

A novel retrograde approach for total laparoscopic hysterectomy in patients with severe adhesion in the cul-de-sac

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Summary

Purpose of Investigation: The purpose of the present study was to establish retrograde-total laparoscopic hysterectomy (TLH) as a treatment option for patients with severe adhesions. **Materials and Methods:** A retrospective review of two cases of endometriosis that underwent retrograde-TLH at Shimane University Hospital due to complete cul-de-sac obstruction was performed. Retrograde-TLH has three key steps: processing the round ligament, anterior lobe of the broad ligament of the uterus, and ligamentum ovarii proprium, followed by dissection of the ureteral roof, and finally, the dissection of the vaginal wall. **Results:** Retrograde-TLH was successfully performed in the two patients, without complications. **Conclusions:** For surgeons experienced in the technique, the retrograde-TLH approach offers several advantages, including the simple and safe dissection of tissue planes as close as possible to the edge of adhesions, avoidance of bladder and rectal injuries, and reduced bleeding, minimizing the possibility of conversion to exploratory laparotomy.

Key words: Retrograde; Total laparoscopic hysterectomy; Endometriosis; Adhesion; Laparoscopic surgery.

Introduction

Total laparoscopic hysterectomy (TLH) was initially described by Reich *et al.* in 1989 [1]. Subsequently, an increasing number of studies have reported the feasibility and safety of TLH for patients with benign diseases, such as uterine leiomyoma, adenomyosis, and endometriosis [2, 3]. In addition, several studies have indicated that laparoscopic surgery has numerous advantages over open surgery, including a better surgical view due to the magnification of the video laparoscope, reduced blood loss, faster recovery, shorter hospital stay, fewer wound-related complications, and fewer scar formations [4-8]. However, the laparoscopic route is not useful in all conditions. For example, laparoscopic surgery in uteri with endometriosis or in patients who have undergone several previous abdominal surgeries remains challenging for surgeons. Particularly, patients with endometriosis often have severe adhesions in the adnexal region or cul-de-sac. In such cases, the surgeon must perform a synechiotomy between the uterus and rectum before dissecting the vaginal wall in the basic approach, causing difficulties in dissecting tissue planes, significant bleeding, a lengthy operative time, and visceral or rectal injuries. The location of the adhesion and its degree of severity are not always correlated with the findings on MRI or symptoms, such as dysmenorrhea. Occasionally, laparotomy is recommended for patients who have severe en-

ometriosis when a surgical treatment is required.

The present institution has established a retrograde approach for TLH (retrograde-TLH) in patients with endometriosis and complete cul-de-sac obstruction, using malignant tumor surgical techniques, which contribute to its safe outcomes. The authors herein report two cases with severe adhesions in the cul-de-sac due to endometriosis who successfully underwent retrograde-TLH.

Materials and Methods

Two patients presented with a history of dysmenorrhea, with or without menorrhagia, caused by an endometrial cyst. Both patients provided written informed consent for the retrograde-TLH procedure and for study participation. Data were collected from medical records. The study protocol was approved by the Ethics Committee of Shimane University, Faculty of Medicine, Izumo, Japan (no. 2004-0381). The research was conducted in accordance with the Declaration of Helsinki and Title 45, U.S. Code of Federal Regulations, Part 46, Protection of Human Subjects, effective December 13, 2001.

Surgery was performed in the lithotomy position under general anesthesia. After placing a uterine manipulator, the first port (camera port), was inserted through a 12-mm diameter prepared in the umbilical region, and pneumoperitoneum was applied. Ports were placed in the left and right iliac fossae (5-mm port diameter) and midway between (12-mm port diameter), arranging the ports in a diamond pattern, with the apex in the umbilical region. The operator and first assistant stood on the left and right sides of the patient, respectively, and the second assistant operated the

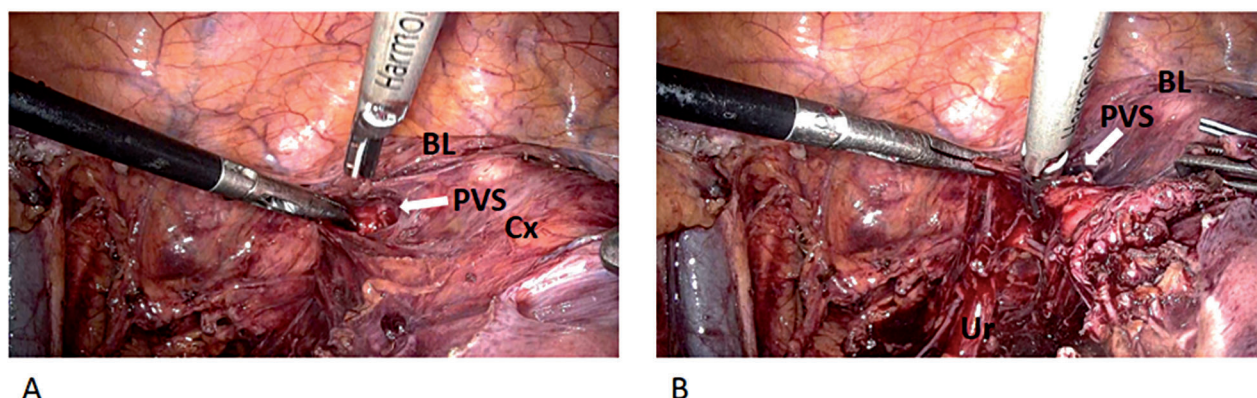


Figure 1. — A) Laparoscopic dissection of the ureteral roof. B) A view from the mediosuperior left side during laparoscopic surgery. Development of the PVS by digging the paravaginal connective tissue along with the cervix in the dorsal direction is helpful in further exposing the ureteral roof for dissection. Cervicovesical vessels that are difficult to visualize can be the source of major bleeding in open surgery. These are easily exposed and treated via vessel sealing in laparoscopic surgery. PVS: paravaginal space. Ur: ureter. BL: bladder. Cx: uterine cervix.

manipulator. The unilateral pelvic sidewall triangle (the region surrounded by the round ligament, infundibulopelvic ligament, and posterior lobe of the broad ligament) were processed. The posterior lobe of the broad ligament, paravesical space, Okabayashi pararectal space, and Latzko pararectal space were exposed. The uterine artery and ureter were identified, and the uterine artery was ligated with absorbable thread, coagulated, and cut. Dissection of the uterine artery and ureter was advanced, and the ureter was dissected up to the ureteral tunnel. These procedures were similarly applied to the opposite side. Next, the round ligament, anterior lobe of the broad ligament, ligamentum ovarii proprium (infundibulopelvic ligament), posterior lobe of the broad ligament, and uterosacral ligament were coagulated and cut. The vesicouterine pouch peritoneum was incised and dissected to expose the vesicouterine pouch. The parametrium was then coagulated and cut. The manipulator was removed, a vagi-pipe was inserted along the vaginal fornix, and the vaginal wall was cut along the vagi-pipe. The excised specimen was collected through the vagina. The vaginal stump was then sutured and closed with absorbable thread. The central peritoneum was continuously sutured and closed with absorbable thread. After irrigation and confirming hemostasis, an anti-adhesive agent was applied to the wound and the abdomen was closed, marking the completion of the laparoscopic surgery.

The following three steps were devised to perform retrograde-TLH: the round ligament, anterior lobe of the broad ligament of the uterus, and ligamentum ovarii proprium (infundibulopelvic ligament) were processed before creating the pelvic sidewall triangles.

In cases with favorable uterine mobility, a uterine manipulator is inserted during normal TLH; as the uterus can be freely moved, tension can be readily loaded on ligaments supporting the uterus, and pelvic sidewall triangles can be promptly processed, followed by the processing of the uterine artery and ureter. However, uterine mobility is poor in cases with severe adhesion, such as endometriosis. Although a manipulator is still inserted, the processing of the pelvic sidewall triangle and identification of the ureter and uterine artery are difficult in many cases. Thus, to secure uterine mobility, the authors first processed the round ligament, ligamentum ovarii proprium (infundibulopelvic ligament), and anterior lobe of the broad ligament of the uterus.

The vesicouterine ligaments are composed of two layers, ante-

rior and posterior, with the former known as the ureteral roof. In normal TLH, the ureter is separated from the uterine cervix during the process of cutting the parametrium, in which the cut vaginal region can be identified. However, this normal processing of the parametrium cannot be applied to cases with severe adhesion, such as endometriosis, and the identification of the positional relationship between the cervix and ureter is difficult. Thus, the ureteral roof was processed by applying techniques of malignant tumor surgery, which enabled the safe separation of the ureter from the cervix and dissection of the vaginal wall, decreasing the risk of injury to the ureter. Many surgeons create a ureteral tunnel just medial to the ureter to create a distance from the dissection lines of the roof and ureter. The authors believe that tunnel formation is not always necessary in laparoscopic surgery, as the magnified visual field enables fine dissection of the roof without involving the ureter. Lateral exclusion of the ureter helps expose the tensioned ureteral roof, which can be dissected with monopolar cutting or sealing devices. Development of the paravaginal space is helpful in exposing the uterine roof. This space is an operative artifact that can be developed with forceps by digging paravaginal connective tissues in a dorsal direction along with the lateral edge of the cervix (Figure 1A). This space can be developed more easily and broadly in laparoscopic surgery than in open surgery due to the presence of pneumoperitoneum. Development of this space mobilizes the bladder and vesicoureteral junction in the caudal and lateral directions, rendering it easy to recognize and safely dissect the uterine roof. The ureteral roof usually contains one or two veins (known as cervicovesical veins) that drain into the uterine cervix [9]. In open surgery, these vessels are sometimes injured, causing massive bleeding, and hemostasis may cause ureteral injury. A magnified visual field can clearly identify such vessels, especially when the paravaginal space is developed, and bleeding can be prevented by sealing them directly (Figure 1B).

In patients with endometriosis and complete cul-de-sac obstruction, it is difficult to separate an adhesion between the uterus and rectum, and dissect the uterosacral ligament. Retrograde-TLH enables dissection of the vaginal wall without opening the cul-de-sac, as well as the identification of the posterior vaginal wall cut-line.

After inserting a vagi-pipe along the vaginal fornix, only the anterior vaginal wall was cut along the vagi-pipe. Subsequently,

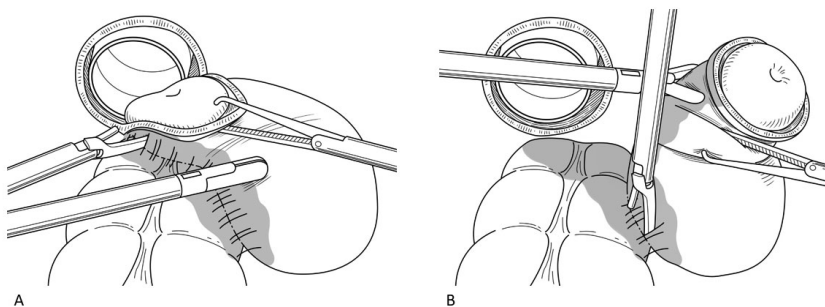
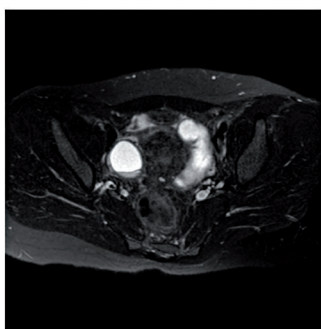
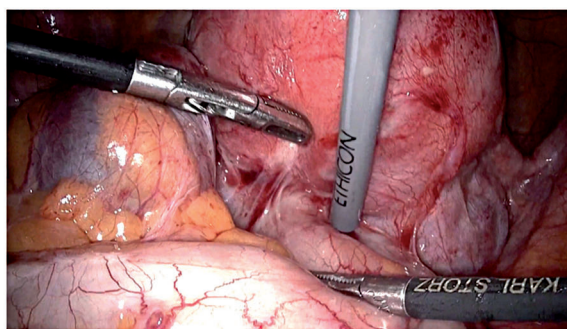


Figure 2. — (A) Schematic drawing showing the dissection of the vaginal wall. (B) Schematic drawing showing the separation of the adhesion from the uterus and rectum.



A



B

Figure 3. — (A) Magnetic resonance imaging in case 1 (axial T2-weighted images). (B) Laparoscopic findings in case 1 showing severe adhesion in the cul-de-sac.

a portion of the uterus was grasped by grasping forceps, and the portio was then pulled cranially and turned over (Figures 2A, B). This clarifies the cutline between the uterus and rectum due to the stretching of the tissue with adhesion and provides a magnified visual field from various angles. Next, the adhesion was separated by cutting the associated region while being careful not to injure the rectum. In this process, cutting along the cervix is slightly helpful in not injuring the rectum.

Results

Case 1

A 42-year-old woman (nulliparous) was referred to Shimane University School of Medicine (Izumo, Shimane) in October 2016 for the investigation and treatment of endometrial cysts. The patient had a ten-year history of endometriosis, adenomyosis, menorrhagia, and dysmenorrhea but had no other significant medical or surgical history. The patient's general physical examination findings were unremarkable. Her hemoglobin level was 7.8 g/dL (normal range, < 11.5 g/dL) and cancer antigen 125 (CA125) level was 90 U/mL (normal range, < 35 U/mL).

Pelvic MRI showed cysts measuring 45×40×40 mm (depth×width×height) in the right ovary and in both fallopian tubes (Figure 3A). Additionally, there was thickening of the posterior uterine wall. These findings were considered to represent endometrial cysts and adenomyosis. Since the patient did not desire to bear children, retrograde-TLH, right salpingo-oophorectomy, and left salpingectomy were performed.

Surgical findings included severe adhesion around the

uterus, particularly in the cul-de-sac, which was completely obstructed (Figure 3B). Although a uterine manipulator was used, uterine mobility was poor. The uterine round ligament, anterior lobe of the broad ligament, and infundibulopelvic ligament were first processed to secure uterine mobility, followed by the processing of both pelvic sidewall triangles, and the identification of the uterine artery, along with the ureter. To process the cervix, the anterior layer of the left vesicouterine ligament (ureteral roof) was dissected. The adhesion between the uterus and rectum could not be separated. A vagi-pipe was inserted, and the anterior vaginal wall was cut. Subsequently, the portio was pulled cranially and turned over using grasping forceps. The adhesion was then separated by dissecting the region of adhesion. No injury of the rectum was observed. The uterus, both fallopian tubes, and left ovary were removed through the vagina. Blood loss was 250 mL, for which no blood transfusion was required. The operative time was 254 min, and the patient was discharged from the hospital on the sixth postoperative day, following an uneventful postoperative period.

Case 2

A 46-year-old woman (nulliparous) was referred to the present hospital in December 2016 for the investigation and treatment of adenomyosis and endometrial cysts. The patient had a six-year history of menorrhagia and dysmenorrhea, but had no other significant medical or surgical history. The patient's general physical examination was unremarkable. Her hemoglobin level was 7.6 g/dL (normal

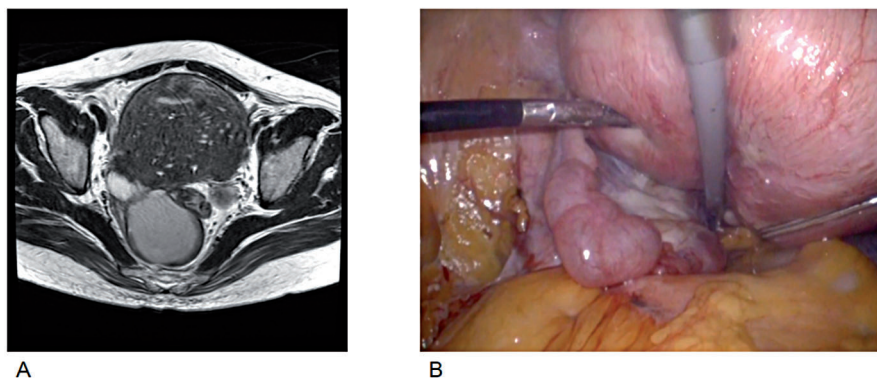


Figure 4. — (A) Magnetic resonance imaging in case 2 (axial T2-weighted images). (B) Laparoscopic findings in case 2 showing severe adhesion in the cul-de-sac.

range, < 11.0 g/dL) and CA125 level was 228 U/mL (normal range, < 35 U/mL).

Pelvic MRI showed cysts measuring 57×52×45 mm (depth×width×height) in both ovaries (Figure 4A), as well as thickening of the posterior uterine wall. These findings were considered to represent endometrial cysts and adenomyosis. Since the patient did not desire to bear children or preserve her ovaries, retrograde-TLH and bilateral salpingo-oophorectomy were performed.

Surgical findings included severe adhesion around the uterus, particularly in the cul-de-sac, which was completely obstructed (Figure 4B). Although a uterine manipulator was used, uterine mobility was poor. Thus, the uterine round ligament, anterior lobe of the broad ligament, and infundibulopelvic ligament were processed to secure uterine mobility, followed by processing of both pelvic sidewall triangles, and identification of the uterine artery and ureter. To process the cervix, the ureteral roof was dissected. Since the adhesion between the uterus and rectum could not be disrupted, a vagi-pipe was inserted and the anterior vaginal wall was cut. Subsequently, the portio was pulled cranially and turned over using grasping forceps. The adhesion was then separated by cutting the region of the adhesion. No rectal injury was observed, and the uterus and both fallopian tubes along with the left ovary were removed through the vagina. Blood loss was 450 mL, for which no blood transfusion was required. The operative time was 285 minutes, and the patient was discharged from the hospital on the sixth postoperative day, following an uneventful postoperative period.

Discussion

The present department introduced TLH in 2014, which was performed using the standardized procedure. Over the years, the time required for surgery has shortened, and the number of TLH-treated cases has increased. In addition, the authors are now able to apply TLH in difficult cases of endometriosis and adhesion.

Pelvic adhesions often arise from endometriosis or intra-abdominal infections, or occur following myomectomies,

cystectomies, or tubal surgeries. Extensive pelvic adhesions are responsible for 74% of small bowel obstructions, 20%-40% of infertility cases, and 19% of inadvertent enterotomies [10], which result in morbidity and increased medical expenses. In the past, pelvic adhesions were considered a contraindication for laparoscopic surgeries. Severe adhesions increase surgical difficulties and operating times, requiring conversion to laparotomy, and are involved in 8.8% of re-admission cases [11], which are time consuming and increase medical costs [12].

The present department began laparoscopic radical surgery for endometrial cancer in November 2014 and laparoscopic radical hysterectomy for cervical cancer in May 2015, which were performed in 27 and 7 patients, respectively, between July 2014 and July 2016. Retrograde-TLH was safely performed in two cases of endometriosis and severe adhesion, which may be attributed to the processing of the anterior layer of the vesicouterine ligament using the techniques of malignant tumor surgery. In Japan, cooperation between physicians certified for gynecological endoscopic techniques and physicians specialized in gynecological oncology is recommended to introduce laparoscopic surgery for malignant diseases; however, not all institutions have access to both types of physicians. The present department only has physicians specialized in gynecological oncology, and TLH was introduced by these physicians. Physicians specialized in gynecological oncology are familiar with surgeries for malignant tumors with ureterolysis and processing of the pelvic blood vessels. Thus, they can rapidly improve their endoscopic surgical techniques through short-term trainings. Based on the rapid increase in the use of TLH, the introduction of laparoscopic surgery for malignant tumors in the present department, and the convincing results, the authors propose that physicians specialized in gynecological oncology should shift to endoscopic surgery as soon as possible in Japan.

In both of the present cases, the cul-de-sac was completely obstructed, but TLH could be completed without complications using a retrograde approach. To the present authors' knowledge, TLH using a retrograde approach for severe adhesions has not been previously reported. The

present results suggest that the retrograde approach may reduce the risk of laparotomy conversion in cases complicated with severe adhesions; however, this is based on a small number of relevant cases (two cases). Moreover, to the best of the present authors' knowledge, there is no previous report on a method in which the anterior layer of the vesicouterine ligament is processed using a paravaginal space. They plan to accumulate more cases and investigate the usefulness of this technique in the future.

Conclusion

In conclusion, the present authors safely performed retrograde-TLH for endometriosis and severe adhesion by processing the round ligament, anterior lobe of the broad ligament of the uterus, and ligamentum ovarii proprium, followed by dissection of the ureteral roof. These results indicate that when severe adhesions are suspected in patients, retrograde-TLH is a potential alternative. Furthermore, many facilities are not certified for laparoscopic radical hysterectomy, which is not used widely in Japan, although difficult benign cases can be handled by applying procedures of malignant tumor surgery. The acquisition of skills in laparoscopic radical hysterectomy is an important task for surgeons.

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