Tzu Chi Medical Journal 2024; 36 (4): 412-417

Original Article

Comparison of the surgical outcomes between paravaginal repair and anterior colporrhaphy: A retrospective case–control study

*Pei-Chen Chen[a], Wing Lam Tsui[a], Dah-Ching Ding[a,b]**

[a]Department of Obstetrics and Gynecology, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation and Tzu Chi University, Hualien, Taiwan, [b]Institute of Medical Sciences, Tzu Chi University, Hualien, Taiwan

Abstract

Objectives: This study compared the surgical outcomes of anterior vaginal wall repair (A-repair) and paravaginal repair (PVR) for laparoscopic pelvic organ prolapse (POP) surgeries. **Materials and Methods:** This retrospective case–control study recruited patients who underwent laparoscopic POP surgeries in our hospital from May 1, 2013, to May 31, 2022, using the health insurance surgical code payment system (laparoscopic colpopexy/hysteropexy/cervicopexy: 80025B) in Taiwan. The patients were divided into A-repair (group 1) and PVR (group 2). Patients aged <20 years, without postoperative outcomes, and without baseline characteristics were excluded. Baseline characteristics (age, menopausal status, parity, diabetes mellitus, and hypertension) were collected. The outcome was to compare the changes in Pelvic Organ Prolapse Quantification (POP-Q) scores (Aa, Ba, and total vaginal length) preoperatively and 1–2 months, 3–6 months, and 1 year postoperatively in the two groups. **Results:** After exclusion, 23 and 10 patients in A-repair and PVR, respectively, were recruited. There was no significant difference in baseline characteristics between the two groups. Patients in both groups showed significant improvement in Aa and Ba of POP-Q 1–2 months and 3–6 months postoperatively, except for those in group 2 1 year postoperatively. However, there was no significant difference in postoperative scores between the two groups at 1–2 months, 3–6 months, and 1 year postoperatively. The estimated blood loss did not exhibit a significant difference between the two groups; however, PVR had a longer duration of operation. **Conclusion:** The surgical outcomes of A-repair and PVR for the anterior compartment were comparable at 1–2 months, 3–6 months, and 1 year postoperatively.

Keywords: *Anterior colporrhaphy, Anterior compartment, Case–control studies, Paravaginal repair, Pelvic organ prolapse*

Submission : 28-Sep-2023
Revision : 23-Oct-2023
Acceptance : 27-Nov-2023
Web Publication : 24-Apr-2024

Introduction

The prevalence of pelvic organ prolapse (POP) worldwide is estimated to be approximately 3%–6% by symptoms and 50% by vaginal examination [1]. As the aging population grows, the prevalence of POP will rise and become a major health challenge for aging females, especially in less-developed countries [2]. A study in rural Pakistan reported a POP prevalence of up to 10.3% [2,3]. Although the disease is not life-threatening, related symptoms are highly uncomfortable and negatively impact patients' quality of life.

The anterior compartment defect involves the prolapse of the bladder (cystocele), urethra (urethrocele), and pelvic fascia (paravaginal defect) [4]. A cystocele occurs when the front wall of the vagina (anterior vaginal wall) weakens and bulges into the vaginal canal. This condition typically involves the descent of the bladder into the vaginal space. It can lead to symptoms such as a feeling of vaginal fullness, urinary incontinence, and discomfort during sexual intercourse [5]. Cystocele is one of the most common forms of POP. A paravaginal defect, on the other hand, involves a weakening or disruption of the lateral (side) support structures that help keep the bladder in its proper position [6]. The separation of the vagina from the arcus tendinous fascia pelvis (ATFP) would be linked to the descent of the upper pubocervical fascia and the emergence of an anterior wall prolapse. These lateral supports are known as paravaginal supports. When these supports are compromised, the anterior vaginal wall

Access this article online

Quick Response Code:

Website: www.tcmjmed.com

DOI: 10.4103/tcmj.tcmj_237_23

**Address for correspondence:* Dr. Dah-Ching Ding, Department of Obstetrics and Gynecology, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, 707, Section 3, Chung-Yang Road, Hualien, Taiwan.
E-mail: dah1003@yahoo.com.tw

How to cite this article: Chen PC, Tsui WL, Ding DC. Comparison of the surgical outcomes between paravaginal repair and anterior colporrhaphy: A retrospective case–control study. Tzu Chi Med J 2024;36(4):412-7.

and bladder may shift laterally, creating a gap or defect in the support system. This can contribute to the development or exacerbation of a cystocele.

The anterior compartment defect is statistically the most prevalent and severe type of prolapse [4,7]. The etiology is usually multifactorial, with various risk factors, including parity, vaginal delivery, and aging [8], resulting in pubocervical fascia defects. Symptoms may vary in individuals, but voiding difficulties, a sensation of a lump in the pubic area, and incontinence are common [9].

The anterior vaginal defect is traditionally repaired by anterior colporrhaphy (A-repair) through native tissue or synthetic products [4]. The surgery is minimally invasive and approached through the vagina. The vaginal mucosa below the urethra is dissected up to the front of the cervix, followed by stitches placed in the periurethral tissue and the midline of the pubocervical fascia to elevate the bladder neck. Excessive vaginal tissue is then removed [10]. Another approach for anterior wall defect is paravaginal repair (PVR), in which stitches are made on the defective edges of the pubocervical fascia [11]. Both repair methods are commonly used, although some studies debated that a paravaginal approach may need to be followed by anterior colporrhaphy to ensure a lower recurrence rate [11]. Little is known about the differences in surgical outcomes of both repair methods.

No previous study has compared the surgical outcomes of the two techniques. This study aimed to compare the surgical outcomes of the anterior compartment after A-repair and PVR.

Materials and methods

Ethics

The study was conducted following the Declaration of Helsinki and was approved by the Research Ethics Committee of the Hualien Tzu Chi Hospital (IRB number 112–145-B). The requirement for patient consent was waived due to minimal risk and approved by the Research Ethics Committee.

Inclusion and exclusion criteria

The inclusion criteria were patients aged 20–80 years with POP who received laparoscopic colpopexy/hysteropexy/cervicopexy with surgical code 80025B at our hospital from May 1, 2013 to May 31, 2022. The exclusion criteria were cases with (i) only laparoscopic colpopexy/hysteropexy/cervicopexy without A-repair or PVR, (ii) only PVR or A-repair, and (iii) other procedures.

The case collection flowchart is illustrated in Figure 1.

Diagnosis of cystocele or paravaginal defect

While the woman is lying in the supine position, both at rest and during maximal Valsalva maneuver, examining the anterior vaginal wall involves using curved sponge forceps. These forceps are applied to the vaginal wall, where each tip of the forceps is positioned against the ischial spines, simulating paravaginal support akin to the ATFP. The patient is then instructed to perform a maximal Valsalva maneuver, and if no prolapse is evident, it is characterized as a paravaginal prolapse. However, if prolapse is still observed despite the support provided by the forceps, it suggests the presence of a midline defect component. The disappearance of rugal folds was also considered linked to a midline defect, while the presence of preserved rugal folds was associated with a paravaginal defect.

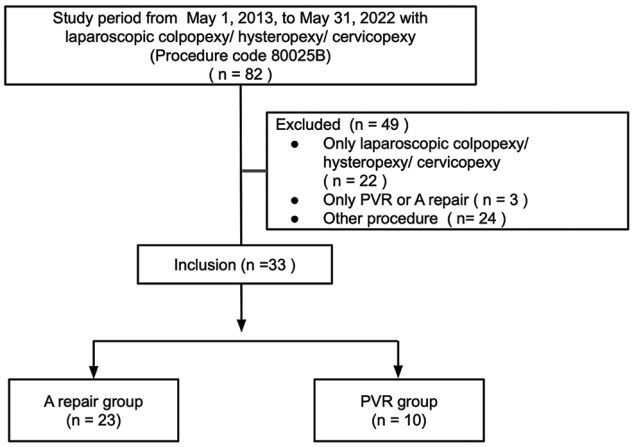

Figure 1: The case collection flowchart

Indication for A-repair or paravaginal repair

The decision to perform A-repair or PVR for cystocele repair is typically based on individual patient characteristics, anatomical considerations, and the surgeon's preference. The choice between A-repair and PVR may depend on factors such as specific anatomical defects, the extent of vaginal wall relaxation, and the presence of lateral defects. A-repair focuses on correcting defects in the anterior vaginal wall, often involving the bladder. It is commonly used when the cystocele is mainly located in the midline or anterior part of the vagina. A-repair may involve the plication or reconstruction of the anterior vaginal wall to provide support to the bladder. PVR targets lateral defects and aims to restore support to the bladder by repairing the attachments of the vagina to the pelvic sidewall. It is particularly considered when significant lateral defects are contributing to the cystocele. PVR may involve reattaching the vagina to its original position and reinforcing the lateral support structures.

Surgical procedure

A-repair

Under general anesthesia, the patient was positioned in a lithotomy position. A longitudinal incision was made in the anterior vaginal wall, and the underlying structures, including the bladder and supportive tissues, are dissected. The cystocele was repaired using purse string sutures to reinforce the weakened tissues, and excess vaginal tissues were removed. The remaining vaginal wall was then approximated and closed using a continuous suture.

Paravaginal repair

Paravaginal repair was done as follows [Figure 2]. Under general anesthesia, the patient was positioned in a lithotomy position. A single port, such as the Glove Port (Nelis Co., Ltd., Gyeonggi-do, South Korea), was inserted at the umbilical region, and two 5 mm trocars (Lagis Enterprise Co., Ltd.,

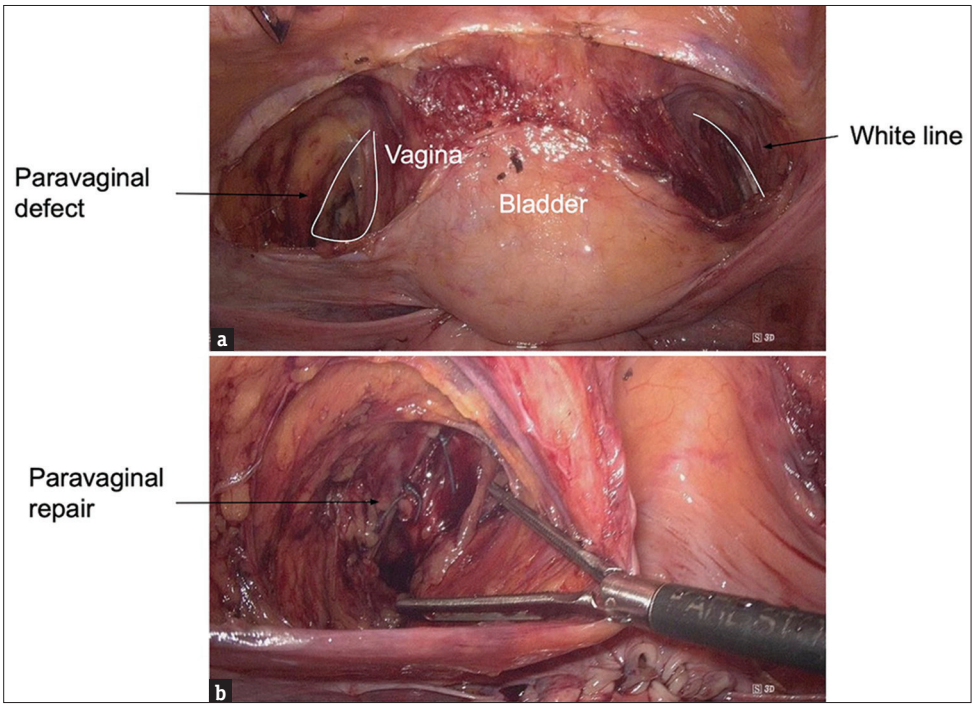

Figure 2: Paravaginal defect and paravaginal repair. (a) Paravaginal defect. Vagina away from the white line. (b) Paravaginal repair. Approximate vaignal wall to white line by 2-0 ethibond sutures

Taichung, Taiwan) were inserted into the bilateral abdominal wall. A Maryland LigaSure (Medtronic, Minneapolis, MN, USA) was used to dissect the paravaginal space. The procedure begins with identifying a 2-cm landmark above the pubic bone. An incision was made in the peritoneum to access the Retzius space. Bilateral dissection of the Retzius space was performed, excluding the area where the urethra was located until the pubic bone became visible [Figure 2a]. Ethibond 2-0 sutures were inserted through the single port. The operator's left hand was inserted into the vagina to elevate the paravaginal space. Suturing was performed to approximate and secure the entire layer of tissue without suturing the vaginal epithelium and was anchored to the ATFP, also known as the white line, located just below the pubic bone [Figure 2b].

Intracorporeal ties and sliding ties were utilized during this process. The same procedure was repeated on the other side, ensuring three stitches for fixation of the vaginal wall on each side. The peritoneum was then approximated using 1–0 V-Loc sutures (Medtronic).

Demographic data

The demographic data, including age (years), parity, prior hysterectomy, menopausal status, diabetes mellitus, and hypertension, were collected.

Surgical characteristics

Information regarding hospital stay, blood loss, and surgical time was also collected for analysis.

Primary outcome

The Pelvic Organ Prolapse Quantification (POP-Q) system is an objective method used to describe, quantify, and stage pelvic support in women [12]. It is a site-specific system that allows health-care providers to assess the severity and location of POP by measuring the descent of various pelvic structures relative to the hymen. The POP-Q system is widely used in clinical practice and research, and it provides a standardized language for communication among health-care providers regarding POP assessment and treatment. The POP-Q system comprises six defined points for measurement– Aa, Ba, C, D, Ap, Bp– and three additional landmarks: genital hiatus, total vaginal length (TVL), and perineal body. Each point is measured in centimeters above or proximal to the hymen (with negative numbers) or below or distal to the hymen (with positive numbers), with the plane of the hymen serving as point 0 [12]. The hymen is used as the reference point, rather than the introitus, as it is more precisely identifiable. The primary outcome was the POP-Q score of the anterior compartment (Aa, Ba, and TVL) at 1–2 months, 3–6 months, and 1 year after surgery. The postoperative success rate was determined based on POPQ < stage II (point Aa or Ba within a range of 1 cm above and below the hymen).

Statistical analysis

Statistical analysis was done using SPSS software (version 22, IBM, New York, NY, USA). Summary statistics are presented as means and standard deviation for continuous or ordinal variables and frequencies and percentages for categorical variables. We compared the two treatment groups using the *t*-test or Fisher exact test for categorical variables. For continuous or ordinal variables, we performed a Wilcoxon test for comparison. Analysis was performed for longitudinal measurements on the duration of surgery and estimated blood loss using linear mixed models. $P < 0.05$ was considered statistically significant.

Table 1: Baseline characteristics of patients

Variable	Group 1 (A-repair) (*n*=23)	Group 2 (PVR) (*n*=10)	*P*
Age, mean±SD	62.48±10.36	66.90±8.12	0.241
Parity, mean±SD	3.0±1.38	3.0±1.33	1
Vaginal delivery, *n* (%)	23 (100)	10 (100)	1
BMI (kg/m^2)	24.2±4.80	24.2±1.76	0.9
Preoperative POP-Q (mean±SD)			
Aa	0±1.71	0±1.25	1
Ba	0.43±1.67	1.2±1.75	0.243
TVL	7.17±1.59	7.5±0.71	0.420
Commitment or previous hysterectomy, *n* (%)	8 (34.78)	6 (60.00)	0.132
Concomittent surgeries, *n* (%)			
Colpopexy	14 (60.9)	1 (10)	0.001*
Manchester operation	1 (4.3)	1 (10)	
Cervicopexy	0	8 (80)	
Hysteropexy	8 (34.8)	0	
Postmenopausal, *n* (%)	21 (91.30)	10 (100)	1
DM, *n* (%)	4 (17.39)	3 (30.00)	0.646
HTN, *n* (%)	9 (39.13)	5 (50.00)	0.707

*P<0.05. A-repair: Anterior repair, DM: Diabetes mellitus, POP: Pelvic organ prolapse, HTN: Hypertension, POP-Q: POP-quantification system, PVR: Paravaginal repair, SD: Standard deviation, TVL: Total vaginal length, BMI: Body mass index

Table 2: Surgical characteristics of patients in Groups 1 and 2

Variable	Mean±SD		*P*
	Group 1 (A-repair) (*n*=23)	Group 2 (PVR) (*n*=10)	
Hospitalization day	3.74±1.29	4.4±0.97	0.157
Blood loss	57.17±10.42	95.0±59.86	0.051
Operation time (min)	193.0±45.2	212.9±39.0	0.236

A-repair: Anterior repair, PVR: Paravaginal repair, SD: Standard deviation

Results

Basic characteristics

Thirty-three patients were included in our study: 23 in the A-repair group and 10 in the PVR group. Table 1 illustrates the baseline characteristics of the two groups. The mean age was 62.48 ± 10.36 and 66.9 ± 8.12 in the A-repair and PVR groups, respectively. The body mass index was 24.2 ± 4.80 for the A-repair group and 24.2 ± 1.76 for the PVR group (P = 0.9). All patients in both groups delivered their babies vaginally. There was no significant difference in baseline characteristics between the two groups except that the commitment or previous hysterectomy rate was higher in the PVR group, but no statistical significance (34.78% vs. 60%, P = 0.132). Concomitant surgical procedures encompassed colpopexy, Manchester operation, cervicopexy, and hysteropexy. The distribution of these procedures varied between the two groups. Within the A-repair group, most surgeries (95.7%) involved colpopexy and hysteropexy. In contrast, in the PVR group, cervicopexy was the dominant procedure in 80% of cases.

Surgical characteristics

We compared the surgical characteristics of patients in the two groups. No statistical difference was observed in hospital stay, blood loss, and surgical time among the groups [Table 2].

Postoperative outcomes

Tables 3-5 illustrate the postoperative outcomes 1–2 [Table 3], 3–6 [Table 4], and 12 months [Table 5] after the procedures. The Aa and Ba of POP-Q were significantly improved in groups 1 and 2 at 1–2 months and 3–6 months postoperatively and in group 1 1 year postoperatively. However, the Aa and Ba of POP-Q did not significantly improve in group 2 1 year postoperatively. There was no difference between group analyses.

Postoperative overall success rate

The postoperative overall success rate, determined based on POPQ < stage II, was examined. Within 1–2 months after surgery, both groups achieved a 100% success rate. Between 3 and 6 months postoperatively, the success rate was 88.8% in the A-repair group and 100% in the PVR group. At 12 months after surgery, both groups exhibited a 100% success rate.

Discussion

Our retrospective case–control study concluded that A-repair and PVR significantly improved the POP-Q score postoperatively. However, both surgical methods had no significant difference in outcome regarding the anatomical position. The outcome of the anterior compartment was comparable between the two groups at 1–2, 3–6, and 12 months postoperatively.

The support system of the anterior vaginal wall comprises an intricate interplay between muscular and connective tissues, working together to prevent the descent of the vagina and the surrounding organs [13]. A cystocele can be caused or aggravated by a paravaginal defect [5]. When the lateral support structures (paravaginal supports) fail to provide adequate support to the bladder and anterior vaginal wall, the front wall of the vagina can sag or bulge more significantly, resulting in a more pronounced cystocele. Conversely, repairing a paravaginal defect can help address the underlying anatomical issue contributing to a cystocele's development or persistence [6]. By restoring the lateral support structures, surgeons aim to provide better support to the bladder and anterior vaginal wall, potentially reducing the severity of the cystocele or preventing its recurrence.

Table 3: Postoperative outcomes at 1–2 months after the procedures

Item	Group	*n*	Preoperative score	1–2 months postoperatively			
				Mean±SD	Difference between postoperative and preoperative scores	Within group (*P*)	Between group (*P*)
Aa	Group 1	23	0.00±1.71	−2.78±0.42	−2.78±1.65	<0.001*	0.603
	Group 2	8	0.00±1.25	−3.00±0.00	−3.13±1.36	<0.001*	
Ba	Group 1	23	0.43±1.67	−2.78±0.42	−3.22±1.62	<0.001*	0.073
	Group 2	8	1.20±1.75	−3.00±0.00	−4.50±1.85	<0.001*	
TVL	Group 1	23	7.17±1.59	7.78±1.24	0.61±1.67	0.095	0.827
	Group 2	8	7.50±0.71	8.25±1.04	0.75±1.16	0.111	

*P<0.05. Group 1: A-repair, Group 2: PVR, SD: Standard deviation, TVL: Total vaginal length, A-repair: Anterior repair, PVR: Paravaginal repair

Table 4: Postoperative outcomes at 3–6 months after the procedures

Item	Group	*n*	Preoperative score	3–6 months postoperatively			
				Mean±SD	Difference between postoperative and preoperative scores	Within group (*P*)	Between group (*P*)
Aa	Group 1	9	0.00±1.12	−2.44±0.73	2.44±0.73	<0.001*	0.536
	Group 2	4	−0.25±0.96	−3.00±0.00	−2.75±0.96	0.010*	
Ba	Group 1	9	0.44±1.01	−2.67±0.50	−3.11±0.78	<0.001*	0.320
	Group 2	4	1.25±1.89	−3.00±0.00	−4.25±1.89	0.021*	
TVL	Group 1	9	7.44±1.13	9.22±0.44	1.78±1.20	0.002*	0.268
	Group 2	4	7.25±0.50	8.25±0.96	1.00±0.82	0.092	

*P<0.05. Group 1: A-repair, Group 2: PVR, SD: Standard deviation, TVL: Total vaginal length, A-repair: Anterior repair, PVR: Paravaginal repair

Table 5: Postoperative outcomes at 12 months after the procedures

Item	Group	*n*	Preoperative score	1 year postoperatively			
				Mean±SD	Difference between postoperative and preoperative score	Within group (*P*)	Between group (*P*)
Aa	Group 1	4	0.25±0.96	−2.50±0.58	−2.75±0.96	0.010*	0.765
	Group 2	2	−0.50±0.71	−3.00±0.00	−2.50±0.71	0.126	
Ba	Group 1	4	0.50±0.58	−2.50±0.58	−3.00±0.82	0.005*	0.218
	Group 2	2	2.00±2.83	−3.00±0.00	−5.00±2.83	0.242	
TVL	Group 1	4	7.25±1.26	8.25±1.50	1.00±0.82	0.092	0.506
	Group 2	2	7.00±0.00	8.50±0.71	1.50±0.71	0.205	

*P<0.05. Group 1: A-repair, Group 2: PVR, SD: Standard deviation, TVL: Total vaginal length, A-repair: Anterior repair, PVR: Paravaginal repair

Several studies reported similar results to those of this study. In one multicenter study, Zullo *et al*. found similar results in A-repair, which showed a subjective cure criterion of up to 93% after 12 months of surgery [14]. Serati *et al*. also reported that A-repair with native vaginal tissue had a subjective cure rate of up to 88% and an objective cure rate of 86% [15]. Young *et al*. concluded that PVR is equally effective for patients with cystocele, and postoperative complications are largely manageable [15,16]. Gosavi and Dhangar also concluded that PVR for cystocele dramatically improved symptoms and clinically evaluated POP-Q scores 1 week, 3 months, 6 months, and 1 year postoperatively [17].

The earlier study revealed that among 71 patients with cystocele, a left paravaginal defect was found in 87% of cases, and a right defect was identified in 89% of cases [13]. Laparoscopic PVR offers a more anatomically precise solution for addressing lateral defects than anterior colporrhaphy without causing vaginal shortening [18]. Conversely, many studies concluded that PVR is not as effective when treating vagina defects and is a nonroutine procedure. Shippey *et al*. concluded in their retrospective study that sacrocolpopexy with PVR does not improve clinical outcomes compared to sacrocolpopexy alone [19]. Although the procedure may not be routinely performed, studies have shown that certain modified techniques may increase the cure rate. A modified PVR technique with reverse bridge repair and the cross-stitching of bilateral sutures had a success rate of up to 94.3% 12 months postoperatively [20]. There are limited studies comparing outcomes between anterior colporrhaphy and PVR. Further investigation is needed before a definite conclusion can be drawn. Our study compares A-repair and PVR, demonstrating similar anatomical outcomes in both groups.

Regarding the surgical time, A-repair usually ranges from 30 min to 1 h, depending on the extent of the repair [21]. The surgical time for laparoscopic PVR ranges from 1 to 2 h [18]. The difference in time between both procedures maybe 30 min to 1 h. The present study found a 19-min difference between the two procedures. The surgical time of A-repair was shorter than that of PVR. As a consequence, A-repair is more popular than PVR.

A limitation of our retrospective cohort study is the small sample size. Only 33 patients met our selection criteria and were included in the analysis. A larger sample size is needed

to obtain significant results. The follow-up time in our study is also short. Longer follow-up is necessary for cystocele repair. A longer follow-up period may yield more significant results. Finally, the study only allowed us to explore clinical outcomes, not subjective outcomes, such as patient satisfaction and improvement in quality of life. More studies are required to investigate the outcome differences between anterior colporrhaphy and PVR. The different laparoscopic surgical types (colpopexy/hysteropexy/cervicopexy) may influence the surgical time. Our study's length of surgical time may not reflect the difference between A-repair and PVR.

Conclusions

The outcomes of the anterior compartment were comparable between A-repair and PVR at 1–2, 3–6, and 12 months postoperatively. Although the surgical outcomes were comparable between the two groups, informed consent for these two surgical methods can be provided to the patients. Further large-scale trials and long-term outcomes are needed to confirm our results.

Data availability statement

All data are presented in the manuscript.

Financial support and sponsorship

Nil.

Conflicts of interest

Dr. Dah-Ching Ding, an editorial board member at *Tzu Chi Medical Journal*, had no role in the peer review process of or decision to publish this article. The other authors declared no conflicts of interest in writing this paper.

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