



Transvaginal single-port laparoscopic-assisted vaginal sacral fixation

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Abstract: It is estimated that the incidence of pelvic floor dysfunction disease in women over 50 years old is 50%. The aim of treatment for pelvic floor dysfunction is to alleviate symptoms and reconstruct the normal pelvic anatomy in order to improve the quality of life. The surgical methods are various and can be divided into traditional surgery and reconstruction surgery. Reconstruction surgery includes sacral fixation, sacrospinal ligament fixation, high uterosacral ligament suspension, and pelvic floor reconstruction with synthetic mesh. In addition to these, sacrocolpopexy has been widely used in clinical treatment for apical compartment prolapse as one of the classic methods. At present, it is usually completed using an abdominal or laparoscopic method with mesh, but the mesh is a foreign body, which may lead to many complications arising from mesh exposure and erosion. We have been performing transvaginal vaginal sacral fixation with 2 absorbable sliding lines instead of the patch to suspend the vaginal stump on the anterior longitudinal ligament in front of the sacrum. However, due to the need to establish a special surgical position, the use of special lengthening instruments, and the high requirements of teamwork, a limited number of these operations have been completed over the past few years. Recently, different surgical approaches have emerged, especially single-port laparoscopy. With the popularity of the minimally invasive concept and the continuous development of single-port laparoscopic technology, minimal invasiveness, good aesthetic appearance, rapid recovery, and maintaining treatment effectiveness, are the new requirements for our operations. Therefore, we aimed to complete the operation with the aid of transvaginal single-port laparoscopy. The combination of vaginal surgery and laparoscopic surgery avoids the drawbacks in vaginal surgery of a small visual field and exposure difficulties and allows for laparoscopy to be performed under direct vision, which improves the safety of the operation. Furthermore, no scar is left on the body surface, operation-related pain is reduced, the appearance of the body is improved, and rapid recovery is promoted. Here, we describe transvaginal single-port laparoscopic-assisted vaginal sacral fixation.

Keywords: Transvaginal single-port laparoscopy; vaginal sacral fixation; apical compartment prolapse

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Introduction

Pelvic organ prolapse (POP) refers to the pelvic organs and adjacent vaginal wall protruding into the vagina or prolapsing out of the vagina. This is a common disease in elderly women. With the aging of the population, POP is becoming an increasingly common condition, particularly in older females. The risk factors of POP are various, and lead

to the weakening of the supporting pelvic floor connective tissue, muscle tissue, and nerve injury. The patients may have no symptoms or severe symptoms, such as urinary tract-related symptoms, pelvic pain, incontinence, back pain, and dyspareunia. Nonsurgical treatment for POP includes pelvic floor muscle exercise and vaginal insertion of a uterine bracket. According to the patient's expected purpose, degree of activity, and health status, the surgical

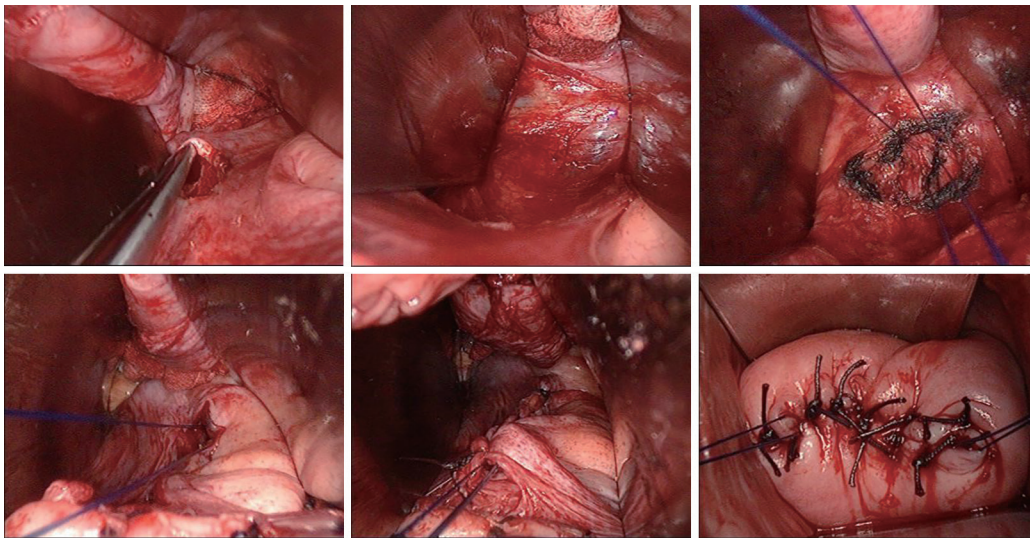


Figure 1 Transvaginal sacral fixation.

Table 1 POP-Q examination result before operation (cm)

Variable	Results
Aa	-3
Ap	-3
TVL	6
Ba	0
Bp	0
Gh	3
C	2.5
D	0
Pb	3

POP, pelvic organ prolapse; TVL, total vagina length; Gh, genital hiatus; Pb, perineal body.

treatment should be individualized, and multiple defects should be repaired. Thus far, vaginal sacral fixation has been considered a good option in the surgical treatment of this disease (*Figure 1*). In accordance with the concept of minimally invasive surgery, we have tried to integrate single-port laparoscopic technology into the treatment of POP. We here report a case from Yantai Yuhuangding Hospital, China. We present the following case in accordance with the CARE reporting checklist (available at <https://gpm.amegroups.com/article/view/10.21037/gpm-20-69/rc>).

Patient information

The patient was a 66-year-old woman, complaining of a vulva prolapse lump for 1 year that was aggravated for 1 month. Her life quality was severely reduced by this disease, and she had a strong desire for operation. Pelvic examination revealed no obvious bulge in the anterior or posterior walls of the vagina. The surface of the cervix was smooth. The external cervical orifice was to be outside the vaginal orifice, but the uterine body was found located within the vagina and of normal size. No obvious abnormality was found in bilateral appendages. The POP-Q examination result are shown in *Table 1*.

All procedures performed in studies involving human participants were in accordance with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this study and any accompanying images.

Diagnostic assessment

Her POP-Q examination results were the following: uterine prolapse, POP-Q III; anterior vaginal wall prolapse, POP-Q II; posterior vaginal wall prolapse, POP-Q II.

Given the results of the relevant examination, contraindications to operation could be excluded. After informed consent was signed by the patient, we performed the single-port laparoscopic-assisted transvaginal sacral

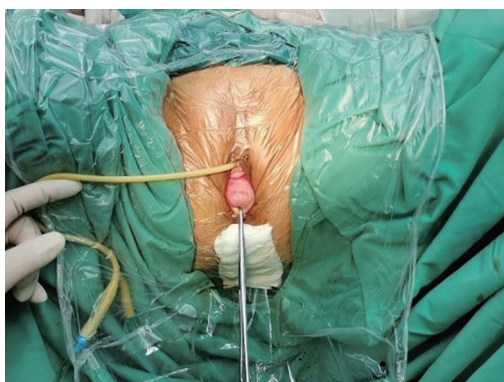


Figure 2 Transvaginal hysterectomy.

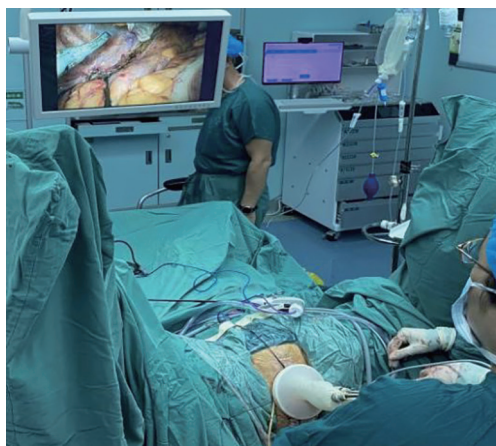


Figure 3 An artificial pneumoperitoneum was established using the self-made port.

fixation.

Video 1: Transvaginal hysterectomy was performed first. We then prepared the port for single-port laparoscopy with an incision protector and sterile gloves. An artificial pneumoperitoneum was established and the laparoscope was placed inside the pelvic cavity through the port.

Therapeutic intervention

Surgical operation using transvaginal single-port laparoscopy (Figures 2 and 3)

- (I) The rectum was separated and the sacrum was exposed. From 1.5–2 cm above the vaginal stump to the sacral promontory, the posterior peritoneum was incised longitudinally along the right side of the rectum using an ultrasonic scalpel. The rectum was

pushed to the left to expose the sacrum and determine the position of sacrum 2.

- (II) The anterior longitudinal ligament in front of sacrum 2 was separated, exposed, and sutured. The loose tissue ahead of sacrum 2 was removed and the anterior longitudinal ligament was exposed; 2-0 non absorbable sliding line was used to suture the upper right and lower left of the ligament.
- (III) The retroperitoneum at the right of the rectum was sutured closed. Two nonabsorbable sliding lines were embedded outside the peritoneum, and care was taken to keep the sliding line sliding without resistance. The details of our suture method are shown in *Figures 4-6*.

Removal of the laparoscope and suturing the top of vagina transvaginally

- (I) The peritoneum was sutured circularly with absorbable suture. The front edge was close to the edge while the posterior edge was about 1 cm left of the edge.
- (II) The sliding line was sutured to the anterior longitudinal ligament on the stumps of the main and sacral ligaments of the same side of the vaginal wall. Care was taken to not penetrate the vaginal mucosa, and the thread was left outside.
- (III) An absorbable suture was used to close the vaginal wall intermittently or continuously.

Transvaginal suspension of the top of the vagina

Finally, the sliding line was tied to the location of the sacral promontory, ending 1–2 cm above the ischial spine (it can be adjusted according to the length of vagina), which suspended the vaginal vault on the anterior of the longitudinal ligament. At the end of the operation, the sliding suture knot was delivered to the sutured vaginal wall incision.

After operation (*Figure 7*), transvaginal examination showed that there was no prolapse of the anterior and posterior wall of the vagina and the top of the vagina (C point: –6 cm). After operation, the intestinal function of the patient recovered quickly with no serious complaints (*Table 2*).

Discussion

With continued economic development of and an aging

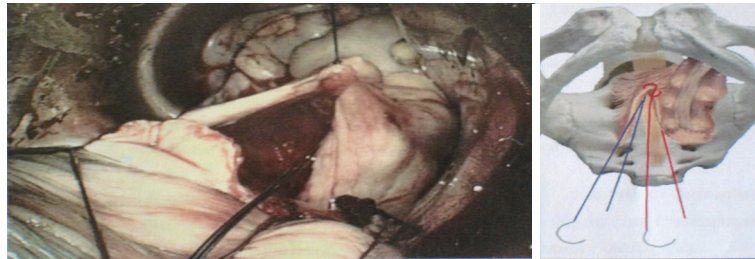


Figure 4 The anterior longitudinal ligament of sacrum is sutured twice with 2-0 nonabsorbable sliding suture.

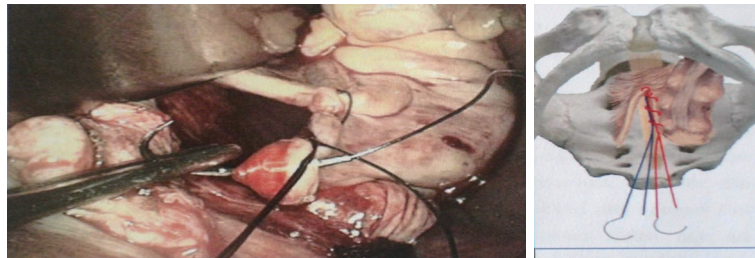


Figure 5 The peritoneum at the left of the rectum and the suture at the other end of the suture are sutured to the edge of the extraperitoneal incision using suture 1. The 2 ends of the other suture are sewn into it, with both ends of the needle being able to slide. The tail of the thread is knotted and marked, with the tail of the thread of the needle being able to slide. The 4 ends of the 2 sutures are reserved, with at least 1-end of each suture being able to slide.

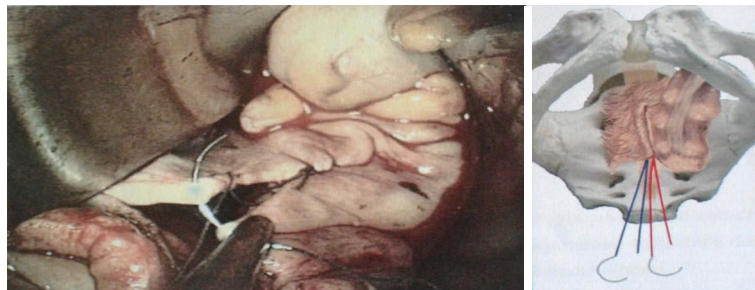


Figure 6 Another 2-0 absorbable suture is then used to close the retroperitoneum. The 4 ends of the 2 sliding lines are embedded under the peritoneum, with the sliding lines being able to slide without resistance.

population, the incidence rate of POP is increasing year by year. At present, surgery is the main treatment method for POP with a grade III–IV POP-Q. Vaginal sacral fixation has the advantages of a low complication rate, high anatomic cure rate, and little impact on sexual function. It has become one of the standard operation methods for treating pelvic defects (1-3), and nearly 50% of anterior vaginal wall and 30% of posterior vaginal wall prolapse can be corrected using this approach after correction of middle pelvic defects (4).

With the continuous development of minimally

invasive surgical equipment and instruments, the surgical approach is evolving from traditional porous laparoscopic surgery to transumbilical single-port laparoscopic surgery and even natural lumen endoscopic surgery (NOTES). NOTES is a kind of endoscopic surgery that uses the natural lumen of the human body, such as oral cavity, anus, urethra, vagina, and so on, and penetrates the tube wall to reach the chest, abdomen, and pelvic cavity to establish the operation channel and pneumoperitoneum to diagnose and treat diseases (5). This concept is part of the pursuit in the surgery sciences to develop from invasive to



Figure 7 The surgical operation completed.

Table 2 POP-Q examination result after operation (cm)

Variable	Results
Aa	-3
Ap	-3
TVL	6
Ba	-3
Bp	-3
Gh	3
C	6
D	-
Pb	3

POP, pelvic organ prolapse; TVL, total vagina length; Gh, genital hiatus; Pb, perineal body.

minimally invasive and finally to non-invasive operation. In accordance with the aims of ensuring the safety of operation, completely removing tumor and lesion tissue, and retaining organ function, it is a surgical method that reduces the pain of patients, leaves no scars on the surface of the body, prompts no bodily reactions, and incurs no additional medical expenses. This is the ideal which every surgeon pursues.

In 2012, Noblett (6) carried out a feasibility study of transvaginal NOTES sacral vaginoplasty on cadavers. It was also confirmed by our group that transvaginal vaginal sacral fixation is effective in the treatment of pelvic prolapse disease. Having experience using vaginal single-hole laparoscopic-assisted surgery, we find the field of view is more open, and that there is reduced bleeding, trauma, and postoperative recovery times, among other advantages. It is in line with the concept of minimally invasive surgery

that the prolapsed dome can be anatomically reduced by using the natural passage of human body, while the vaginal axial direction does not change. With this method, the perioperative disease rate is low, as long as the applied anatomy of presacral area is mastered, serious complications such as intraoperative massive hemorrhage can be avoided. The specific complications caused by patch use can be avoided by using a nonabsorbable sliding line instead of a patch. However, it should be noted that compared with the traditional laparoscopy method, single-port laparoscopic surgery has more prominent characteristics of minimally invasive and aesthetic appearance, but due to its “chopsticks” effect, it is relatively difficult to suture and knot under single-port laparoscopy, as this requires higher surgical skills and patience. Therefore, the operation seems simple, but the actual operation requires surgeons to have mastery of single-port laparoscopy techniques and rich experience in pelvic floor and vaginal surgery. Moreover, the surgeon should be proficient in anterior sacral fixation. During the operation, the suture of the anterior longitudinal ligament should not be too deep or too shallow to ensure the exact and effective surgical suspension, and thus laparoscopic or open anterior sacral fixation operation experience is necessary. The transvaginal single-hole laparoscopy has also changed our consistent top-down operation habit. The operation field of vision needs the adjustment of the operator to adapt to the new operation vision and habits. At present, the application of NOTES technology in female pelvic floor disorder surgery is only limited to case reports, and its potential technical advantages still need to be verified by more clinical studies (7). However, as long as the above basic operation techniques are mastered, it is believed that transvaginal single-port laparoscopic-assisted vaginal sacral fixation has high clinical value and is should

be promoted for clinical application.

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