ORIGINAL ARTICLE

Combined Transvaginal Hysterectomy, Mesh Placement, and Laparoscopic Sacrocolpopexy for Pelvic Organ Prolapse with Voiding Dysfunction: A Case Series

Sunporn Boonwong, MD[1], Patkawat Ramart, MD[1]

[1] Division of Urology, Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

Objective: To evaluate the feasibility, safety, and clinical outcomes of a hybrid surgical technique combining transvaginal hysterectomy, transvaginal polypropylene mesh placement, and laparoscopic sacrocolpopexy in women with pelvic organ prolapse (POP) and voiding dysfunction.

Materials and Methods: The present study was a retrospective cohort study conducted at the Division of Urology, Siriraj Hospital, Thailand. Women aged 18 years and older with stage II or higher POP and concurrent lower urinary tract symptoms (LUTS) who underwent the hybrid procedure between September 2022 and September 2024 were included. Patients with neurological disorders, prior pelvic radiation, or incomplete clinical data were excluded. Preoperative assessment included medical history, POP-Q staging, and video-urodynamic studies. All procedures were performed by a single reconstructive urologist. Data on baseline characteristics, operative outcomes, and postoperative findings were analyzed.

Results: Ten women met the inclusion criteria. Median age was 70 years (range of 66 to 80), and a mean BMI of 24.7 kg/m^2. All patients presented with obstructive voiding symptoms. A mixed urinary incontinence was observed in seven patients. Median operative time was 130 minutes (range of 80 to 225), and median estimated blood loss was 50 mL (range of 10 to 300). No major intraoperative complications occurred. Catheters were removed within two days postoperatively in all cases. At a median follow-up of 116.5 days (range of 64 to 389), all patients reported significant improvement in both LUTS and prolapse symptoms. Four patient experienced urgency urinary incontinence, which was well-controlled with medication. No mesh extrusion or recurrent prolapse was observed.

Conclusion: This hybrid technique offers a safe, effective, and efficient approach for managing POP with voiding dysfunction. It achieves excellent anatomical restoration, symptom relief, and rapid recovery.

Keywords: Voiding dysfunction; Pelvic organ prolapse; Vaginal hysterectomy; Transvaginal mesh placement; Laparoscopic sacrocolpopexy

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Pelvic organ prolapse (POP) is a prevalent condition among women, with a lifetime surgical risk of 11% to 19%[1]. POP, particularly involving anterior and apical compartment weakness, is strongly associated with voiding dysfunction[2-4]. The anterior compartment, including the bladder, can obstruct the urethra, leading to symptoms like urinary hesitancy, incomplete emptying, and retention[5]. Apical prolapse further exacerbates these symptoms by displacing pelvic structures. Sacrocolpopexy, especially via minimally invasive techniques such as laparoscopic or robotic-assisted procedures, is essential for correcting both anterior and apical prolapse, effectively restoring anatomy and improving symptoms[6,7].

Modifications to sacrocolpopexy were made to enhance success rates and applicability while reducing recovery time[8-10]. Laparoscopy is the standard approach[11], though it requires a learning curve. Traditional laparoscopic sacrocolpopexy was introduced in the early 1990s. Vaginally assisted laparoscopic sacrocolpopexy (VALS) was first reported by von Pechmann et al. in 2011[12,13], demonstrating its safety and efficacy. Newer techniques, such as transvaginal natural orifice transluminal endoscopic sacrocolpopexy (vNOTES-SC)[14] and laparoendoscopic single-site sacrocolpopexy (LESS-SC)[15], have also been proposed and have demonstrated durability and safety

Correspondence to:

Ramart P.

Division of Urology, Department of Surgery, 12th Floor Syamindra Building, Siriraj Hospital, Prannok Road, Bangkok-Noi, Bangkok 10700, Thailand.

Phone: +66-2-4198010, Fax: +66-2-4112011

Email: patkawat.ram@mahidol.edu

ORCID 0000-0003-0452-367X

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for this procedure.

The main advantage of VALS is that it combines the benefits of both vaginal and laparoscopic surgery[12,13,16]. This technique allows for more precise dissection and mesh placement through the vaginal approach, while the laparoscopic part offers quicker recovery and fewer complications. The main difference from traditional sacrocolpopexy is that VALS includes the vaginal approach, which can make the surgery more efficient and improve the results, especially in complicated cases. This combination makes the procedure more effective overall.

This case series is the first to report transvaginal hysterectomy with combined transvaginal polypropylene mesh placement and laparoscopic sacrocolpopexy in Thailand. The present study goal was to introduce and familiarize this surgical method to urogynecologists in Thailand and to encourage its integration into clinical practice to enhance patient care and outcomes.

Materials and Methods

Study design and ethical approval

A retrospective cohort study was conducted at the Division of Urology, Siriraj Hospital, Thailand, after receiving approval from the Siriraj Institutional Review Board (SIRB) (COA no. Si 860/2024). The present study focused on women who underwent transvaginal hysterectomy with combined transvaginal polypropylene mesh placement and laparoscopic sacrocolpopexy for POP with associated voiding dysfunction between September 2022 and September 2024.

Inclusion and exclusion criteria

Participants eligible for inclusion were women aged 18 years or older diagnosed with POP stage II or higher, confirmed by clinical findings such as vaginal bulging. All participants had concurrent lower urinary tract symptoms (LUTS), defined according to the International Continence Society (ICS) 2002 criteria[5]. Symptoms included urinary frequency, urgency, nocturia, urinary incontinence, hesitancy, poor stream, and related voiding dysfunctions. Exclusion criteria were designed to ensure data integrity and included patients with incomplete clinical records, a history of neurological disorders affecting lower urinary tract function within the past year, urethral tumors or cysts, prior pelvic radiation, and previous urethral or bladder surgeries, including augmentation cystoplasty. Additional exclusion criteria included frailty, defined as an Eastern Cooperative Oncology Group (ECOG) performance status of 2 or higher, pregnancy, breastfeeding, and an inability to commit to a follow-up.

Preoperative assessment and counseling

Each patient underwent a detailed preoperative assessment, including clinical evaluation of prolapse severity and location using the Pelvic Organ Prolapse Quantification (POP-Q) system. In most cases, video-urodynamic studies were conducted to assess lower urinary tract function comprehensively. Patients diagnosed with lower urinary tract dysfunction with POP stage II or higher were offered transvaginal hysterectomy with combined transvaginal polypropylene mesh placement and laparoscopic sacrocolpopexy. Thorough counseling was provided to discuss the risks and potential benefits of the surgical intervention.

Data collection and outcome measures

Data on baseline characteristics, preoperative findings, perioperative adverse events, and postoperative outcomes were collected systematically. Baseline data included demographic information, prolapse stage, and severity of LUTS. The perioperative period was monitored for any adverse events, and specific postoperative follow-up intervals were established to ensure consistent outcome assessment. At each follow-up visit, patients' clinical symptoms and POP status were re-evaluated. LUTS improvement was assessed using patient-reported symptom relief during clinical interviews. Postoperative follow-ups were scheduled at specific intervals, including any ongoing or new LUTS and a clinical re-evaluation of POP symptoms.

Surgical technique

All procedures were performed by a single senior surgeon specializing in female pelvic medicine and reconstructive surgery. The operation was conducted in two main steps, transvaginal hysterectomy with polypropylene mesh placement, followed by transabdominal laparoscopic sacrocolpopexy. General anesthesia was administered in all cases, and patients were positioned in the lithotomy and Trendelenburg position to enhance visibility and access to the pelvic organs by allowing the intestines to fall away from the surgical field.

Step 1: transvaginal hysterectomy with polypropylene mesh placement (Figure 1)

A LoneStar® retractor was used to provide optimal exposure, enabling a thorough vaginal

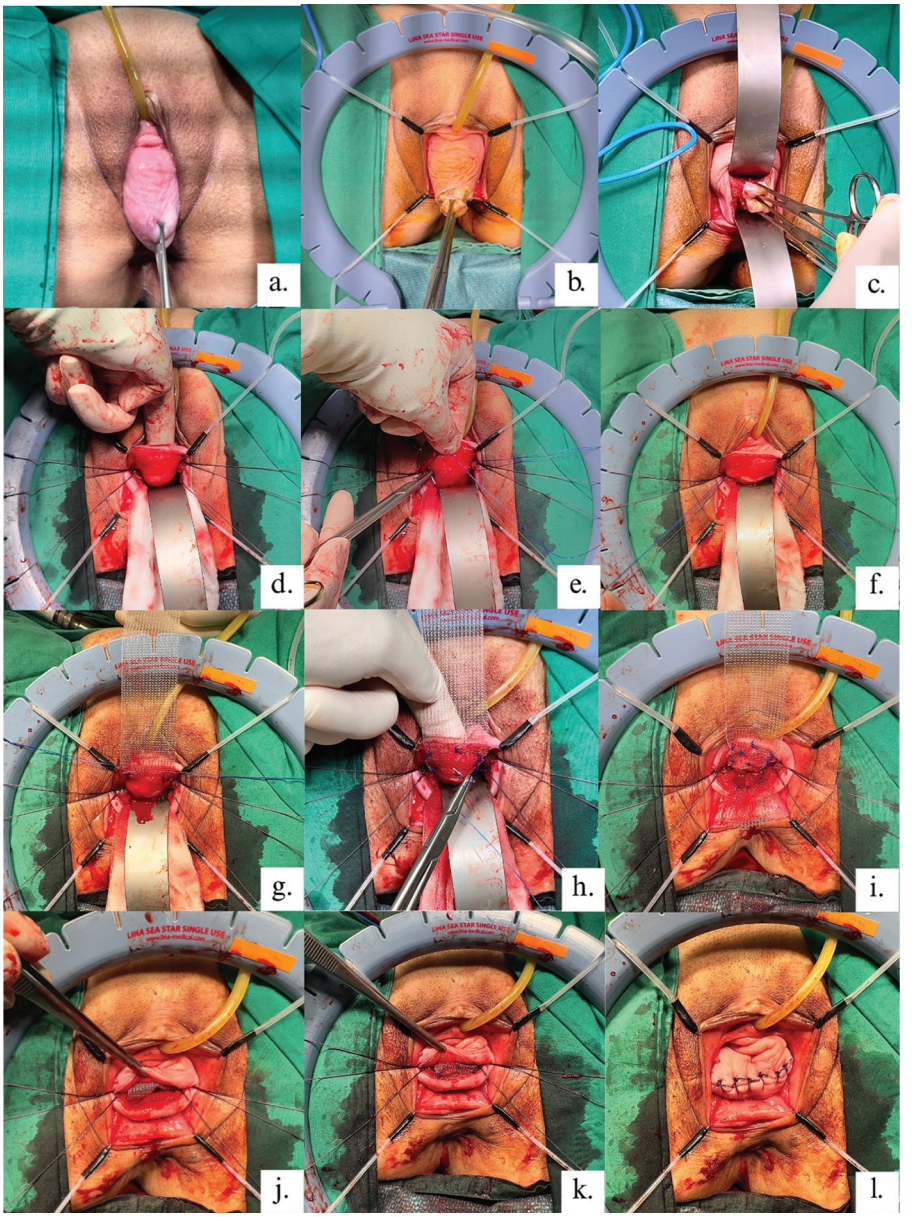

Figure 1. Surgical steps of transvaginal hysterectomy with polypropylene mesh placement.

(a) The cervix was grasped with Allis clamps in the anteroposterior direction to facilitate transvaginal hysterectomy. (b) A circumferential incision was made around the cervix to begin uterine dissection. (c) Deaver retractors were placed following dissection of the vesicovaginal fascia anteriorly and entry into the rectouterine pouch posteriorly. (d) After completion of hysterectomy, the bladder and perivesical fascia were dissected off the anterior vaginal wall to create a space for mesh placement. (e) Prolene 2-0 sutures were placed on the inner aspect of the anterior vaginal wall under digital guidance to avoid deep tissue penetration. (f) Two traction sutures were prepared and positioned to facilitate mesh fixation. (g) A polypropylene mesh (4×15 cm) was laid over the dissected anterior vaginal wall. (h) The mesh was secured using 6 to 7 interrupted Nylon 2-0 sutures, taking care to maintain adequate depth to prevent future mesh extrusion and to avoid over-tensioning. (i) The posterior vaginal wall was reinforced with a second mesh using the same technique. (j) The anterior and posterior mesh limbs were passed into the peritoneal cavity. (k) The two mesh arms were positioned to form a Y-shaped configuration. (l) The vaginal cuff was closed with interrupted Vicryl 2-0 sutures.

examination to accurately assess the stage of POP. A 14 Fr urethral catheter was inserted to facilitate continuous bladder drainage and to minimize the risk of bladder injury during surgery. A circumferential incision was made around the cervix to begin uterine dissection. The lateral pedicles, containing key vascular structures such as the uterine arteries, were meticulously sutured and ligated with Vicryl 1-0. The uterus was then removed through the vaginal canal. Given the patient's prolapse, a 4×15 cm tailor-made

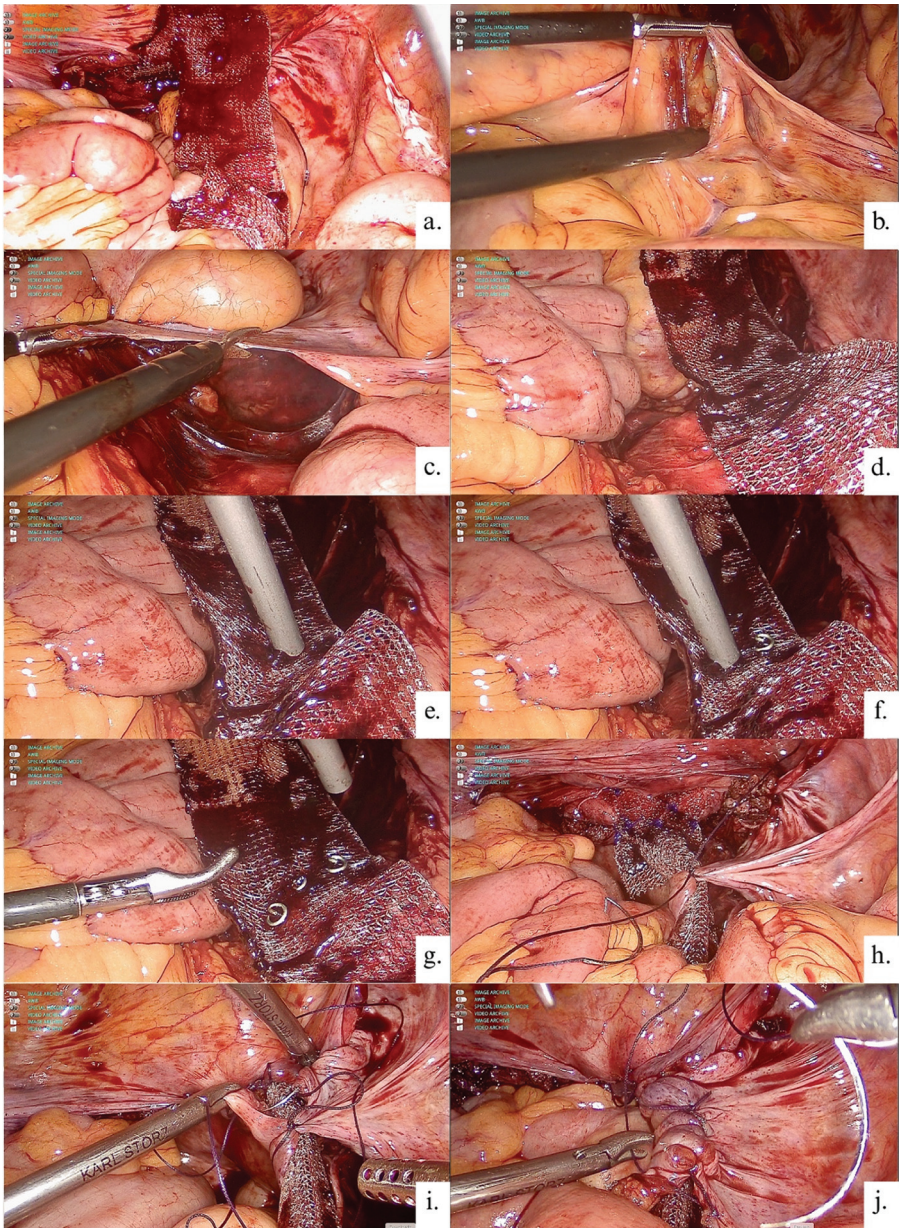

Figure 2. Surgical steps of laparoscopic sacrocolpopexy with mesh.

(a) The mesh was retrieved from the pelvic cavity. (b) After identifying the right ureter, an incision was made in the peritoneum over the sacral promontory to create a subperitoneal tunnel. (c) The peritoneal dissection was extended distally to connect with the previously dissected area. (d) The sacral promontory was cleared, and the mesh was gently retracted to determine the optimal site for fixation. (e) A ProTack™ device was used to fix the mesh to the anterior longitudinal ligament at the sacral promontory. (f) Three metallic staples were applied for secure fixation. (g) Proper mesh tension and fixation were confirmed. (h-j) The mesh was retroperitonealized using continuous Vicryl 2-0 sutures to prevent erosion into surrounding structures.

polypropylene mesh was used to reinforce the vaginal cuff. This mesh was secured to the anterior aspect of the vaginal cuff with 6 or 7 interrupted stitches using Prolene 2-0, creating a strong, supportive structure. The mesh was then placed into the intraperitoneal cavity. The vaginal cuff was subsequently closed in a watertight fashion using interrupted stitches with Vicryl 2-0.

Step 2: laparoscopic sacrocolpopexy (Figure 2)

Following the transvaginal procedure, a supraumbilical incision was made, and a port was inserted using an open technique to establish pneumoperitoneum with CO_2 at 14 mmHg. Under direct laparoscopic vision, additional ports were

placed with one 12-mm port and three 5-mm ports. The sacral promontory, identified as the superior-most point of the anterior surface of the first sacral vertebra at the junction of the lumbar spine and sacrum, was located and prepared as the anchor point for the mesh. The right ureter was carefully visualized and preserved throughout the operation. An incision was made in the peritoneum overlying the sacral promontory to create a subperitoneal tunnel. The anterior mesh was then securely affixed to the sacral promontory at three sites using a laparoscopic tack fixation device, ProTack™. When indicated, a posterior mesh was sutured to the anterior mesh with Prolene 2-0, forming a continuous supportive structure. The mesh was retroperitonealized with continuous Vicryl 2-0 sutures to protect it from potential erosion into adjacent structures. After confirming hemostasis and the absence of active bleeding, the pneumoperitoneum was released, and the port incisions were closed.

The study's outcome measures focus on clinical results of the surgery, specifically assessing LUTS, changes in POP-Q stage, and incidence of recurrent POP. LUTS and POP status are evaluated pre- and post-operatively to compare outcomes, with POP assessed by physical examination to verify organ position restoration. Descriptive statistics summarize the data with quantitative variables for age, body mass index (BMI), and operative time, that are presented as mean ± standard deviation (SD) or median and range, depending on distribution, while qualitative variables as postoperative complications are shown as counts, with proportions reported descriptively where appropriate.

Results

Among patients who underwent the combined transvaginal hysterectomy and laparoscopic sacrocolpopexy procedure, 10 women with POP and associated voiding dysfunction met the inclusion criteria and were enrolled in the present study. Baseline demographics for these patients are shown in Table 1. The median age was 70.0 years, with a range of 66 to 80 years, and the mean BMI was 24.7 kg/m². Eight patients had a history of vaginal delivery, with a median parity of two (range 1 to 5), while the other two patients were nulliparous. All patients presented with obstructive voiding symptoms, and seven patients also had mixed urinary incontinence. Preoperative urinalysis was normal except in one patient with recurrent urinary tract infections. Additionally, one patient had a history of anterior vaginal repair. In terms of prolapse severity, five patients had stage II POP, three had stage III, and two had stage IV. Preoperative videourodynamics (VUDS) was performed on eight patients, revealing detrusor overactivity in four of eight patients.

Table 1. Patient characteristics

Characteristics	Total (n=10)
Age (years); median (min, max)	70 (66, 80)
BMI (kg/m^2); mean±SD	24.7±3.1
Parity; median (min, max)	2 (1, 5)
Mode of delivery; n	
Vaginal delivery	8
Chief complaint; n	
Voiding symptoms	10
Mixed urinary incontinence	7
POP stage; n	
II	5
III	3
IV	2
Preoperative VUDS; n	8
Detrusor overactivity	4

BMI=body mass index; POP=pelvic organ prolapse; VUDS=videouro-dynamics; SD=standard deviation

Table 2. Perioperative results and follow-up findings

Parameters	Total (n=10)
Operative times (minutes); median (min, max)	130 (80, 225)
Estimated blood loss (mL), median (min, max)	50 (10, 300)
Intraoperative complications; n	
Stable atrial fibrillation	1
Postoperative complications; n	
Low grade fever without treatment	1
Vaginal packing (days); n	1
Hospital stay (days); median (min, max)	2 (2, 4)
Follow-up duration (days); median (min, max)	116.5 (64, 389)
Improvement of LUTS; n	10
Recurrent clinical POP; n	0
Urgency urinary incontinence; n	4
Urinary tract infection; n	1

LUTS=lower urinary tract symptoms; POP=pelvic organ prolapse

Table 2 summarizes intraoperative and postoperative outcomes. The median operative time was 130 minutes (range 80 to 225), and the median estimated blood loss was 50 mL (range 10 to 300). There were no major intraoperative complications, although one patient experienced stable atrial fibrillation during surgery. Vaginal packing was removed on the first postoperative day. Urethral catheters were removed within one day in seven cases and within two days in the remaining three. Only

one patient experienced a postoperative fever, which resolved without intervention. The median hospital stay was two days, ranging from two to four days.

The median follow-up was 116.5 days (range 64 to 389). All patients showed significant improvement in LUTS, with no reports of recurrent vaginal bulging. Overall, the satisfaction with symptom improvement was good. Urgency urinary incontinence was reported in four patients. Of these, one patient achieved control with daily Mirabegron, two used Mirabegron on an as-needed basis, and the remaining patient required no medication. Postoperative urine analysis was unremarkable, except for one patient who presented with cystitis, evidenced by a significant presence of WBCs in the urine. At the 7-month postoperative follow-up, repeated VUDS revealed recurrent cystocele and urethral kinking, which were identified as the causes of the recurrent cystitis.

Discussion

POP and voiding dysfunction are prevalent health issues among Thai women, particularly in postmenopausal populations. Research shows that the prevalence of POP in postmenopausal women in Thailand is approximately 43.3%[17], a statistic consistent with global trends indicating an increase in POP prevalence with advancing age. As Thailand faces an aging population, the need for effective management strategies for POP with associated voiding dysfunction continues to grow.

The present case series underscores the practicality, safety, and efficacy of transvaginal hysterectomy with combined transvaginal polypropylene mesh placement and laparoscopic sacrocolpopexy in treating POP with voiding dysfunction. This hybrid procedure integrates transvaginal and laparoscopic methods, enabling precise and secure mesh placement, improved surgical workflow, and reduced complication risks. By incorporating transvaginal mesh suturing before starting the laparoscopic component, the technique enhances anatomical correction and symptom relief, offering a robust alternative to traditional methods. Patients in the present study experienced significant improvements in voiding dysfunction and prolapse grading, along with an excellent safety profile.

The transvaginal mesh suturing approach offers advantages[18]. Besides ensuring accurate and secure mesh placement at the vaginal cuff, it allows the surgeon to avoid bladder injury. During this phase, the bladder is palpated and dissected under direct visualization, facilitating safe mobilization before suturing. This precaution lowers the risk of bladder injury. This is a complication sometimes encountered in conventional laparoscopic surgeries. Furthermore, this approach is less time-intensive compared to laparoscopic dissection and suturing. By completing vaginal cuff preparation and suturing transvaginally, the laparoscopic phase is simplified, which contributed to the reduced operative times noted in this series.

Evidence supporting transvaginal mesh placement before sacrocolpopexy has been documented in the literature. For instance, a study on VALS highlighted its feasibility and effectiveness for managing stage III-IV POP. The technique, which involves transvaginal mesh placement followed by laparoscopic sacrocolpopexy, demonstrated favorable medium- to long-term outcomes, with a success rate of 92.5% for anatomical correction and significant symptom resolution reported in 99% of cases[18]. Furthermore, the study reported a mean operative time of 100.12±20.05 minutes and minimal intraoperative complications, emphasizing the procedural efficiency of VALS, which aligns with the shorter operative times reported in the present case series.

When evaluated against existing literature on conventional pure laparoscopic sacrocolpopexy (CLS), the results of this hybrid method are compelling. CLS commonly reports longer operative durations, ranging from 150 to 200 minutes, and greater average blood loss of 100 to 200 mL[6,7,9,10,18]. In contrast, the present series demonstrated a shorter median operative time of 130 minutes and a lower median blood loss of 50 mL. Additionally, the procedure demonstrated an outstanding safety record, with no major intraoperative complications and only one minor postoperative event, which was a transient fever that resolved without intervention. While CLS remains the benchmark for advanced POP management, it is associated with higher rates of complications, including mesh-related issues and organ injuries, in 5% to 10% of cases[6,7,10,19]. The hybrid technique not only achieves comparable anatomical and symptomatic outcomes but also exhibits fewer complications. The transvaginal suturing step significantly enhances these results by improving safety and operational efficiency, facilitating precise mesh placement, and mitigating risks to surrounding structures.

When compared to newer minimally invasive options like vaginal natural orifice transluminal endoscopic surgery (vNOTES), single-port laparoscopy, and robotic-assisted sacrocolpopexy,

the hybrid method remains a competitive alternative. These modern techniques, while offering benefits such as improved ergonomics and cosmetic results, often involve increased complexity and longer surgical durations. For instance, single-port robotic sacrocolpopexy reports median operative times exceeding 200 minutes, while robotic-assisted sacrocolpopexy frequently averages over 180 minutes[7,14]. Additionally, these approaches require significant resources, limiting their availability in many settings[20].

In comparison, the hybrid approach demonstrated in this case series achieved a markedly shorter operative time of 130 minutes with minimal complications. The transvaginal mesh suturing technique played a key role in achieving these results by shortening the laparoscopic phase, as it simplifies the dissection and suturing processes. This efficiency demonstrates that excellent surgical outcomes can be achieved without relying on costly methods like robotic surgery. This makes the hybrid approach a safe, effective, and cost-efficient alternative, particularly well-suited for resource-limited healthcare settings such as those in Thailand.

All patients in the present series showed marked improvement in urinary and prolapse-related symptoms with no major complications, suggesting that the hybrid technique provides anatomical and functional outcomes comparable to conventional laparoscopic or robotic sacrocolpopexy. Its shorter operative time, low blood loss, and reliance on standard instruments also make it a cost-conscious and accessible option, particularly in settings where robotic platforms are limited. Given the increasing demand for POP surgery in aging populations, this approach may offer a practical, scalable solution for centers already familiar with both vaginal and laparoscopic surgery. Larger studies with longer follow-up are needed to validate long-term durability and mesh-related safety.

Despite these favorable outcomes, certain procedure-related risks should be recognized. Although our series reported no mesh-related complications, the potential risk of mesh erosion should be acknowledged, particularly when sacrocolpopexy is performed in conjunction with a total hysterectomy. Prior studies have demonstrated that total hysterectomy is associated with significantly higher mesh erosion rates compared with supracervical hysterectomy, with a large meta-analysis reporting erosion rates of 3.8% versus 0.36% (OR 0.26, 95% CI 0.18 to 0.38)[21]. Similarly, Tan-Kim et al. found an erosion rate of 23% following sacrocolpopexy with total hysterectomy compared with 5% after supracervical hysterectomy ($p=0.003$)[22]. These findings suggest that total removal of the cervix may predispose the vaginal cuff to impaired tissue integration and higher exposure risk. In the authors' technique, however, the transvaginal hand-sutured approach allows direct tactile feedback during mesh fixation. This facilitates appropriate suture depth and tension and may reduce local tissue trauma or ischemia, which are more difficult to control with purely laparoscopic suturing where tactile sensation is limited. Although this theoretical advantage may help mitigate erosion risk, longer follow-up and comparative studies are required to confirm this effect.

Limitation

The present study had limitations. The small sample size restricted the generalizability of the findings and reflected the early experience with this hybrid technique. Its retrospective design also limited control over confounding factors and may introduce selection bias. Because all procedures were performed by a single surgeon at a single institution, external applicability may be reduced. The short follow-up period prevented the evaluation of long-term outcomes, including prolapse recurrence and mesh-related complications. The lack of a comparison group further limits interpretation of relative efficacy when compared with standard approaches. In addition, not all patients underwent pre- or postoperative video-urodynamic studies, leading to incomplete objective assessment of voiding dysfunction. Symptom improvement relied on clinical interviews rather than standardized questionnaires, which may affect the reliability of patient-reported outcomes. The use of tailor-cut mesh may also introduce technical variability. Despite these limitations, the study provides preliminary evidence supporting the feasibility and safety of this hybrid approach and highlights the need for larger prospective studies with longer follow-up.

Conclusion

The present case series demonstrates that transvaginal hysterectomy with combined transvaginal polypropylene mesh placement and laparoscopic sacrocolpopexy is a feasible, safe, and effective surgical option for women with POP and associated voiding dysfunction.

What is already known about this topic?

Laparoscopic sacrocolpopexy is the standard surgical treatment for POP due to its durable anatomical and symptomatic outcomes. However, its adoption in Thailand remains limited, partly due to its technical complexity and steep learning curve.

What does this study add?

This study introduces a simplified hybrid technique for POP repair, combining transvaginal and laparoscopic approaches. The findings suggest that this method can lower the technical barriers of laparoscopic sacrocolpopexy and facilitate wider adoption in clinical practice in Thailand.

Authors' contributions

SB: Conceptualization, data curation, methodology, and writing (original draft). PR: Supervision, validation, and writing (review & editing).

Conflicts of interest

The authors declare no conflict of interest.

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