Hand-Assisted Laparoscopic Hysterectomy for Large Uterine Fibroids

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Abstract

Background: In recent years, laparoscopic hysterectomy (LH) has increasingly been used in total hysterectomy for uterine fibroids. In our department, approximately 95% of total hysterectomies for benign uterine disease are performed by LH; however, in the 5% patients for whom LH is contraindicated, how to provide minimally invasive surgery was a challenge.

Methods: To avoid open surgery with a large vertical midline incision, we introduced a hand-assisted LH (HALH), whereby a lower abdominal transverse incision of 8 cm was made above the pubic symphysis apart from an incision needed for the operating port for laparoscopy.

Results: The procedure was performed on five patients between January 2015 and February 2016. The mean weight of the resected uteri was 1382 g, and the mean estimated blood loss was 541 ml. No patients required allogeneic blood transfusion, and there were no complications. Recovery was rapid and postoperative progress was good.

Conclusion: HALH is a procedure that avoids traditional open surgery using a large vertical midline incision in patients for whom LH is contraindicated and for those with large uterine fibroids.

Keywords: Hand-assisted laparoscopy, huge fibroma, laparoscopic hysterectomy

INTRODUCTION

In recent years, indications for laparoscopic hysterectomy (LH) for uterine disease are expanding, and LH is being performed on more patients.[1] At our institution, LH is being performed on approximately 95% patients, including patients with benign uterine disease such as uterine fibroids, adenomyosis, and endometriosis. Patient recovery following LH is rapid, and patients are generally discharged faster than those undergoing open hysterectomies.[1] With regard to the surgical wound for LH, positive esthetic outcomes following surgery provide a high level of satisfaction to patients, decreasing the long-term emotional and physical stress of patients. Thus, LH offers many benefits to patients.

Unfortunately, the indications for LH still have certain limitations. In our department, LH is often contraindicated when uterine weight is expected to be >1000 g or in patients with a huge cervical myoma. Furthermore, it has been reported that the presence of an endometrioma, a previous cesarean section, and a wide uterus were independent risk factors for LH.[2]

In addition, when these factors are combined, the level of surgical difficulty rapidly increases and leads to more instances where LH is contraindicated. In our department, LH is performed in approximately 95% of total hysterectomies performed for benign uterine disease; however, for the abovementioned reasons given, LH is contraindicated in...
approximately 5% patients. In those cases, open surgery is typically performed by the intraperitoneal approach with a large vertical midline incision. We believe that this cannot be avoided in many instances to perform surgery safely and successfully. However, such large midline incisions made vertically into the trunk delay postoperative recovery for patients and can cause long-term postoperative complications, such as intestinal obstruction. Furthermore, the inferior esthetic outcomes are considered to cause long-term emotional and physical stress in patients. Therefore, we believe that it is an important challenge to examine the possibility of avoiding large vertical midline incisions for patients in whom minimally invasive total hysterectomy such as by LH is contraindicated.

In the present study, we introduce hand-assisted LH (HALH), a surgical procedure that avoids a large vertical midline incision, for patients with a large uterus caused by uterine fibroids. We describe the procedure details in this report.

**MATERIALS AND METHODS**

**Patients**

From January 2015 to February 2016, we performed HALH on five patients at the Hamamatsu University hospital. All patients were made preoperatively aware that LH was possibly difficult according to the results of tests such as magnetic resonance imaging (MRI) and examination findings. Furthermore, on actual intraoperative examination of the abdominal cavity, a decision was made to complete the procedure with HALH rather than LH. For the surgical procedure concerned, informed consent was obtained preoperatively from all patients. The local institutional review board approved the study on July 24th in 2019 (Vol-1014).

**Surgical technique**

Under general anesthesia, the patient is positioned in the lithotomy, i.e., approximately 10° Trendelenburg position. The surgeon stands on the left of the patient.

To begin, a 12-mm camera port is placed at the approximate midpoint between the umbilicus and xiphoid process using the open method. Next, a 10-mm direct-view, rigid scope is inserted through the same port for examination of the abdominal cavity. Additional (5-mm) ports are placed on the left and right sides somewhat cranial and medial, respectively, to the anterior superior iliac spine. Then, the abdominal cavity is examined on laparoscopy to verify uterine size, the location of the uterine fibroids, as well as the presence or absence of adhesions. Because LH is the first choice of procedure for total hysterectomy at our hospital, at this point, we decide whether LH is possible. If LH is deemed possible, the surgeon proceeds to perform LH with four ports in a diamond configuration. If LH is deemed impossible, further assessments are made as to whether HALH was possible. When HALH is contraindicated, open surgery is performed using a vertical midline incision.

When HALH is decided on, a lower abdominal transverse incision of 8 cm is made approximately 3–4 cm above the pubic symphysis, and a regular-sized Lap disc® (Hakko Shoji, Nagano, Japan) is attached. In addition, 5-mm ports were placed on the left and right upper abdomen parallel to the left and right ports previously placed in the lower abdomen. This completed port placement for HALH [Figure 1].

Next, we proceed to the actual operation. To begin, the round ligaments of the uterus are coagulated and sectioned. However, it is often difficult to obtain a good visual field because the uterus could be large. At this point, the surgeon inserts one hand through the Lap disc® (regular size) [Figure 2]. Uterine manipulations with the inserted hand often enable identification of the round ligament of the uterus for its coagulation and sectioning [Figure 3a]. The left and right round ligaments of the uterus are coagulated and sectioned whenever possible to improve uterine mobility. Next, the ureter is identified at the pelvic inlet, and by lateral approach, the main trunk of the uterine artery is sectioned at the internal iliac artery bifurcation. However, similar to the round ligaments of the uterus, in patients for whom HALH is indicated, it is often extremely difficult to ensure a good view of the lateral side of the pelvis. At many instances, the main trunk of the uterine artery cannot be reached using an anterior approach. In those cases, the uterine adnexa are tackled first. When preserving the uterine adnexa, the ovarian ligament and ovarian tubes are coagulated and sectioned [Figure 3b]. On the other hand, when resecting the uterine adnexa, the suspensory ligament of the

![Figure 1: Port placement. Port placement for hand-assisted laparoscopic hysterectomy. A 12-mm port is placed approximately midpoint between the umbilicus and the xiphoid process. Then, 5-mm trocars are inserted into the left and right sides of the abdomen. An 8-cm transverse incision is made above the pubic symphysis, in which a Lap disc® (regular size) is placed](image-url)
ovary is coagulated and sectioned. At this point, manipulation using the practitioner’s right hand inserted into the Lap disc® enables these processes. If possible, the ureter is subsequently identified, and the main trunk of the uterine artery is sectioned at the bifurcation of the internal iliac artery.

Next, the iris valve on the Lap disc® is opened. Under direct view, the peritoneum of the vesicouterine pouch is sectioned and the urinary bladder is detached. After sufficiently detaching the bladder, the uterine fibroids are enucleated under direct vision or under laparoscopy. The uterine fibroids are sufficiently enucleated so that the uterine body can be delivered out of the abdomen [Figure 3c]. The entire uterine fibroid does not necessarily need to be enucleated. If the main trunk or ascending branch of the uterine artery is not sectioned, massive blood loss could occur; therefore, the uterine fibroids are enucleated as quickly as possible. On decreasing uterine body volume, if a clean operative field could be adequately ensured, basic ligament processing is performed under direct view or under laparoscopy [Figure 3d]. Finally, colpotomy followed by hysterectomy is performed. The vaginal cuff is closed with simple interrupted sutures or continuous sutures. All skin incisions, apart from the drain insertion site, are closed using buried dermal sutures [Figure 4]. Generally, a closed drain is inserted through the lower abdominal port and is used to drain intraperitoneal blood and irrigation fluid, as well as to manage postoperative bleeding until the next morning.

**Results**

During the period from January 2015 to February 2016, HALH was successfully performed on five patients at the Hamamatsu University hospital. Initially, HALH was scheduled for eight patients; however, as mentioned earlier, LH was deemed possible on initial intraperitoneal examination, and surgery was completed by LH in three patients. Over the same periods, total hysterectomy for uterine fibroids was performed in 98 cases of LH and 4 cases of TAH.

The outcomes of the five patients who underwent HALH are shown in Table 1.

The mean individual age was 44.2 years (39–52 years), the mean weight of the resected uterus was 1382 g (960–1650 g), the mean operative duration was 235.8 min (193–262 min), and the mean estimated blood loss was 541 ml (210–1000 ml). Two patients received autologous blood transfusion; however, no patients needed allogeneic blood transfusion. No intraoperative complications, such as urinary tract or bowel injuries, occurred. Intraoperatively, no patients required an additional port or conversion to purely open surgery. There was no case of postoperative infection, intestinal obstruction, or delayed complications to other organs. All five patients were discharged on the postoperative day 4 and had a good recovery.
In all five patients, the pathology permanent specimens revealed uterine fibroids. On postoperative examination at outpatient services, all five patients were satisfied with the esthetic outcomes of their surgical procedure.

**DISCUSSION**

In recent years, the frequency of laparoscopic surgery for total hysterectomy has increased. In our department, total hysterectomy for benign uterine disease is performed by LH in approximately 95% cases. LH is recognized as safe with stable outcomes, with only 0.5% LH cases requiring conversion to an open procedure. For the remaining 5% patients for whom LH is contraindicated, open surgery is performed with a vertical midline incision. Over the past few years, the popularization of laparoscopic surgery and developments in the technique have led to an increase in the number of outpatients who hope to undergo LH. However, when LH is contraindicated, some express disappointment. When open surgery is required, it is typically performed by extending the vertical midline incision up to the umbilicus, or on occasion, to above the umbilicus. In such instances, patient recovery is slow, and esthetic outcomes are a major problem. Yeung *et al.*,[3] who conducted a questionnaire survey on patient preferences regarding abdominal skin incisions for gynecologic surgery, found that no patient wanted a vertical midline incision. If patient safety and successful surgery can be ensured, we believe that it is better to avoid a vertical midline incision whenever possible. This is the main reason that we introduced HALH.

The biggest characteristic of HALH, in terms of technique, is that the surgeon inserts one hand through a Lap disc® (regular size) attached to a transverse incision 8 cm above the pubic symphysis and performs a hand-assisted procedure for the uterus or its adnexa. In other words, the procedure involves hand-assisted laparoscopic surgery (HALS). The concept of HALS is not new and has been reported in the fields of surgery[4,5] and urology[6] from the mid to late 1990s. In the field of gynecology, in particular for hysterectomy, Pelosi and Pelosi[7] first reported hand-assisted LH performed for a giant uterus weighing 3050 g caused by uterine fibroids in the US in 1999. Similar to the procedure reported by Pelosi and Pelosi, we developed a surgical technique with methods developed in our department using a Lap disc®. We found that when inserting hand into the abdominal cavity to manipulate the uterus, large manipulations may not be achieved because of the large size of the uterus itself; however, pulling and moving the upper portion of the ligament by fingers was easier.

HALH generally includes the technique of laparoscopic-assisted myomectomy (LAM), which has been used in our department. When performing LAM, adequate uterine mobility is achieved by enucleating the uterine fibroids under direct vision through the Lap disc®, which decreases uterine volume. This usually ensures a good operative field for periuterine structures. Thus, in the event of hysterectomy for a large uterus for which LH would likely be contraindicated, we believe that LAM would enable processing of the tissue surrounding the uterus. Furthermore, on performing HALH, following uterine fibroid enucleation, there are many instances where the parauterine tissue, such as the cardinal ligament, could be processed laparoscopically with the assistance of a hand inserted through the Lap disc®. Furthermore, bleeding arising from the cardinal ligament could be easily controlled with a finger.

In our department, when considering HALH for large uterine fibroids, we first examine the abdominal cavity by laparoscopy to determine whether LH is feasible. HALH is only performed when LH is considered impossible. On the basis of our experience, the difficulty level for LH may be higher when uterine weight appears to be >1000 g, i.e., when the uterine fundus extends above the umbilicus. Furthermore, in patients with major uterine swelling resulting from uterine fibroids, particularly in a lateral direction, we believe that the approach to the uterine artery and ureter can be difficult with forceps alone and increases LH difficulty level. To date, we have planned surgery with HALH for eight patients but were able to perform LH for three of these. At present, the number of patients who have undergone HALH is limited; therefore, limitations to HALH in terms of uterus size and weight are presently unclear. As with LH, the indications for HALH are thought to vary depending on the practitioner and institution. Among the five patients who underwent HALH in our department, the largest volume for an extracted uterus was 1650 g. Interestingly, Pelosi *et al.*[7] reported performing LH on a uterus weighing ≥3000 g. Thus, we believe that HALH...
can be performed for patients with a uterus weighing ≥3000 g. However, when performing surgery with uterine fibroid enucleation through an abdominal incision made for the Lap disc® in HALH, we believe that the larger the uterus, the greater the estimated intraoperative blood loss caused by blood flow back into the uterus. Therefore, careful countermeasures for bleeding are needed.

In 2014, US Food and Drug Administration recommended that greater caution should be exercised when using a power morcellator for laparoscopic uterine fibroid collection. This is because dispersion of the uterine fibroid or dissemination of malignant tissue such as uterine sarcoma contained in the resected specimen during fibroid morcellation is viewed as a complication. However, in the event of LH, when transvaginal collection is difficult, the use of a power morcellator may be needed. In HALH, uterine fibroids are morcellated using a cold surgical knife, and thus great caution should be exercised with regard to intra-abdominal dispersion and tissue loss. In patients scheduled to undergo HALH, large uterine fibroids are indicated. It is particularly important to ensure that there are no malignant findings according to preoperative clinical progress; image findings such as on MRI; and pathology test results of the uterus, cervix, and endometrium. However, the risk of morcellated specimen dispersion within the abdominal cavity is lower when not using a power morcellator. For surgeons and patients who do not prefer a power morcellator for specimen collection, HALH is able to decrease fine uterine fibroid tissue dispersion within the abdominal cavity, even if HALH is more invasive than LH.

Furthermore, LH includes all factors such as dissection, resection, suturing, and reconstruction, which are necessary technical points in laparoscopic gynecological surgery. Therefore, a large number of cases and training time is needed to master the skills involved. In addition, when LH is performed on a uterus weighing ≥500 g, it has been reported that the surgical difficulty level is increased and that both the estimated blood loss and bleeding duration tend to increase. Therefore, HALH can not only be performed for uterine fibroids weighing ≥1000 g, such as in the present study, but can also decrease the operative duration for smaller uteri. In addition, unless a uterus is particularly large, HALH can be performed by surgeons who are not very experienced in laparoscopic operations. For surgeons who are experienced in total abdominal hysterectomy, we believe that HALH can be performed with relative ease for uteri that are not very large. However, caution should be exercised when performing HALH because it is important to determine which sites to manage laparoscopically and which to manage under direct vision. Furthermore, the forceps often interfere with surrounding organs because of uterus size; extreme care is required when performing laparoscopic operations.

Bleeding is a problem in HALH. Of the five patients who have undergone HALH at our hospital to date, the estimated blood loss was 310–1200 ml. The blood loss was particularly high in two patients, i.e., 1000 and 1200 ml. As mentioned in the surgical procedure section, HALH is essentially similar to LH in that the main trunk of the uterine artery is coagulated and sectioned by lateral approach at the bifurcation of the internal iliac artery; however, this is actually very difficult to perform. Among our five patients, coagulation and sectioning of the main trunk of the uterine artery as in LH was possible on only one side (left side) in one patient. In all other instances, after enucleation of the uterine fibroids, the uterine artery could be clamped and sectioned at the cardinal ligament, i.e., at the ascending branch of the uterine artery by simple total hysterectomy. In such instances, bleeding can be difficult to control, and blood loss may be increased. Therefore, preoperative assessment is important. It is important to estimate blood loss according to the site and size of uterine fibroid onset and uterine size overall according to MRI and examination findings. At our hospital, when total laparoscopic myomectomy is contraindicated, LAM is proactively performed. To date, LAM has been performed on approximately 120 patients, and our experience of bleeding control was useful. HALH was also considered suitable for cases with preoperatively estimated blood loss of approximately 1000 ml. Furthermore, when HALH is the planned surgical procedure, 800 ml of autologous blood is collected and stored preoperatively. At present, we have not had to use allogeneic blood transfusion in HALH cases; however, for patients at greater risk of bleeding, it is important to have intraoperative diluted autologous blood prepared to ensure safer surgery.

**Conclusion**

Although we have only performed HALH on five patients to date, we experienced no major complications in terms of surgical safety, and patient recovery was rapid. Furthermore, the patients had a high level of satisfaction with the esthetic outcomes. For patients with large uterine fibroids that are difficult to treat by LH, the introduction of HALH makes it possible to avoid the conventional vertical midline incision up to near the umbilicus.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Malzoni M, Perniola G, Perniola F, Imperato F. Optimizing the total laparoscopic hysterectomy procedure for benign uterine pathology. J Minim Invasive Gynecol 2004;11:211-8.
2. Saito A, Hirata T, Koga K, Takamura M, Fukuda S, Neriishi K, et al. Prooperative assessment of factors associated with difficulty in performing total laparoscopic hysterectomy. J Obstet Gynaecol Res 2017;43:320-9.
3. Yeung PP Jr., Bolden CR, Westreich D, Sobolewski C. Patient preferences of cosmesis for abdominal incisions in gynecologic surgery. J Minim Invasive Gynecol 2013;20:79-84.
4. Kusminsky RE, Boland JP, Tiley EH, Deluca JA. Hand-assisted laparoscopic splenectomy. Surg Laparosc Endosc 1995;5:463-7.
5. O’Reilly MJ, Saye WB, Mullins SG, Pinto SE, Falkner PT. Technique of hand-assisted laparoscopic surgery. J Laparoendosc Surg 1996; 6:239-44.
6. Wolf JS Jr., Moon TD, Nakada SY. Hand-assisted laparoscopic nephrectomy: Technical considerations. Tech Urol 1997;3:123-8.
7. Pelosi MA, Pelosi MA 3rd. Hand-assisted laparoscopy for complex hysterectomy. J Am Assoc Gynecol Laparosc 1999;6:183-8.
8. Food and Drug Administration. FDA discourages use of laparoscopic power morcellation for removal of uterus or uterine fibroids. Food Drug Adm 2014;17:4.
9. Ferrari MM, Berlanda N, Mezzopane R, Ragusa G, Cavallo M, Pardi G, et al. Identifying the indications for laparoscopically assisted vaginal hysterectomy: A prospective, randomised comparison with abdominal hysterectomy in patients with symptomatic uterine fibroids. BJOG 2000;107:620-5.
10. Salmanli N, Maher P. Laparoscopically-assisted vaginal hysterectomy for fibroid uteri weighing at least 500 grammes. Aust N Z J Obstet Gynaecol 1999;39:182-4.