Strategies and Outcomes of Total Laparoscopic Hysterectomy for Large Uterine Cervical Fibroids

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ABSTRACT

Background and Objectives: To present the methods and outcomes of total laparoscopic hysterectomy with debulking surgery for large cervical fibroids.

Methods: This is a single-center study. Twenty-one women who underwent total laparoscopic hysterectomy between October 1, 2012 and November 30, 2020 for large cervical fibroids (diameter ≥10 cm) based on a diagnosis by magnetic resonance imagining were enrolled. Conventional total laparoscopic hysterectomy for large cervical fibroids was initially attempted. If this could not be completed, debulking surgery, such as enucleation of large cervical fibroids or cervical amputation, was performed during total laparoscopic hysterectomy.

Results: Total laparoscopic hysterectomy could be completed in all 21 patients with large cervical fibroids without blood transfusion. Conventional total laparoscopic hysterectomy was performed in four patients (19%), and 17 patients (81%) required debulking surgery at the time of total laparoscopic hysterectomy. The median diameter of the major axis of the cervical fibroid, uterine weight, intraoperative blood loss, and operative time were 12 cm, 750 g, 100 mL, and 191 min, respectively.

Conclusion: Total laparoscopic hysterectomy for large cervical fibroids, although minimally invasive, requires a high level of laparoscopic skill. However, our data suggests that total laparoscopic hysterectomy for large cervical fibroids can be feasible, with an acceptable level of blood loss, by performing debulking surgeries such as enucleation of large cervical fibroids or cervical amputation.

Key Words: Cervical amputation, Cervical fibroid, Debulking surgery, Enucleation, Total laparoscopic hysterectomy.

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INTRODUCTION

Uterine cervical fibroids account for 1 – 2% of all uterine fibroids[1,2] and large cervical fibroids (≥ 10 cm) are even rarer. Total laparoscopic hysterectomy (TLH) for large cervical fibroids is difficult as their presence in the pelvic cavity leads to poor pelvic visibility, decreased uterine mobility, deformity and dislocation of the uterine cervix, and displacement of the bladder and ureter from their anatomical positions. Since the uterine cervix has abundant blood vessels, including the uterine artery and vein, TLH for large cervical fibroids often results in substantial blood loss. Therefore, total abdominal hysterectomy (TAH) is often performed in such cases.[3,4] However, compared with TAH, TLH has many advantages, such as better cosmetic outcome, less blood loss, less postoperative pain, shorter hospitalization period, and shorter recovery time.[5,6] Furthermore, there are only a few reports of laparoscopically assisted vaginal hysterectomy (LAVH) or TLH for cervical fibroids,[7,8] and they were performed using temporary endovascular balloon occlusion of the bilateral internal iliac arteries,[7] and ureterolysis, transection of the anterior layer of the vesicouterine ligament, and isolation of the ureter.[8] These methods require special instruments or special surgical techniques that are not generally performed for removal of the uterus or uterine fibroids.

Laparoscopic myomectomy (LM) during laparoscopic hysterectomy for large uterine fibroids has been reported to be an effective technique.[9] Enucleation of cervical fibroids during TAH has also been reported,[3,4] and some studies have reported LM for cervical fibroids.[10–12] Furthermore, laparoscopic supracervical amputation during LAVH for a large myomatous uterus has been reported to be effective.[13,14] These reports indicate the possibility of successfully performing an otherwise difficult TLH for large cervical fibroids
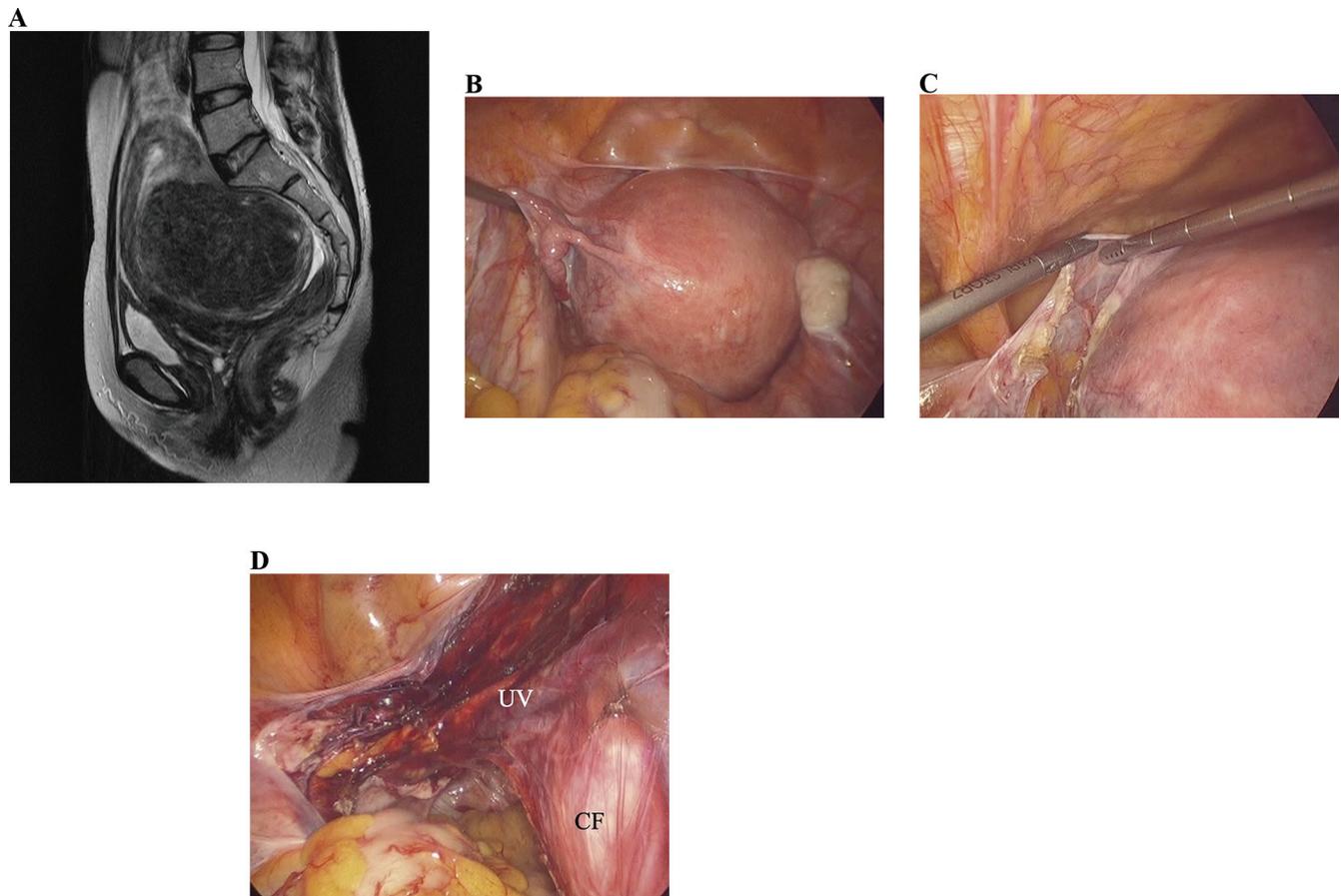
Figure 1. Conventional total laparoscopic hysterectomy (case 13). **A**: Sagittal magnetic resonance image. A large cervical fibroid was recognized. **B**: Status of the large cervical fibroid under laparoscopy. **C**: Dissection of the peritoneum of the left vesicouterine pouch. **D**: The left uterine blood vessels and cervical fibroid. CF, cervical fibroid. UV, uterine vessel.

by performing debulking surgery, such as enucleation of large cervical fibroids or cervical amputation. Enucleation and cervical amputation are generally performed as laparoscopic surgery of uterine fibroids.[9–14] Therefore, if TLH for large cervical fibroids (≥ 10 cm) can be performed with debulking surgery, the method will provide a minimally invasive and relatively easier alternative to using special instruments or special surgical techniques (as previously described). Thus, this study aimed to report the methods and outcomes of TLH for large cervical fibroids by performing debulking surgery through a consecutive case series.

MATERIALS and METHODS

Patients and Study Design

We enrolled 21 patients with large cervical fibroids who underwent TLH between October 1, 2012 and November 30, 2020. The patients were diagnosed with large cervical fibroids (diameter ≥ 10 cm) by magnetic resonance imaging (MRI). The indications for TLH included menorrhagia, anemia, dysmenorrhea, abdominal pressure, chronic pelvic pain, frequent urination, and urinary retention. Pelvic examinations and pre-operative examinations, including transvaginal and/or abdominal ultrasound examinations, uterine cervical cytology, endometrial cytology at the time of atypical genital bleeding, and MRI were performed. One or two radiologists used MRI to assess the condition of the entire uterus, the status of the uterine fibroids, the presence or absence of malignant tumors, ovarian disease, and deep infiltrating endometriosis (**Figures 1A, 2A, 3A**). Women with suspected malignant findings based on these examinations were excluded from this study. Classification of large cervical fibroids in relation to the uterine myometrium was performed using the leiomyoma subclassification system of the Federation Internationale de Gynecologie et d'Obstetrique.[15]
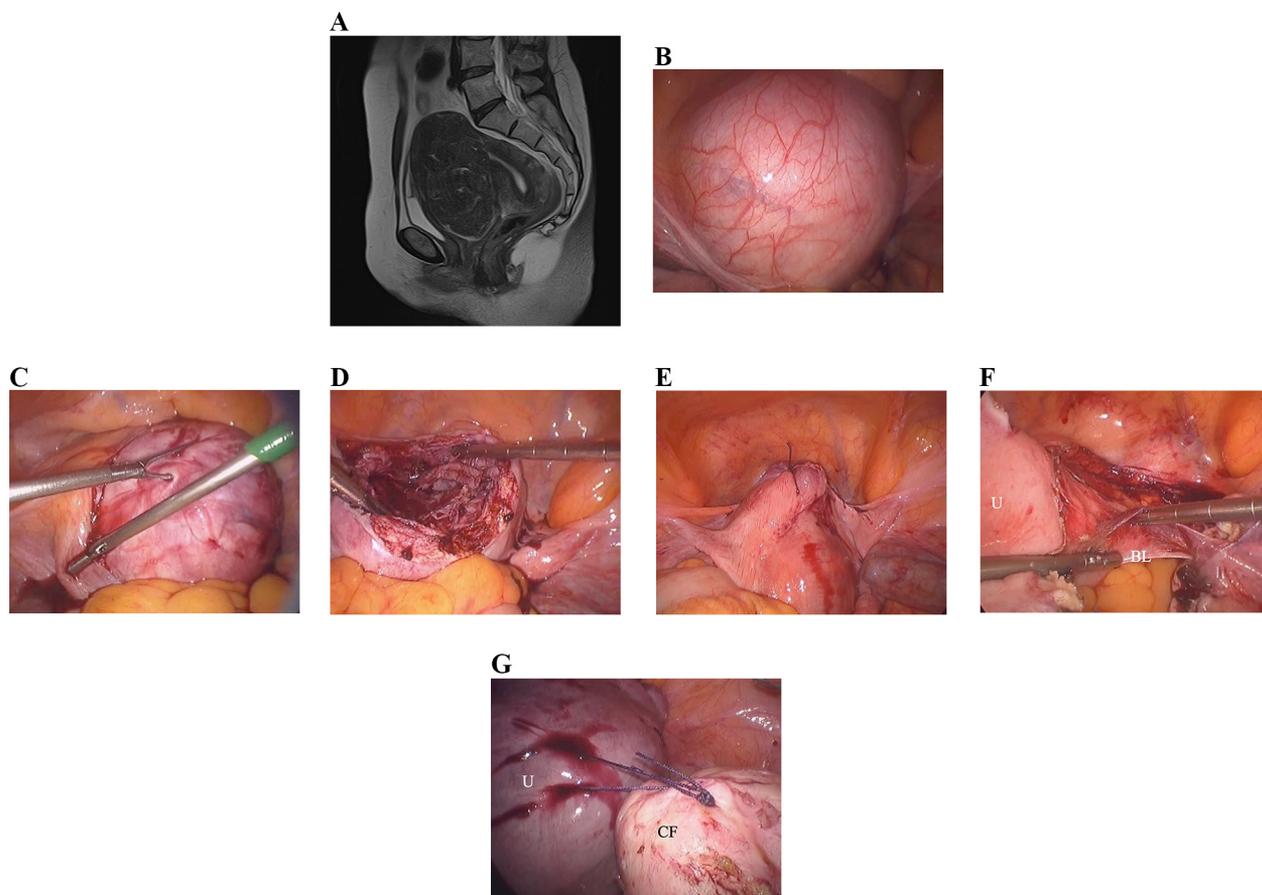
Figure 2. Enucleation of large cervical fibroid during total laparoscopic hysterectomy (case 2). **A**: Sagittal magnetic resonance image. A large cervical fibroid was recognized. **B**: Status of the large cervical fibroid under laparoscopy. **C**: Enucleation of large cervical fibroid. **D**: Wound after enucleation of large cervical fibroid. **E**: Suturing of the enucleated wound to prevent bleeding. **F**: Improvement of pelvic visibility and uterine mobility. **G**: Connection of the uterus and the enucleated large cervical fibroid with suture. BL, broad ligament; CF, cervical fibroid; U, uterus.

Gonadotropin-releasing hormone (GnRH) agonist (1.88 mg of leuprolide acetate, monthly injection; Takeda Pharmaceutical Co., Tokyo, Japan) or GnRH antagonist (40 mg of relugolix, oral, once daily) (ASKA Pharmaceutical Co., Tokyo, Japan) was administered for 1 to 6 months to reduce uterine volume.

All patients provided informed consent for the surgical procedures and the use of their clinical information for research purposes. This study was reviewed and approved by the Institutional Review Board. All patients were followed-up for at least 4 months after surgery.

Conventional TLH (TLH without Debulking Surgery)

Conventional TLH was performed in the standardized manner using three trocars; a 10-mm trocar was placed through the umbilicus and two 5-mm trocars were inserted in the lower abdomen (1 trocar on each side) and shifted upward according to the position of the uterine fundus to obtain good visibility. Carbon dioxide was used to establish pneumoperitoneum, with the abdominal pressure set to 8 mmHg. The pelvis was inspected under laparoscopic guidance (**Figures 1B, 2B, 3B**). At the beginning of the TLH, a diluted vasopressin solution (15 – 20 mL; 20 U in 50 mL of saline) was injected[16,17] at two to three locations into the myometrium around the uterine fibroid to decrease blood loss. The plunger of the syringe was withdrawn prior to injection to prevent inadvertent injection of vasopressin into the blood vessels. The diluted vasopressin solution was administered once every 40 – 50 minutes until the uterine blood vessels were cauterized and cut. The round ligaments, fallopian tubes, and ovarian or infundibulopelvic ligaments were cauterized and
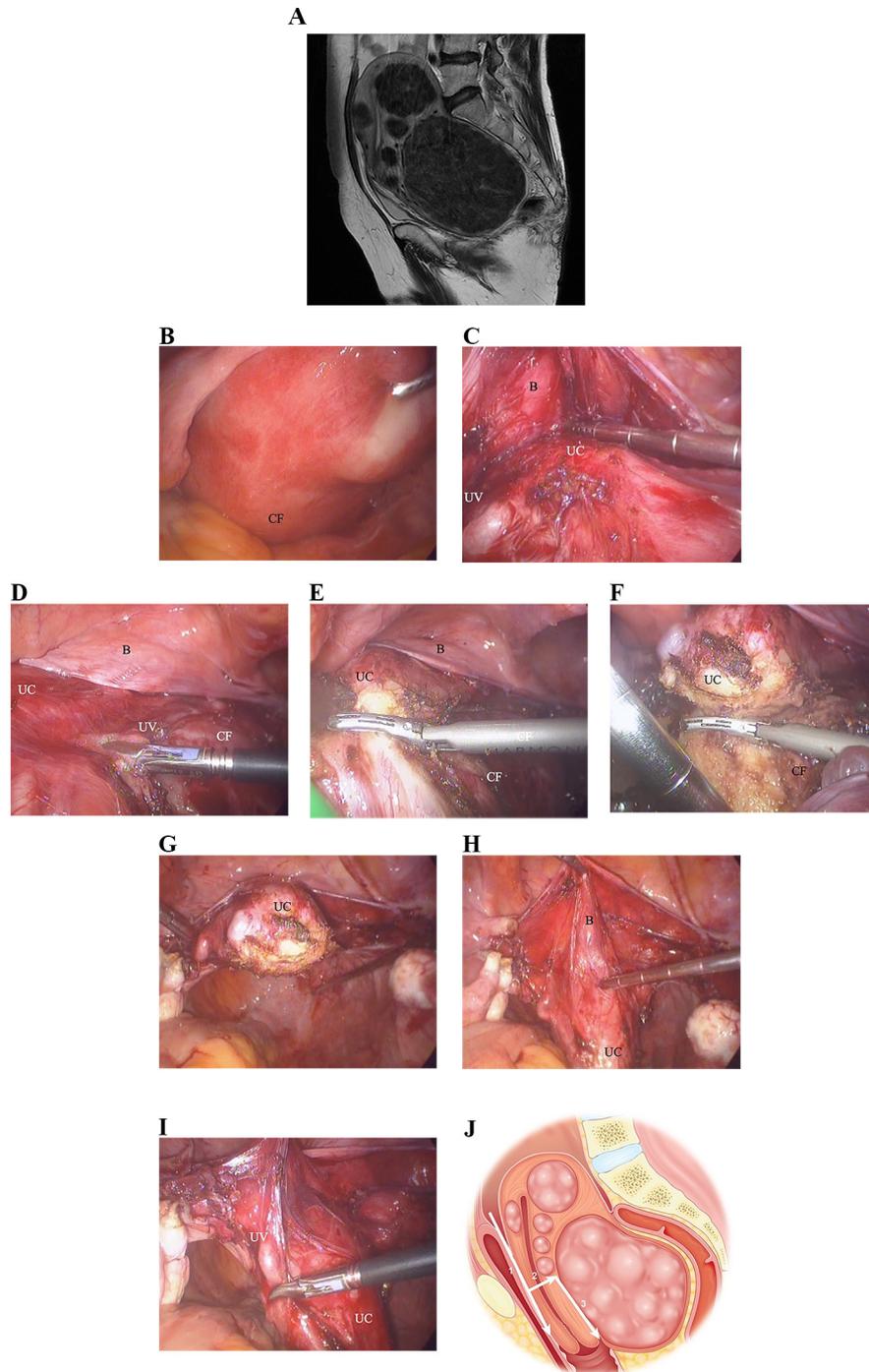
Figure 3. Cervical amputation with enucleation of large cervical fibroid during total laparoscopic hysterectomy (case 8). **A**: Sagittal magnetic resonance image. A large cervical fibroid was found in the posterior cervix. **B**: Status of the large cervical fibroid at laparoscopy. **C**: Dissection of the bladder from the anterior uterine cervix. **D**: Cauterization and cutting of right uterine blood vessels. **E**: Cervical amputation with an ultrasonic scalpel. **F**: Enucleation of the posterior large cervical fibroid after cervical amputation. **G**: Residual uterine cervix. Good pelvic visibility and good cervical mobility. **H** : Detachment of the bladder from the anterior residual uterine cervix. **I**: Cauterization of left uterine blood vessels of residual uterine cervix. **J**: Illustration showing detachment of the bladder from the anterior uterine cervix: (1), amputation of the uterine cervix (2), and enucleation of the large cervical fibroid (3) during Total laparoscopic hysterectomy. B, bladder; CF, cervical fibroid; U, uterus: UC, uterine cervix; UV, uterine vessel.
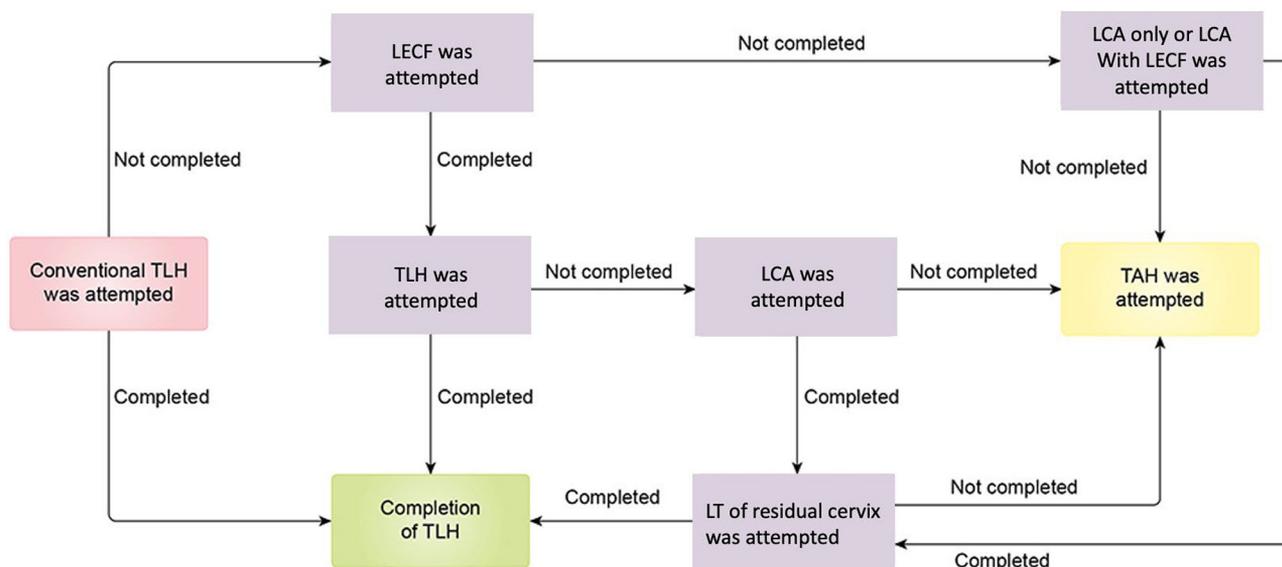
Figure 4. Selection of the operative methods during total laparoscopic hysterectomy for large cervical fibroids. LCA, laparoscopic cervical amputation; LECF, laparoscopic enucleation of large cervical fibroids; LT, laparoscopic trachelectomy; TAH, total abdominal hysterectomy; TLH, total laparoscopic hysterectomy.

cut. The peritoneum of the broad ligament and the vesicouterine pouch were cut (**Figure 1C**), and the bladder was bluntly detached from the anterior uterine cervical wall (**Figure 3C**). After detaching the crude connective tissue from the uterine blood vessels (**Figure 1D**), the uterine blood vessels were cauterized and cut. The uterine manipulator was removed, and a cylindrical vaginal pipe was inserted. Circumferential colpotomy was performed and the uterus was morcellated vaginally. From November 1, 2018 onwards, an in-bag manual extraction of the uterus was performed vaginally, to prevent the spreading of occult uterine malignancy tissue.[18] The vaginal stump was sutured in two layers with absorbable suture. Cystoscopy with intravenous indigo carmine was performed using a 5-mm laparoscope[19] in order to detect lower urinary tract injuries. The skin incisions were closed, and all extracted tissues were examined histopathologically.

Enucleation of Large Cervical Fibroids during TLH

After inspection of the status of the uterus and the large cervical fibroid (**Figure 2B**), ligaments and vessels around the uterus were cauterized and cut in order to minimize blood loss before performing the enucleation of the cervical fibroid. The myometrium was incised, and the cervical fibroid was enucleated (**Figures 2C, 2D**). The enucleated wound was sutured to prevent bleeding (**Figure 2E**). Pelvic visibility and uterine mobility were improved

following enucleation (**Figure 2F**). After detaching the uterus from the vaginal wall, the uterus and the enucleated fibroid were connected with sutures (**Figure 2G**), morcellated vaginally, and extracted.

Cervical Amputation with or without Enucleation of Large Cervical Fibroids during TLH

The surgical procedure is similar to conventional TLH up to the point of cauterization and cutting of the uterine blood vessels. After the uterine blood vessels were cauterized and cut (**Figure 3D**), cervical amputation was performed with an ultrasonic scalpel (**Figure 3E**). If the large cervical fibroid was found attached to the lower uterine cervix even after the cervical amputation, the fibroid was enucleated (**Figure 3F**). The lower uterine cervix then remained, and good pelvic visibility and good uterine cervical mobility were obtained (**Figure 3G**). Trachelectomy of the residual cervix was performed laparoscopically (**Figures 3H, 3I**). Subsequently, the amputated uterus and fibroid were morcellated and extracted transvaginally. **Figure 3J** shows this procedure.

Selection of Operative Methods (Figure 4)

Conventional TLH for large cervical fibroids was attempted initially. When it could not be completed, enucleation of the large cervical fibroid was attempted. When conventional TLH

could not be performed even after enucleation or enucleation of the large cervical fibroid could not be performed, cervical amputation alone or cervical amputation with enucleation of the large cervical fibroid was attempted. When feasible, trachelectomy was performed laparoscopically. When these methods could not be performed, TAH was attempted.

Complications

Complications were classified according to the Clavien-Dindo classification.[20]

Statistical Analyses

Data are expressed as the median value and range (minimum–maximum). All statistical analyses were performed using Microsoft 365 Excel for Mac OS X (Microsoft, Redmond, WA).

RESULTS

Of the 463 patients who underwent TLH during this study period, 21 (4.5%) had large cervical fibroids (diameter ≥ 10 cm) and were included in this study. The clinical characteristics of the patients are shown in **Table 1**. Nine patients (42.9%) were nulliparous, six patients had a history of pelvic surgery (28.6%), and one patient had a history of uterine artery embolization (4.8%).

The median value of the major axis of the cervical fibroids was 12 cm (range, 10 – 16 cm). The median number of fibroids larger than 2 cm (including the large cervical fibroid) was two. There were no cases of suspected malignancy during the pre-operative examinations. Fourteen of the 21 patients (66.7%) received the GnRH agonist or antagonist. However, seven patients (33.3%) underwent TLH without GnRH agonist or antagonist; three of these patients required early surgery due to repeated urinary retention requiring urethral catheterization, and four refused the GnRH agonist or antagonist due to the side effects or cost.

Table 2 shows the surgical outcomes. Conventional TLH was performed in four women (19.0%), enucleation of a large cervical fibroid during TLH was performed in 10 women (47.6%), cervical amputation during TLH was performed in 10 women (47.6%) and both enucleation of a large cervical fibroid and cervical amputation were performed in three women (14.3%). There were no cases of cervical fibroids that could be enucleated transvaginally before performing a TLH (type 0 or 1 according to the leiomyoma subclassification system).[15] All cases with a history of

cesarean section had adhesions between the bladder and anterior uterine cervix. In two cases, endometriosis was recognized. One of them had an obliterated Douglas pouch and severe adhesions around the uterus due to severe endometriosis as well as a history of abdominal myomectomy and cesarean section. An ovarian cyst was noted in one case.

The median uterine weight, intraoperative blood loss, operative time (defined as the time from skin incision to closure), and postoperative hospitalization were 750 g (range, 318 – 1502 g), 100 mL (range, 10 – 675 mL), 191 min (range, 147 – 254 min), and 4 days (range, 4 – 6 days), respectively. Histopathological examination did not reveal malignancies. The histopathologic findings of the large cervical fibroid are presented in **Table 2**. Intraoperative complications occurred in one case (case 17), resulting from cauterization of the ureter. Therefore, a ureteral catheter was placed in the ureter by a urologist during TLH, and the patient was discharged from the hospital 5 days after surgery with the ureteral catheter. An ileal conduit urinary diversion was performed 12 months after the initial surgery (Clavien–Dindo grade 3). Clavien–Dindo grade ≥ 2 complications were not seen, except in this patient.

DISCUSSION

In this study, TLH were successfully completed by performing debulking surgery and without the need for blood transfusion in 21 patients with large cervical fibroids. The reason for performing debulking surgery during such TLH was to improve the pelvic cavity visibility and uterine mobility. Furthermore, performing of debulking surgery allows the bladder and ureters to revert to their anatomical positions, along with the displaced and/or deformed uterine cervix that also return to its anatomical position and shape. In terms of debulking surgery, enucleation of large cervical fibroids or cervical amputation were performed. It has been previously reported that LM for cervical fibroids caused a median blood loss between 50 and 105 mL, with a maximum of 500 mL.[10–12] Therefore, blood loss during LM for cervical fibroids is not always excessive. Concerning cervical amputation during LAVH, Yen et al. reported that laparoscopic bipolar uterine vascular coagulation and supracervical amputation significantly reduced the operative time and blood loss in LAVH of the uterus over 12 weeks.[14] In this study, all cases in which conventional TLH or enucleation of a large cervical fibroid during TLH could not be performed, were finally completed via TLH by performing cervical amputation. This suggests the effectiveness of cervical amputation. Therefore, when

Table 1.
Patient Characteristics

Case	Age (Years)	BMI	Obstetric History	Main Symptoms, except for urinary symptoms	Main Urinary Symptoms	Previous Pelvic Surgery	Cervical Fibroid Size (cm)	PALM-COEIN Classification of cervical fibroid	Median Number of fibroids larger than 2 cm	GnRHa Administration (No. of Months)
1	48	21	0G	Abdominal pressure	No	No	$11 \times 10 \times 9$	Types 2 – 5	5	4
2	46	17	4G3P	Menorrhagia, abdominal pressure	Frequent urination, urinary retention, residual urine	No	$12 \times 9 \times 8$	Types 2 – 5	1	0
3	42	19	2G1P1C	Menorrhagia, dysmenorrhea, abdominal pressure, abdominal pain	No	Abdominal myomectomy once, cesarean delivery, once	$14 \times 12 \times 9$	Types 2 – 5	2	3
4	40	22	7G3P	Abdominal pressure	Residual urine	No	$12 \times 10 \times 9$	Types 2 – 5	6	3
5	44	25	0G	Menorrhagia, dysmenorrhea, abdominal pressure	Frequent urination, residual urine	No	$16 \times 13 \times 10$	Types 2 – 5	3	3
6	51	22	3G0P	Abdominal pressure	Frequent urination	No	$16 \times 14 \times 10$	Type 6	2	3
7	44	23	1G1P	Menorrhagia, dysmenorrhea, abdominal pressure	Frequent urination	No	$12 \times 10 \times 9$	Types 2 – 5	6	4
8	45	29	0G	Menorrhagia	No	Laparoscopic myomectomy once	$14 \times 11 \times 9$	Types 6	6	4
9	37	23	2G2P2C	Menorrhagia, dysmenorrhea	No	Cesarean delivery, twice	$11 \times 11 \times 9$	Types 2 – 5	1	6
10	48	21	3G2P	Menorrhagia, abdominal pressure	Frequent urination, urinary retention	No	$11 \times 11 \times 9$	Types 2 – 5	1	0
11	52	27	2G2P	Menorrhagia, dysmenorrhea, abdominal pressure	No	No	$14 \times 12 \times 9$	Types 2 – 5	1	6
12	54	21	2G0P	Dysmenorrhea, abdominal pressure	Frequent urination, urinary retention, residual urine	No	$12 \times 11 \times 10$	Types 2 – 5	1	2

Table 1. Continued

Case	Age (Years)	BMI	Obstetric History	Main Symptoms, except for urinary symptoms	Main Urinary Symptoms	Previous Pelvic Surgery	Cervical Fibroid Size (cm)	PALM-COEIN Classification of cervical fibroid	Median Number of fibroids larger than 2 cm	GnRHa Administration (No. of Months)
13	46	21	3G2P	Menorrhagia, abdominal pressure, abdominal pain	Frequent urination, urinary retention	Appendectomy	11 × 9×8	Types 2 – 5	1	0
14	43	18	0G	Menorrhagia, abdominal pressure	Frequent urination, urinary retention	No	16 × 12 × 11	Types 2 – 5	2	5
15	65	23.7	2G2P2C	Abdominal pressure, abdominal pain	No	Cesarean delivery, twice	12 × 9×10	Types 2 – 5	1	0
16	46	28	0G	Dysmenorrhea, abdominal pressure	No	No	11 ×10 × 9	Types 2 – 5	6	5
17	45	17	2G2P	Abdominal pressure	No	No	11 ×10 × 8	Types 2 – 5	1	0
18	51	17	1G1P	Menorrhagia, anemia, abdominal pressure	No	Appendectomy	12 × 11 × 10	Type 6	7	4
19	54	30	2G2P	Menorrhagia, anemia	No	No	10 × 9×7	Types 2 – 5	3	0
20	45	21	0G	Dysmenorrhea, abdominal pressure	urinary retention	Uterine artery embolization	12 × 8×11	Types 2 – 5	1	1
21	51	20	1G0P	Abdominal pressure	No	No	14 × 8×7	Type 6	4	0
Median	46	21	-	-	-	-	-	-	2	3
(range)	(37–65)	(17–30)							(1 – 7)	(0 – 6)

BMI, body mass index; PALM-COEIN, polyp, adenomyosis, leiomyoma, malignancy and hyperplasia, coagulopathy, ovulatory dysfunction, endometrial, iatrogenic, and not yet classified; GnRHa, gonadotropin-releasing hormone agonist or antagonist; G, gravidity; P, parity; C, cesarean.

Table 2.
Surgical Outcomes

Case	LECF or LCA during TLH	Suture after enucleation of fibroids	Uterine Weight (g)	Operative Time (Min)	Estimated Volume of blood loss (mL)	In Bag Morcellation	Histopathologic Findings	Postoperative Hospitalization (Days)
1	-	-	686	230	10	Not done	Leiomyomas and adenomyosis	5
2	LECF	Yes	661	228	150	Not done	Leiomyoma	5
3	LECF	Yes	763	244	675	Not done	Leiomyomas and adenomyosis	4
4	LCA after LECF	No	356	165	90	Not done	Leiomyoma	4
5	LECF	No	362	187	100	Not done	Leiomyomas and adenomyosis	4
6	LECF	Yes	980	180	150	Not done	Leiomyoma	4
7	-	-	572	147	75	Not done	Leiomyoma	4
8	LCA before LECF	No	894	254	300	Not done	Leiomyoma	6
9	-	-	441	158	200	Not done	Leiomyoma	5
10	LECF	No	318	165	50	Not done	Leiomyoma	5
11	LECF	Yes	831	204	280	Not done	Leiomyoma	5
12	LCA	No	897	152	80	Not done	Leiomyoma	4
13	-	-	609	190	50	Not done	Leiomyoma	4
14	LCA	No	910	200	50	Not done	Leiomyoma	4
15	LCA	No	760	230	550	Not done	Lipoleiomyoma	5
16	LCA	No	844	191	100	Not done	Leiomyoma	4
17	LCA	No	779	252	245	Not done	Leiomyoma	5
18	LCA	No	1502	211	110	Not done	Leiomyoma	4
19	LCA	No	750	186	600	Done	Leiomyoma	4
20	LCA after LECF	No	442	205	100	Done	Leiomyoma	5
21	LECF	No	650	163	50	Done	Leiomyomas, adenomyosis and Adenomatoid tumor	5
Median			750	191	100			4
(range)			(318 – 1502)	(147 – 254)	(10 – 675)			(4 – 6)

LECF, laparoscopic enucleation of large cervical fibroids; LCA, laparoscopic cervical amputation; TLH, total laparoscopic hysterectomy.

feasible, difficult TLH in patients with large cervical fibroids would be made easier by debulking surgery.

Furthermore, as a strategy to reduce the blood loss, we administered diluted vasopressin solution during TLH for large cervical fibroids. Diluted vasopressin solution is generally administered in LM to reduce blood loss.[10–12,21] Some studies have also reported that the administration of a diluted vasopressin solution during TAH or vaginal hysterectomy results in a significant reduction in blood loss.[16,17]

In these 21 cases, administration of diluted vasopressin solution is considered to be one of the major factors for completing TLH without blood transfusion. However, as bradycardia, cardiac arrest, and other complications have been reported as side effects of vasopressin,[22,23] patients should be informed about the risks prior to surgery, and diluted vasopressin solution must be used with caution.

In this study, we performed TLH, and not LAVH, to reduce blood loss and complete hysterectomy for large

cervical fibroids. TLH has been associated with a significant reduction in blood loss when compared to LAVH.[24,25] And the treatment of the uterine cervical surroundings through the vaginal cavity in LAVH for large cervical fibroids is considered difficult, especially through the narrow vaginal cavity seen in nulliparous patients. Therefore, TLH is probably easier to perform than LAVH for large cervical fibroids.

Using these surgical methods, we could successfully complete TLH for large cervical fibroids. Enucleation, cervical amputation, administration of diluted vasopressin solution, and performing TLH and not LAVH, are generally performed as laparoscopic surgical methods for uterine fibroids, and do not require special instruments or special surgical techniques, such as temporary endovascular balloon occlusion of the bilateral internal iliac arteries, or ureterolysis, transection of the anterior layer of the vesicouterine ligament, and isolation of the ureter.[7,8] Therefore, when performing TLH for large cervical fibroids, these surgical methods appear easier to generalize, compared to using special instruments or special surgical techniques. To our knowledge, there has been no report of completing TLH for large cervical fibroids without blood transfusion by performing debulking surgery and this is the first report.

In some reports of laparoscopic hysterectomy for cervical fibroids, blood transfusions were performed due to substantial blood loss.[7,8] In addition, it has been reported that postoperative blood transfusion was necessary in 1 of 12 cases that underwent cervical myomectomy.[10] Therefore, pre-operative preparation for blood transfusion, including autologous blood, was undertaken for some of our cases; however, transfusion was not required. Nevertheless, preparation for blood transfusion appears necessary when performing TLH for large cervical fibroids as a high-level of laparoscopic skill is required.

Of the 21 cases, one ureteral injury occurred (4.8%), and this was the only case of ureteral injury among the 463 patients who underwent TLH during this study period. Therefore, the rate of ureteral injury of these 463 TLH cases was 0.2%, which is similar to that reported by other studies of laparoscopic hysterectomy (0.3 – 0.5%).[26] However, this rate is high, considering that only 21 patients underwent TLH for large cervical fibroids, thereby indicating the difficulty of TLH in such cases. Ureteral injury is one of the most serious complications of total hysterectomy. In order to prevent ureteral injury, insertion of ureteral catheters before operation seems to be the optimal method. However, to our knowledge, there are no reports that the

procedure significantly reduces the incidence of ureteral injury during laparoscopic hysterectomy for benign disease.[27] Furthermore, insertion of ureteral catheters requires urologist input, and results in additional time and cost; ureteral catheter insertion also has some complications, such as pain caused by the catheters, hematuria, reflux anuria, and urinary tract infection.[28,29] On the other hand, the advantage of inserting ureteral catheters is that the ureteral bulge against the peritoneum and the elasticity of the ureteral catheters may allow the path of the ureter to be confirmed,[28] resulting in less severe ureteral injury.[29] Therefore, in cases of TLH for large cervical fibroids, because of poor pelvic visibility and decreased uterine mobility, it is advised that ureteral catheters should be inserted to check the path of the ureter.

Intraoperative cystoscopy is often performed during a hysterectomy to detect lower urinary tract injuries.[19,30] Although intraoperative cystoscopy does not always detect lower urinary tract injuries, lower urinary tract injuries have been often detected by intraoperative cystoscopy, and this intervention reportedly minimizes long-term sequelae.[30] In addition, intraoperative cystoscopy is easier to perform over ureteral catheter insertion and has a lower risk of complications. We performed intraoperative cystoscopy in all 463 cases of TLH during this study. However, the case of lower urinary tract injury (case 17) was discovered only before cystoscopy.

TLH has been widely performed and has many advantages compared to TAH. However, in the case of TLH for large cervical fibroids, additional expertise and skilled laparoscopic techniques are required to complete the surgery. Therefore, conversion to open surgery is needed when the completion of TLH for large cervical fibroids becomes difficult, even if debulking surgeries is attempted. Moreover, these procedures should never be attempted by a novice surgeon.

CONCLUSION

TLH for large cervical fibroids is a minimally invasive surgery. Although it requires a high level of expertise and laparoscopic skill, our data suggests that it is still feasible for large cervical fibroids and can be performed without the need for blood transfusion by performing debulking surgeries, such as enucleation of the fibroids or cervical amputation. A limitation of our study is that we only included 21 women; therefore, further studies with a larger sample size are required to confirm our findings.

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