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*Original Article*

# Laparoscopic myomectomy for posterior cervical myoma: authors' experience and strategy

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**Abstract:** Objectives: Posterior cervical myoma poses a challenge for gynecologic surgeons, especially in women who want to preserve their fertility. The objective of this study is to summarize our experience with and strategy for this difficult situation. Methods: Between July 2019 and June 2021, 13 patients with posterior cervical myoma underwent laparoscopic myomectomy in our department. In addition to using the conventional strategy for laparoscopic myomectomy, other measures such as uterine suspension and preliminary exposure of vital structures, including the uterine artery and ureter, were implemented to enhance safety and improve efficacy. The perioperative outcomes for these patients were retrospectively evaluated. Results: All surgeries were completed successfully with no conversion to laparotomy. There were no intraoperative complications or needs for blood transfusion. Uterine suspension was performed in all cases, while preliminary exposure of the uterine artery and ureter was performed in nine cases (69.2%). Uterine artery ligation was necessary in two cases. The mean surgical duration was 78.5 ± 12.3 minutes, mean blood loss was 54.2 ± 11.9 mL, and the mean specimen weight was 171.5 ± 59.8 g. Histopathologic analysis revealed leiomyomas in all cases. The postoperative course and follow-up were uneventful. Conclusion: By uterine suspension and preliminary exposure of vital structures, including the uterine artery and ureter, laparoscopic myomectomy for posterior cervical myoma can be performed safely.

**Keywords:** Cervical myoma, laparoscopy, surgical strategy, myomectomy, cervix

## Introduction

Uterine myoma is a common gynecologic disorder among women of reproductive age. Fewer than 5% of myomas occur in the cervix [1]. Although infrequent, cervical myoma poses a significant challenge for many gynecologic surgeons. A limited surgical field, possible injury to adjacent vital structures, and difficult suture repairs all contribute to an increased number of surgical complications during laparoscopic myomectomy for cervical myoma [2, 3]. For posterior cervical myoma, laparoscopic myomectomy may be more difficult as the sacrum is not flexible.

Previously, many surgeons have reported their strategies for dealing with cervical myoma. Vasopressin administration, internal iliac balloon occlusion, and uterine artery ligation and embolization have each been attempted with favorable outcomes [1, 4-8]. However, few studies have specifically addressed the use of laparoscopic myomectomy for posterior cervical myoma. Herein, our strategy is described in detail for this situation, and its efficacy and safety are retrospectively evaluated. In addition, a review of the relevant literature is presented.

## Materials and methods

### *Patients*

Between July 2019 and June 2021, 13 patients underwent laparoscopic myomectomy in our department. All patients provided written informed consent for both the operation and this study. This study was approved by the Ethics Committee of Affiliated Women and Children's Hospital of Ningbo University (2022-011).

All patients underwent preoperative pelvic ultrasonography and magnetic resonance imaging to accurately determine the size and loca-

**Table 1.** Patient characteristics

| No. | Age (years) | Obstetric history | Chief complaint | Maximal size of myoma at MRI (cm) |
|---|---|---|---|---|
| 1 | 37 | 2 CS | Abdominal fullness | 8.8 |
| 2 | 34 | 2 CS | Menorrhagia | 7 |
| 3 | 37 | Nulliparous | Abdominal fullness | 5 |
| 4 | 29 | Nulliparous | Menorrhagia | 6.2 |
| 5 | 42 | 1 VB | Nonspecific | 7 |
| 6 | 46 | 1 VB | Abdominal fullness | 4.2 |
| 7 | 43 | 1 CS | Nonspecific | 5.5 |
| 8 | 40 | 1 VB | Menorrhagia | 9.2 |
| 9 | 35 | 1 VB | Abdominal fullness | 7 |
| 10 | 39 | 1 VB | Menorrhagia | 6.5 |
| 11 | 41 | 2 CS | Nonspecific | 5.3 |
| 12 | 38 | 1 VB | Abdominal fullness | 8.5 |
| 13 | 35 | 1 VB | Nonspecific | 6 |

MRI, magnetic resonance imaging; CS, cesarean section; VB, vaginal birth.

tion of the myoma. The baseline characteristics of the patients are shown in **Table 1**.

*Surgical procedure and strategy*

Each patient was placed in the lithotomy position and given general anesthesia by endotracheal intubation. After a pneumoperitoneum was established, a 10-mm trocar was inserted above the umbilicus for the laparoscope. Then, 10-mm and 5-mm trocars were inserted into the left and right lower abdominal regions, respectively, and a 5-mm trocar was inserted into the midline region.

After entry of the trocars, the pelvic cavity was inspected. All adhesions, especially the adhesion in the left pelvic region of the sigmoid colon, were lysed. The uterus was then suspended from the abdominal wall through a transabdominal wall suture. Both ovaries were also suspended in the same manner. All three suture lines were drawn tight extracorporeally to better expose the posterior cervical myoma (**Figure 1A**).

The surgeon then evaluated the field and decided whether to preliminarily expose the uterine artery and ureter. For the latter, the pararectal region was dissected and the ureter was exposed. The ureter was identified and dissected at the brim of the pelvic cavity. By drawing the ureter toward the midline, the pararectal space was entered and dissected forward along the ureter until the uterine artery was identified (**Figure 1B**). However, in most cases, the uterine artery was neither skeletonized nor coagulated.

Subsequently, 5-10 mL diluted vasopressin (6 U diluted in 30 mL saline) was injected into the uterine myometrium overlying the myoma. A vertical linear incision was made into the most prominent part of the serosa and myometrium using a monopolar electrode (**Figure 1C**). Initially, only a small incision of approximately 2 cm was made. Care was taken to ensure the full depth of the pseudocapsule of the myoma was reached, and the cleavage plane was properly identified.

The incision was enlarged slowly and gradually using a monopolar electrode (**Figure 1D**). The myoma was then grasped with either a 5- or 10-mm tenaculum and gently separated from the pseudocapsule. A myoma screw could also be used for this purpose. During this procedure, any small bleeding was coagulated immediately using a bipolar electrode. A clear view of the surgical field was needed to facilitate precise maneuvering. Usually, the final length of the incision was shorter than the maximal diameter of the myoma.

After enucleation of the myoma, the edges of the capsule were pulled to expose the depth of the myoma bed. The cavity was swiftly obliterated by applying two layers of barbed sutures in a bottom-up manner. In cases where the endocervix was opened, the first layer of sutures

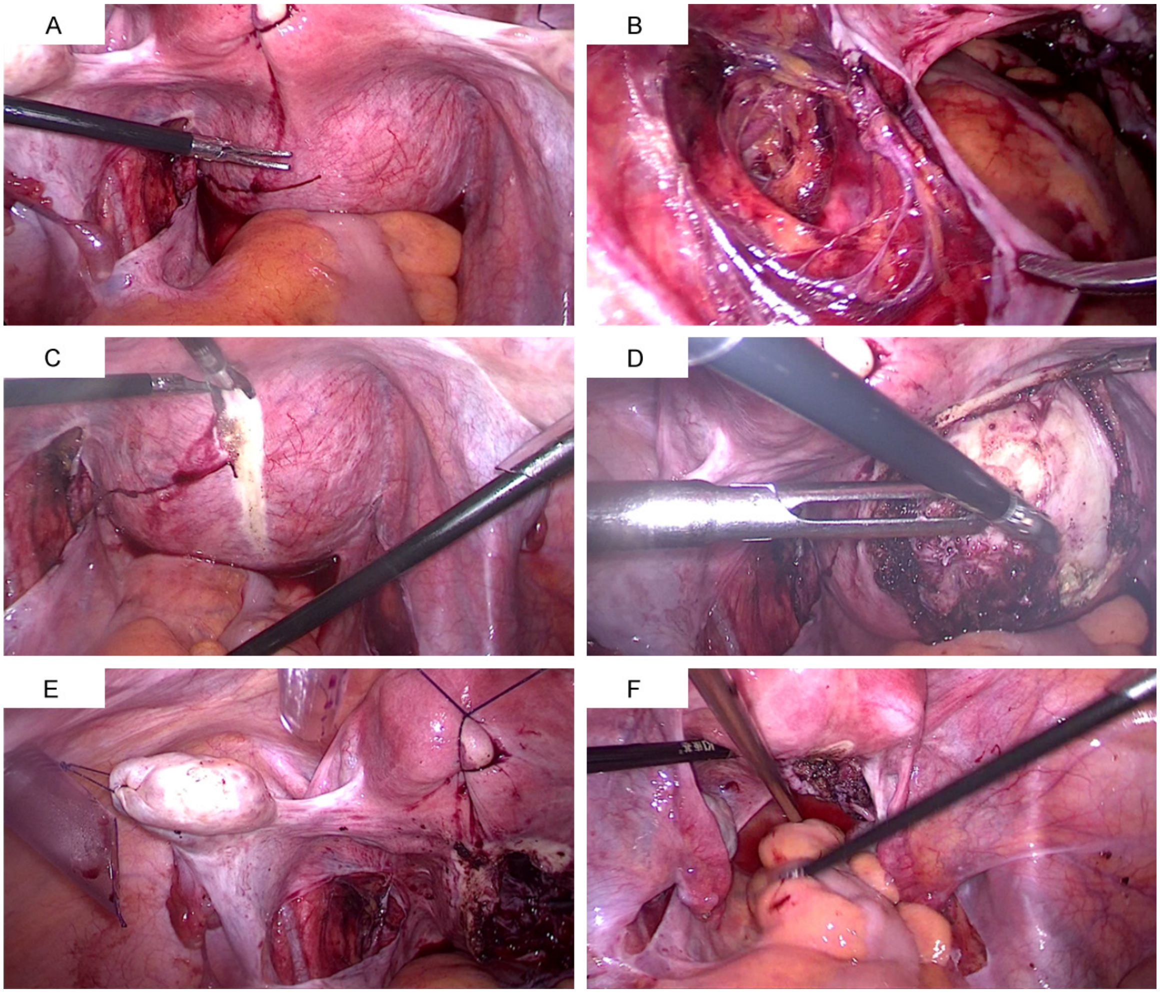


**Figure 1.** Procedures in posterior cervical myomectomy. A: Suspension of the uterus; B: Preliminary exposure of the ureter and uterine artery; C: Vertical lineal incision in the serosa and myometrium overlying the myoma; D: Enucleation of the myoma; E and F: Before and after wound closure with barbed suture.

included the cervical endothelium and adjacent inner myometrial tissue; otherwise, it included only the inner myometrial tissue at the bottom of the myoma bed. The second layer of sutures included the myometrium and serosa. Suture tension was maintained so that the serosa blanched slightly at all suture points (**Figure 1E** and **1F**).

The enucleated myoma was removed in a transumbilical fashion using knife morcellation. A drain was placed within the cul-de-sac. The omentum was inserted between the small loops of the bowel and the posterior aspect of the uterus. Each patient was discharged after three days and followed up after one month.

Total blood loss was calculated as the volume of blood collected in the suction apparatus, including blood in the suction tube. No saline irrigation was used during the procedure until after the calculation of total blood loss. Surgical outcomes included the normalization of menses and symptom relief.

Descriptive statistics were used for our study. Quantitative data were presented as means with standard deviations. Qualitative data were given as absolute number and percentages. All data were analyzed with the SPSS version 20 (IBM Corp., Armonk, NY, USA).

## Results

All procedures were completed successfully with no conversion to laparotomy. There were no intraoperative complications. Uterine suspension was applied in all cases, while prelimi-

**Table 2.** Perioperative outcomes

| No. | Surgical duration (min) | Blood loss (mL) | Uterine suspension | Exposure of UA | UA ligation | Weight of specimen (g) |
|---|---|---|---|---|---|---|
| 1 | 96 | 50 | + | + | - | 260 |
| 2 | 82 | 80 | + | + | - | 210 |
| 3 | 75 | 60 | + | + | - | 110 |
| 4 | 72 | 50 | + | + | - | 160 |
| 5 | 80 | 50 | + | + | - | 170 |
| 6 | 65 | 60 | + | - | - | 90 |
| 7 | 70 | 50 | + | - | - | 120 |
| 8 | 105 | 60 | + | + | + | 270 |
| 9 | 85 | 55 | + | + | - | 190 |
| 10 | 78 | 60 | + | + | - | 160 |
| 11 | 60 | 40 | + | - | - | 100 |
| 12 | 82 | 60 | + | + | + | 240 |
| 13 | 70 | 30 | + | - | - | 150 |

HB, hemoglobin; UA, uterine artery.

nary exposure of the uterine artery and ureter was necessary in nine cases (69.2%). Uterine artery ligation was performed in two cases.

As shown in **Table 2**, the mean surgical duration was 78.5 ± 12.3 minutes (range, 60-105 minutes), mean blood loss was 54.2 ± 11.9 mL (range, 30-80 mL), and the mean specimen weight was 171.5 ± 59.8 g (range, 90-270 g).

No ureteral catheters were inserted, and no patients received a blood transfusion. Histopathologic analysis showed leiomyomas in all cases. The postoperative courses and follow-ups were uneventful. Symptoms of fullness disappeared postoperatively, and hypermenorrhea began to improve during the first menstrual cycle after surgery.

## Discussion

Poor access to the surgical field, anatomic distortion of neighboring structures, and difficulty in suturing the repairs are the three main factors encountered during posterior cervical myomectomy [2, 3, 9]. The findings of the current study indicate that our strategy was efficient and safe in this difficult situation.

As summarized in **Table 3**, various methods have been developed to perform cervical myomectomy safely, such as the preoperative administration of a gonadotropin-releasing hormone agonist, ligation of the uterine artery, temporary balloon occlusion of the bilateral internal iliac arteries, and vasopressin administration [1, 4-12]. In difficult cases such as posterior cervical myomectomy, all of these approaches should be used. Based on this logic, a strategy was developed for performing posterior cervical myomectomy. Several points in our strategy need to be highlighted.

First, uterine suspension, which has been proven efficacious previously, was used in our method [13-15]. Compared to the use of a uterine manipulator, sutures are preferred for the following reasons. First, in cases with distorted anatomy, the uterine manipulator cannot be easily inserted through the cervix. Second, the "fixed" positions of the uterus and ovaries can be achieved using suspension, while the assistant surgeon may inadvertently change the position of the uterus using a manipulator. Finally, the shortage of surgeons in our department could be ameliorated using this technique.

Second, the preliminary exposure of the uterine artery and ureter was performed selectively at the discretion of the surgeon. This step was performed for two reasons. First, in cases of severe bleeding, the uterine artery could be easily found and the bleeding could be controlled. Second, the ureter can be checked intermittently to ensure that no strangulation or other trauma has occurred. Due to the increased surgical duration and possible development of postoperative adhesions, this retro-

**Table 3.** Summary of the current literature on laparoscopic cervical myomectomy

| Author, Year | Case number | Age (years) | Imaging assessment | Myoma size by imaging (cm) | Preoperative procedures | Intraoperative procedures | Surgical duration (minutes) | Blood loss (mL) | Myoma weight (g) | Surgical findings | Follow-up |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Takeuchi et al. (2006) | 5 | 36.2 ± 5.3 | MRI | 5.8 ± 1.6 | GnRH-a for 3-6 months | Uterine artery ligation | 70 ± 18.3 | 18 ± 8.4 | 79.6 ± 59.3 | None | Uneventful |
| Sinha et al. (2009) | 12 | 36 (range, 28-43) | US | 8.5 (range, 6-10) | None | Uterine artery ligation | 90 (range, 60-120) | 50 (range, 30-100) | 220 (range, 180-440) | None | Uneventful |
| Takeda et al. (2009) | 1 | 33 | US, MRI, CTA | - | GnRH-a for 3 months | Temporary endovascular balloon occlusion of the bilateral internal iliac arteries | 130 | <50 | 1,036 | A 3-cm hematoma | Febrile for 4 days |
| Chang et al. (2010) | 28 | 38.0 ± 7.0 (range, 24-52) | US | - | Unclear | None | 121.0 ± 56.0 (range, 45-280) | 99.0 ± 114.0 (range, 50-500) | 287.0 ± 310.0 (range, 30-1,200) | None | Uneventful |
| Matsuoka et al. (2010) | 16 | 37.3 ± 4.2 (range, 35.2-39.6) | MRI | 6.9 ± 1.6 (Range, 6.0-7.8) | GnRH-a for 3-6 months | Uterine artery ligation in 7 cases | 105.8 ± 43.2 (range, 82.8-128.8) | 105 ± 117 (range, 42.6-167.4) | 208.3 ± 195.4 (range, 99.3-306.2) | None | Uneventful |
| Higuchi et al. (2012) | 8 | 35.5 ± 5.3 (range, 29-44) | MRI | 7.6 ± 2.5 (range, 5.0-12.8) | GnRH-a for 4-6 months | None | 176.5 ± 46.3 (range, 125-260)* | 71.4 ± 72.2 (range, 30-200)* | 132.2 ± 106.4 (range, 16-310)* | Retroperitoneal hematoma and conversion to laparotomy in one case | Uneventful |
| Giannella et al. (2016) | 1 | 18 | US, CT | 7 | None | None | - | - | - | None | Uneventful |
| Peker et al. (2017) | 1 | 40 | US | 14 | None | None | 140 | 300 | 670 | None | Uneventful |

MRI, magnetic resonance imaging; GnRH-a, gonadotropin-releasing hormone agonist; US, ultrasonography; CT, computed tomography. *The case which conversed to laparotomy was not included in the analyses.

peritoneal dissection was performed in a selective manner.

The uterine artery was also not coagulated universally because of concerns about adverse effects on future fertility [16, 17]. In our study, ligation of the uterine artery was performed in only two difficult cases. In the future, reversible ligation of the uterine artery may be attempted in selected cases [18-20].

Third, the application of two layers of barbed sutures in a bottom-up manner was adopted in our method. As stated by Giampaolino et al., barbed sutures significantly decrease the difficulty of suturing [21]. Using a bottom-up approach avoids the creation of dead space and ensures good wound healing.

Finally, a midline vertical incision was adopted to avoid injuring the vessels and other vital structures in the paracervical region. It is very important to perform reasonable procedures from the viewpoint of surgical theory. An anatomic understanding of the vascular system is vital for the design of a solid surgical strategy. Anatomic studies of the distribution of myometrial blood vessels show that the arcuate arteries run in a transverse direction laterally to medially and intersect at the median plane. With a vertical incision, the sutures are placed parallel to these vessels, which may actually preserve the blood supply of all the arteries and veins together with their branches and tributaries. However, suturing transverse incisions would position the sutures perpendicular to these vessels, possibly hindering the healing of the uterine scar.

Excessive blood loss is a main concern during laparoscopic myomectomy. Previously, many surgeons believed that a transverse incision should be made to cause less blood loss and better hemostasis [22]. Morita et al. [23] reported that the amount of bleeding was significantly lower in the transverse incision group than in the vertical incision group (137.6 ± 88.1 mL vs. 235.8 ± 169.4 mL, P = 0.0426). However, an extension of the surgical wound to the paracervical region may cause massive bleeding and inadvertent injury to vital structures such as uterine vessels and ureters. By adopting a midline vertical incision, the risk of injury to the vital structures in the paracervical region was obviated. As for the surgical details, an incision was first made at the most prominent point, and the incision was lengthened slowly and deliberately; all bleeding was immediately stopped using bipolar hemostasis, which was minimal using our method. A recent prospective study by Elguindy [24] also found that the use of a vertical incision did not increase blood loss compared to the use of a transverse incision during abdominal myomectomy.

There are several limitations to our study. First, only cervical myomas in a posterior position were addressed in our study; different locations require different strategies. Our strategy may not be applied directly to myomas in other locations. Second, a more robust conclusion cannot be drawn based on only 13 cases. However, our strategy was based on anatomical knowledge and in accordance with surgical principles, which can be easily understood and applied by other gynecologic surgeons.

Based on this preliminary experience, our strategy can be attempted by other gynecologic surgeons during laparoscopic posterior cervical myomectomy. However, the efficacy and safety of this approach must be confirmed based on more cases in future clinical practice.

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**Disclosure of conflict of interest**

None.

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