Laparoscopic sacral colpopexy for uterine prolapse with prolene mesh

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Summary

Objective: To analyze the clinical effects of laparoscopic sacral colpopexy using prolene mesh for patients with pelvic organ prolapse. *Methods:* Laparoscopic placement of prolene mesh in the rectovaginal septum and veslcovaginal septum of 42 women with uterine prolapse with bladder and rectum prolapse. One mesh was fixed to the round ligaments and another to the periosteum of the sacral vertebrae. Operation time, blood loss, complication rate and follow-up surgery results were recorded monthly and analyzed according to the POP-Q system. The uterus was preserved in all cases. *Results:* The mean operating time was 92 ± 12 min and the mean blood loss during surgery was 98 ± 11 ml. Postoperatively, both prolapse and symptoms were highly significantly improved ($p < 0.001$) according to the pelvic organ prolapse quantification (POP-Q) system. *Conclusions:* Laparoscopic sacral colpopexy for uterine prolapse using prolene mesh is a minimally invasive and effective new technique that offers a chance for patients who desire to preserve their uterus.

Key words: Uterine prolapse; Laparoscopy; Sacral colpopexy; Mesh.

Introduction

Pelvic organ prolapse (POP) is a common clinical condition that affects the social, occupational, domestic, psychological and sexual lives of women with an estimated prevalence of up to 50% of parous women. Uterine prolapse and vaginal wall bulge are common types of POP. Uterine prolapse occurs when the pelvic floor muscles and ligaments stretch and weaken, providing inadequate support for the uterus [1]. The disorder is among the most demanding and technically challenging problems of female reconstructive surgery. Several surgical options are available to women with the afflicton and the results vary widely. Although traditional surgical methods like vaginal hysterectomy and anterior/posterior colporrhaphia have short-term recovery rates, the rate of prolapse recurrence is rising year by year. The levator plication procedure is still an effective procedure, but, postoperatively, 27-50% of women report pain during intercourse [2].

Sacral colpopexy placing synthetic mesh through laparoscopic techniques in the rectovaginal septum and veslcovaginal septum seems to be the more reliable procedure for the the cure of uterine prolapse. In this paper, we describe this novel approach to the surgical management of uterine prolapse. The surgery involved a laparoscopic approach to sacral colpopexy and anterior/posterior colporrhaphia with prolene mesh, which produces excellent results with very few complications. To our knowledge a similar study has not previously been reported in the literature.

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Patients and Methods

From October 2006 to November 2009, a total of 42 women with uterine prolapse presented at the Department of Gynecology II, Renmin Hospital of Wuhan University. The age range at surgery was 35-57 (mean 41.1 ± 9.4) years. Consent was obtained from each patient and we did not take extra blood or tissues from any patient. All medical records were reviewed. Ethical approval was obtained from the Research Ethics Committee of our hospital. All assessments in the study were carried out by a gynaecologist who had not performed the operation.

The stage of prolapse was assessed using the International Continence Society pelvic organ prolapse quantification (ICS POP-Q) [3] system. The patients were selected on the basis of POP-Q stage 2-4. Women with POP-Q stage 1 of prolapse and repeat surgery for recurrent prolapse were excluded.

All patients had a preoperative evaluation which included a detailed history, physical examination, gynaecological examination, routine preoperative examination and thinprep cytologic test (to eliminate cervical lesions). Appropriate antibiotic coverage was given perioperatively. After surgery, total operating time and blood loss during surgery were recorded. The postoperative Foley catheter was removed within 24 hours. Routine physical examination and gynaecological examination were repeated ranging from 2-36 months. Minimum follow-up was two months for all patients. These patients were asked the same questions with respect to possible complaints including tenesmus, dysuria, dyschesia, and dyspareunia. Prolapse recurrence was considered as any symptomatic prolapse or stage at or above 2. The end of follow-up was defined as recurrence of prolapse and any complaint mentioned above.

Comparison between preoperative and postoperative POP-Q scores was conducted with use of the t test (Table 1). Chi-square tests were performed to investigate the influence of tenesmus, dysuria, dyschesia, and dyspareunia (Table 2). A p value less than 0.05 was considered to be significant and less than 0.01 to be highly significant. Prolene mesh (Johnson & Johnson Medical Ltd., Shanghai, China) was used during surgery for all cases.

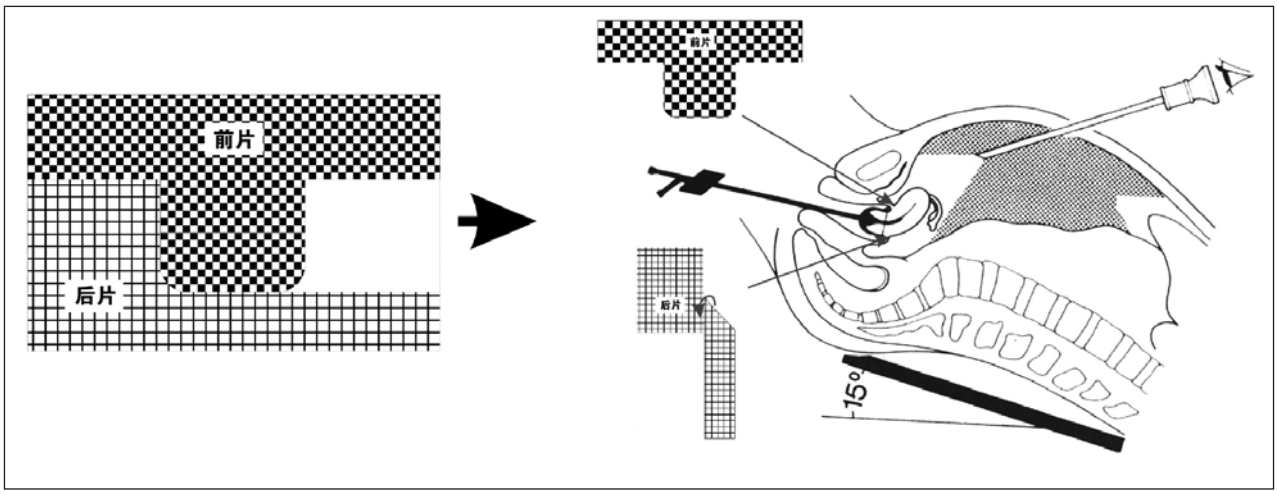

Figure 1. — Drawing of the architectural design of the meshes: the prolene meshes were made and designed as flag- and a T-shaped configurations and placed in the rectovaginal space and vesicovaginal space, respectively.

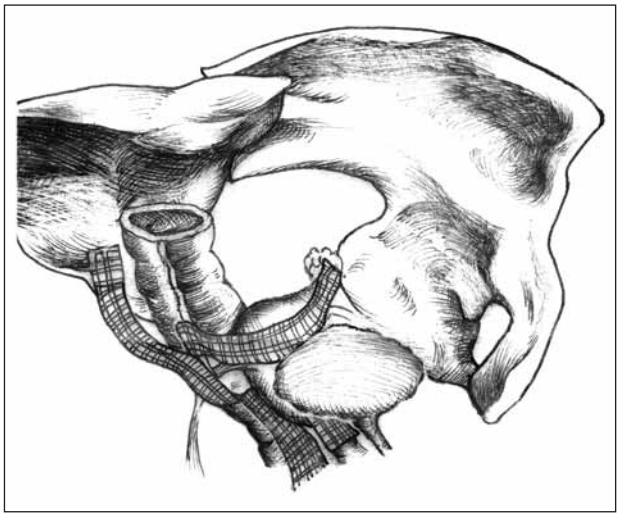

Figure 2. — The abridged general view of laparoscopic sacral colpopexy for uterine prolapse with prolene mesh: the T-shaped mesh was placed in the vesicovaginal space and wings on both sides were pushed into and stitched with the round ligament. The part of the flag was placed in the rectovaginal space. The vessel-free area in the retroperitoneum between the right uterosacral ligament and sacral promontory was incised.

Operative procedure

According to the degree of prolapse and the area to repair the fascia of the anterior and posterior vaginal wall, respectively, the prolene meshes (10 × 15 cm^2), were previously made and designed as a flag- and a T-shaped configuration (Figure 1). The horizontal limb of the T-shaped mesh was 2 cm in width.

The patient was placed in the dorsal lithotomy position under general anaesthesia. The abdomen was opened through a hypogastric laparotomy to access the peritoneal cavity.

The operation procedure was as follows (Figure 2). The peritoneum covering the pouch of Douglas was opened between the uterosacral ligaments. After dissection of the rectovaginal septum, the flag-shaped mesh was introduced into the abdomen through puncture cannula in the pelvic peritoneum. The part of the flag was trimmed to proper dimensions of the protrusion of the posterior vaginal wall. The vessel-free area in the retroperitoneum between the right uterosacral ligament and sacral promontory was incised. The incision was longitudinally extended to the medial aspect of the right uterosacral ligament. The strip of the mesh was folded with a turn through 90° at its base and passed through the right uterosacral ligament. After retracting the rectum forward, the presacral fascia was bluntly dissected until the periosteum was reached. A uterine manipulator was inserted into the vagina and the uterus was pushed gently to its normal anatomic position. Using a nonabsorbable suture, the strip was fixed to the periosteum between the second and third sacral vertebrae in the vessel-free area. The residual portion of the strip was removed.

Attention was then turned to the uterovesicorectal reflection. A transverse incision was made in the peritoneum at the uterovesicorectal reflection. The dissection was continued to the deepest part of the cystocele through the vesicovaginal septum. The T-shaped mesh was placed in the vesicovaginal space and flattened without any tension. A hemicycle space was created in the center of the mesh. The free hemicycle edge was fixed to the vaginal wall using a 1/0 nonabsorbable suture. Care was taken not to exit the suture through the vaginal mucosa. The round ligament was held by a grasping forceps and then the puncture cannula was withdrawn. A trocar was introduced extraperitoneally to the attachment of the round ligament and continued subcapsularly to the anterior wound of the broad ligament. After the trocar was removed, another grasping forceps was inserted through the puncture cannula. The ipsilateral horizontal limb of the T-shaped mesh was pulled to the wound in the peritoneum and the free edge of the limb was sutured to the cardinal and broad ligaments. In a similar fashion, the procedure was performed in the contralateral side. Finally, the retroperitoneum was closed using a continuous suture.

After injection of normal saline solution into the posterior vaginal wall, a 3 cm longitudinal incision was made at the site or transversal incision medial to the hymen. Dissection between the rectovaginal septum was performed by closely following the posterior fascia of the vagina until the vaginal vault was

Table 1. — *POP-Q measurements before surgery and at final follow-up*.

	C	Aa	Ba	Ap	Bp
Preoperation	+3.11 ± 3.23	1.12 ± 1.70	+1.37 ± 1.51	-2.43 ± 1.37	-1.01 ± 1.71
Final follow-up	-7.12 ± 0.61	-2.51 ± 0.43	-2.17 ± 0.55	-2.49 ± 0.85	-2.61 ± 0.17
T-test*	20.066	13.206	14.290	18.916	5.985

The Pelvic Organ Prolapse Quantification (POPQ): Point C represents the position of the cervix or vaginal cuff. The anterior and posterior points A (Aa, Ap) are located on the midline vaginal wall 3 cm proximal to the hymen (range ± 3 cm). The anterior and posterior points B (Ba, Bp) represent the maximum extent of prolapse of the anterior and posterior vaginal wall (range -3 cm to total vaginal length [tvl]); $p < 0.01$.

reached. The free edge of the flag-shaped mesh was pulled down to the lowest position of the posterior vaginal wall and then fixed to the perineal body and bilateral levator ani muscles. The wound in the vaginal wall was closed.

Results

Total operating times ranged from 80 to 104 (average 92 ± 12) min. The mean intraoperative blood loss was 92 ml (range 98 ± 11 ml). No complications occurred during the surgery. Of all cases, there were two with urine difficulty (4.76%) who were released after three continuous urinary catheterisations. Five cases had passing stool difficulty (11.90%), in whom four recovered after symptom treatment, and one recovered one month after surgery. Three cases experienced sexual discomfort (7.14%), in whom two were one month after surgery, and one was three months after surgery. All patients were followed monthly through outpatient department visits and telephone surveys and accurate outcome data of the last follow-up (range 2-36 months) were obtained with the follow-up rate being 97.62%. One patient was lost to follow-up. There was no recurrent prolapse in any of the 41 followed patients. Mesh infection or erosion was not observed. Pre- and postoperative POP-Q scores were assessed, respectively. The index point C, Aa, Ba, Ap, and Bp in all 41 patients was ≤ 1, that is, 1 cm superior to the margin of the hymen, less than grade 2 by the POP level. The vaginal index points of preoperative and postoperative follow-up (last follow-up) are shown in Table 1. Calculating the scores gave p values less than 0.0001. There were highly significant differences between the pre- and postoperative POP-Q scores (Table 1). Table 2 shows the preoperative and postoperative pelvic floor function. There were statistically highly significant differences in the number of patients with tenesmus, dysuria and dyspareunia ($p < 0.0001$), and significant differences with dyschesia ($p < 0.01$) (Table 2).

Table 2. — *Summary of the comparison of preoperative and postoperative pelvic floor function*.

Symptoms	Tenesmus		Dysuria		Dyschesia		Dyspareunia	
Time	Cases	(%)	Cases	(%)	Cases	(%)	Cases	(%)
Preoperation	34	80.95%	21	50.00%	17	40.48%	31	73.81%
Postoperation	6	14.29%	2	4.76%	5	11.90%	3	7.14%
χ^2	33.939		18.894		7.128		35.230	

$p < 0.01$.

Discussion

Uterine prolapse is the herniation of the uterus into or beyond the vagina as a result of failure of the ligamentous and fascial support. A large number of corrective surgical approaches have been described in the literature for uterine prolapse. One concept prevails: if surgery becomes necessary, it allows relief of the symptoms and restores the pelvic organs to their anatomical position. Moreover, the intervention can reduce postoperative complications and incidence of recurrence.

DeLancey *et al*. [4] described three levels of a support system as follows: level 1, superior suspension of the vagina to the cardinal-uterosacral complex; level 2, lateral attachment of the upper two-thirds of the vagina; and level 3, distal fusion of the vagina into the urogenital diaphragm and perineal body. They noted that uterine prolapse was often associated with defects of the cardinal ligaments, rectovaginal and cervical fascia. Delancey's three levels of support are now accepted worldwide.

Vaginal hysterectomy with posterior vaginal wall repair has failed to correct the loss of integrity of the cardinal-uterosacral ligament complex. In addition, postoperative scarring can cause vaginal discomfort during penetration. In a retrospective study, Jin *et al*. [5] found that the recurrence rate was 11.6-31.1% in women who had undergone this procedure. Sacral colpopexy could offer good anatomical and functional results and the reported success rate has been generally as high as 68-100% [6].

A variety of surgical procedures are available for sacral colpopexy. In 1957, Ameline Hugier *et al*. [7] made a detailed description of open sacral colpopexy in which the vaginal vault was suspended to the anterior periosteum of the sacrum with unabsorbable material. Scali *et al*. [8] in 1974 proposed the suspension by the placement of synthetic slings. However, adequate exposure of the rectovaginal septum could not be obtained completely from the vaginal approach. In 1993, Dorsey *et al*. were the first to describe laparoscopic sacral colpopexy [9]. This minimally invasive surgery implied the placement of prosthetic mesh to restore and confer an adequate reinforcement of the pelvic tissues. Presently, this technique is considered as an excellent option for uterine prolapse [2, 10, 11].

Gynacologists favour the laparoscopic approach because of its few complications and quick recovery, which are particularly important for patient quality of life. The use of mesh in prolapse repair avoids dependence on the patient's own weak tissues and maintains vaginal capacity. The dimension of the flag-shaped and T-shaped mesh is individualised and based on the size of the patient defect at the tension-free state. Our results reflect benefits of the laparoscopic approach, including excellent vision, less trauma, less blood loss, less postoperative pain, minimal tissue damage and scarring, no longitudinal incision in the anterior vaginal wall, which can preserve the uterus, decreased discomfort in sexual activity and improvement in quality of life, better than other reports obviously [12].

Our procedure simultaneously repairs vaginal wall defects of both levels 1 and 2. The pelvic floor is reinforced by fascia repair and ligament reconstruction. During sacral colpopexy, care must be taken not to injure the anterior sacral nerves or the vessels at the lateral border of the sacrum. The round ligaments are sutured with mesh and then combined with uterosacral ligament mesh. This procedure stabilizes the uterus in a neutral position which puts the vaginal vault and uterus in the center part of pelvic cavity, preventing the uterus from pressing on the rectum and the occurrence of cystocele and stress urinary incontinence. The retroperitoneal position of mesh has the potential to decrease the risk of intestinal adhesion and occurrence of a hernia beneath the mesh. Adequate exposure of rectovaginal septum can be made easier by the laparoscopic approach and the mesh can be placed into the interspace of the anterior and posterior vaginal walls for fascial reinforcement.

After surgery, the prolene mesh provokes a fibrotic reaction and scar-tissue formation. Collagen deposition in mesh is sufficient to support the vaginal wall and prevent recurrence [13]. The use of prolene mesh theoretically has a lower risk of wound infection and tissue erosion [14], and these complications were not observed in our series.

The indication for this technique is women presenting with uterine prolapse of stage 2 or more, especially women who desire an active sexual life with a preserved uterus and potential fertility. The contraindications included active infection or cancer. The relative contraindication is severe anterior and posterior vaginal wall prolapse.

This study is limited in that it is a retrospective survey in a small population and further long-term follow-up is required.

In conclusion, laparoscopic sacral colpopexy with prolene mesh can effectively restore optimal vaginal function and anatomy and prevent prolapse recurrence, and preserve the uterus. We therefore believe that this technique produces excellent results.

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