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Original Article

A comparison of modified laparoscopic uterine suspension and vaginal hysterectomy with sacrospinous ligament fixation for treating pelvic organ prolapse

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Abstract: Objectives: To compare the efficacy and adverse events between modified laparoscopic uterine suspension and vaginal hysterectomy and sacrospinous ligament fixation. Methods: The study reviewed the clinical data of 50 postmenopausal patients who underwent modified laparoscopic uterine suspension (the hysteropexy group) and 50 patients who underwent vaginal hysterectomy with sacrospinous ligament fixation (the hysterectomy group) conducted by the same group of surgeons (2018.1-2019.6) retrospectively. We compared the two groups' baseline characteristics, perioperative details, complications, and POP-Q values before the operations and at 12 months after the operations. The effects on quality of life according to valid questionnaires (PFIQ-7 and PFDI-20) were compared. The patients were followed up for 12 months. Results: There were no significant differences in the perioperative details or baseline characteristics, except that more cases of concurrent vaginal wall (anterior and posterior) and concurrent perineal repair were observed in the hysteropexy group than in the hysterectomy group (9 versus 0, P=0.02; 33 versus 6, $P < 0.001$). The anatomical measures of points Ba, Bp, and C ($P < 0.001$), and the quality of life measures ($P < 0.001$ for PFIQ-7 and PFDI-20) after the operations exhibited significant improvements in the two groups. The total vaginal lengths (TVL) were dramatically decreased after the surgery in the hysterectomy group, but no differences were observed in the hysteropexy group. The two groups didn't show a significant difference in the recurrence of prolapse anatomically or symptomatically, but a dramatically higher number of patients in the hysterectomy group were found to have experienced postoperative vaginal bleeding, excessive granulation tissue and right buttock pain. Conclusions: The postoperative outcomes, anatomical results, and improvement of function and symptoms of modified laparoscopic uterine suspension were similar to those of vaginal hysterectomy with sacrospinous ligament fixation. Moreover, modified laparoscopic uterine suspension had fewer postoperative complications, so it could be used as an additional choice for POP, although the long-term outcomes haven't been determined yet.

Keywords: Modified laparoscopic uterine suspension, non-absorbable sutures, pelvic organ prolapse, sacrospinous ligament fixation, transvaginal hysterectomy

Introduction

Pelvic organ prolapse (POP) impairs women's quality of life in many aspects by causing physical, psychological, and sexual troubles. It can be physically seen in 41% to 50% of women, but only 3% of them complain of symptoms [1, 2]. The lifetime risk for a woman to undergo prolapse surgery is about 13% [3]. In this situation, vaginal hysterectomy is a traditional approach for treating POP. However, hysterectomy can also be the cause of POP [4].

In fact, the uterus plays an important role in women's physical and psychological well-being [5]. In POP development, the uterus is found to function merely as a passive structure rather than a cause. Hence, uterus conservation surgery and hysteropexy have aroused great interest among gynecologists and pelvic reconstruction surgeons [6, 7]. These procedures were previously shown to have lower reoperation rates, so they were accepted much more by patients [7].

During the past decades, surgical meshes were widely used in many uterus conservation surgeries, and they were thought to preserve women's pelvic structures and were optimistically deemed an effective treatment. However, surgical meshes were also reported to be related to many complications, such as mesh erosion, bleeding, and infections [8]. In April 2019, the U.S. Food and Drug Administration (FDA) announced that transvaginal mesh kits would not be allowed to be marketed for anterior/apical compartment prolapse reparations any more [9]. The mesh-based treatment is still controversial and remains a huge problem for gynecologists.

This study focused on the evidence comparing hysteropexy with hysterectomy during surgery for uterine prolapse. To avoid complications relevant to the meshes, we used nonabsorbable sutures for the vaginal apex suspension and the uterine suspension.

Materials and methods

This retrospective study included women with POP-Q stage 2 or greater uterine prolapse who needed surgical intervention at The International Peace Maternal and Child Health Hospital in Shanghai between January 2018 and June 2019 (to ensure a 12-month follow-up). All the patients were postmenopausal and in the age range of 56-79 years old. Inclusion criteria: 1) according to the POP-Q scale: pelvic organ prolapse (POP-Q stage 2 or greater) without symptoms of stress urinary incontinence; 2) A desire for surgical treatment; 3) Patients who underwent non-surgical treatment but whose symptoms were not alleviated. Patients with coexisting anterior/posterior defects were included. Exclusion criteria 1) Patients with a history of gynecological malignancy; 2) Patients with an acute infection of the reproductive system or other parts; 3) Patients suffering from other diseases and who cannot tolerate surgery or anesthesia; 4) Patients who have re-birth requirements. Women with previous pelvic prolapse surgery, concomitant stress urinary incontinence, abnormal uterine bleeding, cervical smears and ultrasound results of ovaries or uterus were excluded from the study.

Of the 100 patients identified, 50 underwent modified laparoscopic uterine suspension (LUS, the hysteropexy group) and 50 underwent total vaginal hysterectomy (TVH) with sacrospinous ligament fixation (SSLF, the hysterectomy group). They were classified into the two groups based on their own choices. All the participants underwent a clinical examination and a standard evaluation involving their medical histories and symptoms. The medical records provided their POP-Q scores, demographic data, questionnaire outcomes, and intra- and postoperative complications. Subsequently, the patients were systematically followed up for 12 months.

The subjective satisfaction rate was based upon valid questionnaires: PFDI-20 and PFIQ-7, which were administered before and after the operations and during the follow-up. The PFIQ-7 consists of 7 questions that need to be answered 3 times each (corresponds to the scales previously mentioned) considering the symptoms related to the bladder or urine, vagina or pelvis, and bowel or rectum and their effect on function, social health, and mental health in the previous 3 months [1]. The responses for each question range from "not at all" (0) to "quite a bit" (3) [1]. To get the scale scores, the mean of each of the 3 scales is individually calculated, which ranges from 0-3, then this number is then multiplied by 100 and then divided by 3 [1]. The scale scores are then added together to get the total PFIQ-7 score, which ranges from 0-300. A lower score means there is a lesser effect on quality of life [1]. PFDI-20 contained 20 items to assess the specific symptoms of pelvic cavity, bowel and bladder. Every item included 5 options, on the scales from "no symptom, scores 0" to "being affected greatly, scores 4" [10]. The PFIQ-7 evaluated the influence of the bowel, vagina and bladder symptoms on the patients' everyday lives, relationships, and emotions. Every item included 4 options, on the scales from "no influence, scores 0" to "being affected greatly, scores 3" [11].

The objective anatomic evaluation took advantage of the POP-Q scale to grade the prolapse stages at the Ba, C, Bp, and total vaginal length (TVL) sites. The secondary outcomes also included recurrent prolapse equivalent to or greater than stage 2, symptomatic recurrent prolapse, and postoperative complications.

Prior to their surgeries, all the patients and their families agreed to participate in the ex-

periment and signed the informed consent form. This study was approved by the Ethics Committee of The International Peace Maternal and Child Health Hospital, School of Medicine, Shanghai Jiao Tong University. All operations were conducted by senior surgeons. We documented the operation dates, blood losses, operation lengths, hospitalization durations, and the occurrence of the main complications (impairment to the ureter, bowel, or bladder). The details are shown below.

Modified laparoscopic uterine suspension

The ticron coated braided polyester nonabsorbable suture (Covidien LLC, USA) was put into the abdominal cavity through a puncture port. The mounted suture punctured the left uterine horn 1 cm from the attachment of the round ligament and emerged at the posterior wall of the uterus. Then the suture was threaded through the posterior wall of the uterus horizontally. Next the suture was fed posteriorly to enter the right uterine horn at the same level as the left uterine horn entry point.

A 2 mm skin incision was required at the abdominal central line 3 cm above the pubic symphysis. An abdominal puncture apparatus inserted into the abdominal wall from the skin incision was used to take out the two free ends of the nonabsorbable suture. The two free ends were strained under moderate tension and tied outside the anterior rectus sheath, which fixed the uterus to the anterior abdominal wall. The abdominal wall suture was cut, and the skin incision was closed automatically.

If any cystocele, rectocele, or perineal laceration required transvaginal reconstruction, then traditional anterior, posterior colporrhaphy and perineal repair procedures were performed before the laparoscopic procedure.

Transvaginal hysterectomy with sacrospinous ligament fixation

TVH was conducted in the patients who needed uterine removal as standardized requirements. The uterosacral ligament and cardinal stumps were bound together in the midline prior to closing the peritoneum.

Following the closure of the peritoneum, unilateral SSLF was performed to the right sacrospinous ligament for all the patients via a posterior approach. The rectovaginal space was inflated via hydrodissection with normal saline. The sacrospinous ligament was identified and exposed after a sharp and blunt dissection at the ischial spine level. The ticron coated braided polyester nonabsorbable suture (Covidien LLC, USA) was placed via ligament, about 1.5-2 cm medial to ischial spine. The suture went through the vaginal epithelium at the vaginal vault and were held, left untied. Then all extra reconstruction procedures were finished. The vaginal epithelium was closed with absorbable sutures. Lastly, the non-absorbable sutures were bound in a way bringing the vaginal vault back to the ligament.

Statistical analysis

The data were analyzed using SPSS 19.0 (Chicago, IL, USA). The baseline and perioperative details and the consecutive demographic variables were analyzed through t tests for the parametric data. Mann-Whitney U tests and chi-squared tests were used for the nonparametric and categorical data, respectively. The questionnaire and POP-Q scores were analyzed using Wilcoxon signed rank tests when comparing the preoperative and postoperative data in the groups, and Mann-Whitney U tests were used when comparing the preoperative or postoperative data between the two groups. $P<0.05$ indicated a significant difference.

Results

Comparison of the general data between the two groups

There were no significant differences in the general data, including age, parity, gravidity medical comorbidities and POP stage between the two groups ($P > 0.05$), which were comparable (**Table 1**).

Comparison of perioperative details between the two groups

There were no significant differences in terms of the lengths of the operations, blood loss, hemoglobin differences, hospitalization durations or the concurrent anterior vaginal repairs between the two groups. The number of concurrent posterior/perineal repairs was much higher in the hysteropexy group (9 versus 0, $P=0.02$; 33 versus 6, $P < 0.001$; see **Table 2**).

Table 1. Baseline characteristics of both groups

	Laparoscopic Uterine Suspension (n=50)		TVH+SSLF (n=50)		*P* value
	Mean or number or Median	SD or % or range	Mean or number or Median	SD or % or range	
Age	65.78	6.008	67.84	4.670	0.059*
Gravidity	2.5	2,3	3	2,4	0.322**
Parity	1	1,2	1	1,2	0.167**
Hypertension	21	42%	23	46%	0.687***
Diabetes mellitus	7	14%	5	10%	0.538***
Cardiovascular disease	1	2%	2	4%	0.558***
POP Stage, n					
II	10	20%	7	14%	0.424***
III	39	78%	42	84%	0.444***
IV	1	2%	1	2%	1.000***

*t tests; **Mann-Whitney; ***Chi-squared test.

Table 2. Perioperative details of both groups

	Laparoscopic Uterine Suspension (n=50)		TVH+SSLF (n=50)		*P* value
	Mean or number or Median	SD or % or range	Mean or number or Median	SD or % or range	
Operative time (min)	79.08	24.301	72.58	11.735	0.092*
Total blood loss (ml)	50	50,60	50	50,80	0.313**
Hemoglobin difference	11.81	6.968	11.08	9.400	0.659*
Average hospital stay	6	5,7	6	5,7	0.296**
Concurrent anterior repair	31	62%	23	46%	0.108***
Concurrent posterior repair	9	18%	0		0.02***
Concurrent perineal repair	33	66%	6	12%	<0.001***

*t tests; **Mann-Whitney; ***Chi-squared test.

Table 3. Questionnaire scores at the 1-year follow up for both groups

	Laparoscopic Uterine Suspension (n=50)					TVH+SSLF (n=50)					P	
	Pre		Post		P	Pre		Post		P	Pre	Post
	Median	Range	Median	Range		Median	Range	Median	Range			
PFDI-20	29.15	12.50-37.50	0.00	0.00-4.16	<0.001	37.50	28.12-54.68	0.00	0.00-6.25	<0.001	0.475	0.651
PFIQ-7	12.50	5.00-14.00	0.00	0.00-2.25	<0.001	10.00	1.00-14.00	0.00	0.00-2.00	<0.001	0.080	0.577

No surgical impairments or adverse complications in the operations occurred in the two groups.

Comparison of PFIQ-7 and PFDI-20 scores between the two groups

A remarkable improvement in functions and life quality was observed in the two groups after the procedures according to the PFIQ-7 and PFDI-20 scores. Moreover, no differences were observed in the pre- and post-operative scores ($P > 0.05$, **Table 3**).

Comparison of the improvements in POP-Q at the 1-year follow up in both groups

The two groups displayed tremendous data improvements in their anatomical measures of points Ba, Bp and C during the follow-up ($P < 0.001$, **Table 4**). TVL was unchanged in hysteropexy group ($P=0.083$), but a significant reduction was revealed in the hysterectomy group ($P < 0.001$). Thus, there was a significant difference in the postoperative TVL ($P < 0.001$).

Table 4. Improvements in the POP-Q at the 1-year follow up in both groups

	Laparoscopic Uterine Suspension (n=50)					TVH+SSLF (n=50)					P	
	Pre		Post		P	Pre		Post		P	Pre	Post
	Median	Range	Median	Range		Median	Range	Median	Range			
Ba	1.5	1.5,2.0	-2.0	-2.5,-1.5	<0.001	1.5	1.5,2.0	-2.0	-2.5,-1.5	<0.001	0.618	0.728
C	1.5	1.5,2.0	-5.0	-6.0,-5.0	<0.001	2.0	1.5,2.0	-5.0	-6.0,-5.0	<0.001	0.665	0.685
Bp	-1.0	-1.25,0.5	-2	-2,-2	<0.001	-1.0	-2.0,1.0	-2.0	-2.5,-2.0	<0.001	0.643	0.737
TVL	7.0	7.0-7.0	7.0	6.0,7.0	0.083	7.0	7.0,7.0	6.0	6.0,6.0	<0.001	0.628	<0.001

Table 5. Outcome measures and postoperative complications

	Laparoscopic Uterine Suspension (%)	TVH+SSLF	*P* value
Recurrent prolapse ≥ stage 2			
Vault/uterine prolapse	0	0	
Anterior prolapse	3	3	1.000
Posterior prolapse	0	0	
Reoperation for POP	0	0	
Symptomatic recurrent prolapse	3	2	0.646
Lower abdominal pain	1	2	0.558
Right buttock pain	0	4	0.041
Vaginal bleeding	2	8	0.046
vaginal stump polyp	0	4	0.041

Comparison of the outcome measures and postoperative complications

In this study, there was no case of recurrent vault/uterine prolapse equivalent to or greater than stage 2 and no case of reoperation for POP after 12 months. There were 3 cases of recurrent anterior prolapse equivalent to or greater than stage 2 in each group. There were 3 women with symptomatic recurrent prolapses in the hysteropexy group, and there were 2 in the hysterectomy group. In the hysteropexy group, 1 patient complained of lower abdominal pain, and 2 had vaginal bleeding. In the hysterectomy group, 2 patients had pain in the lower abdominal region, 4 patients complained of right buttock pain, 8 patients experienced vaginal bleeding, and 4 patients experienced excessive granulation tissue. Apparently, the rates of right buttock pain, vaginal bleeding and excessive granulation tissue were dramatically higher in the hysterectomy group (P= 0.041, P=0.046, P=0.041, see **Table 5**). One patient's sacrospinous suture was untied due to severe pain over the right buttock at 6 months after the operation.

Discussion

With the development of surgical tenichques, hysterectomy is popularly deemed to be safe and is being widely used in POP management. TVH with SSLF has been a top priority among hysterectomy procedures. With the recognition of uterus function in prolapse development, hysteropexy was reconsidered to be an option. However, mesh-based hysteropexy still generates much debate. This retrospective study analyzed the efficacy, safety, and complications in LUS with suture lines versus TVH with SSLF.

The previous studies reported that uterus conservation procedures have been shown to decrease the length of operation [12, 13]. However, we didn't find this advantage in our hysteropexy group. It might due to the higher concurrent surgery rate. In addition, TVL was significantly reduced in the hysterectomy group, but it remained the same in the hysteropexy group. This may be due to the removal of excess parts of the vaginal wall during the hysterectomy and the suturing of the posterior and anterior vaginal walls together. Nevertheless, this alteration will not worsen the sexual life quality among postmenopausal women [14]. In this study, the average age of the patients was 66.5 years, most of whom weren't sexually active, so their sexual function was not taken into consideration.

In this study, we found that uterine-preserving prolapse surgery compared with hysterectomy does not dramatically change the short-term prolapse results, a finding similar to those in previously reported studies [15, 16]. As previous studies showed, transvaginal sacrospinous ligament fixation is a good method for POP management [17-19]. The most common complications are vaginal bleeding and buttock pain [18, 20]. These situations were similar in our study, which might lead to an increase in the reoperation risk.

Laparoscopic hysteropexy is less well studied than hysterectomy, and none of these trials compared suture hysteropexy to vaginal hysterectomy with SSLF. While we compared these two types of surgery in this work, there still are several limitations to our study. Obviously this was a retrospective study without any randomization or blinding, which might increase the selection bias in our results. Another restriction is the short follow-up period after operations, which might limit the precision of our conclusions. Beside the advantage we have mentioned above, uterine conservation might still augment the chances of futher uterine or cervical abnormalities. Will it be a challenge for ongoing cervical and endometrial surveillance? Further long-term, more comprehensive and randomized clinical trials are required.

The study provided evidence for the efficacy and safety of LUS versus TVH with SSLF. There was no significant difference in the perioperative results, improvement of function and symptoms, subjective success, or anatomical success rates between two groups. However, LUS had fewer bothersome postoperative complications, which meant it might be an additional choice for POP, even though long-term outcomes haven't been obtained yet.

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Disclosure of conflict of interest

None.

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