	Major intraoperative complication	Principal postoperative complications
Randall & Nichols (1971)[4]	18	Minimal	Favorable postoperative outcomes
Cruikshank & Cox (1991)[14]	48	Low	Cystocele and rectocele recurrence
Ozcan et al. (1999)[12]	54	One rectal injury	UTI, enterocele, dyspareunia
Nieminen et al. (2000)[11]	60	Low	UTI, vaginal cuff infection
Dalal et al. (2006)*	35	Low	Minor postoperative morbidity
Present study	30	Hemorrhage (3.3%)	Fever, UTI, buttock pain (10% each)

*Study reported in the original dissertation.

In general, the perioperative outcomes of the present study are in line with previous studies suggesting that prophylactic SSLF can be safely performed during vaginal hysterectomy with acceptable morbidity.

Clinical Implications

The results of this study have a number of clinical implications. First, we can perform the prophylactic SSLF in women undergoing vaginal hysterectomy for advanced uterovaginal prolapse without a significant increase in operative risk. Second, most perioperative complications are minor in nature and can be addressed with conservative treatment. Third, a meticulous surgical technique and a thorough knowledge of the pelvic anatomy are essential to minimize vascular and neurologic complications. Apical suspension during vaginal hysterectomy may be routinely performed to improve long-term pelvic support with an acceptable perioperative safety profile.

Strengths

There are several strengths in the present study:

- prospective, observational design
- Uniform surgical technique in a tertiary teaching institution.
- Standardization of post-operative assessment.
- Complete documentation of perioperative complications.
- Complete follow-up on all enrolled patients.

Limitations There are some limitations that merit recognition. The sample size was small, comprising

only 30 patients, limiting the statistical power and subgroup analysis. It was done at a single tertiary care center and there was no comparison group receiving vaginal hysterectomy without sacrospinous fixation. Therefore, no causal inferences can be made about the effect of SSLF on perioperative morbidity.

The follow-up period was mainly focused on the short-term recovery and therefore long-term complications and functional outcomes were out of the scope of this manuscript. Furthermore, patient-reported outcomes including postoperative pain scores, quality of life, urinary function and sexual function were not assessed in the original thesis and could therefore not be analyzed here.

Further multicenter comparative studies with larger sample sizes and standardized patient-reported outcome measures are warranted to better define the perioperative safety profile of sacrospinous ligament fixation.

Conclusion

Prophylactic sacrospinous ligament fixation during vaginal hysterectomy is safe in the perioperative period for women with advanced uterovaginal prolapse. Combined vaginal reconstructive surgery was acceptable in terms of operative duration, blood loss and need for transfusion. Major intraoperative complications were rare and postoperative morbidity was mainly represented by minor self-limiting events such as transient fever, urinary tract infection and buttock pain. No patient required a

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second operation and there was no perioperative mortality.

These results suggest that sacrospinous ligament fixation can be safely performed as an adjunct procedure for apical support at the time of vaginal hysterectomy by surgeons familiar with pelvic anatomy and reconstructive techniques. Larger controlled studies with longer follow-up are needed to confirm these findings and to assess long-term functional outcomes.

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