

# Transumbilical single-port laparoscopic hysterectomy using traditional laparoscopic instruments: a report of 20 cases

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## Summary

**Purpose of investigation:** We studied 20 cases of transumbilical single-port laparoscopic hysterectomy (TSPLH) to evaluate the feasibility and safety of the TSPLH. **Methods:** Perioperative items and complications were observed: mean operation time, blood loss, gas pass time, out of bed activity time, postoperative analgesic rate, pain perception by visual analogue score (VAS), port site infection, hospital stay, postoperative fever rate and patient satisfaction score were measured. **Results:** All procedures were performed successfully, and no case was transferred to 4-port laparoscopic hysterectomy (LH). No postoperative complication occurred during the period of two month follow-up. **Conclusion:** TSPLH is a feasible and safe method for hysterectomy, although it may be little more time consuming. Nonetheless, it is welcomed by patients who are more concerned about cosmetic outcomes. Future studies are needed to improve the instruments to shorten the surgery time and confirm its advantages.

**Key words:** Transumbilical single-port laparoscopic hysterectomy; Complications; Feasibility and security.

## Introduction

Since the first laparoscopic surgery through a single incision was reported in 1997 [1], single-port laparoscopic surgery (SPLS) has been used successfully to perform nephrectomy, prostatectomy, hemicolectomy, cholecystectomy, thoracoscopic decortication, and appendectomy, etc. [2-4]. In gynecology, SPLS has been used to perform oophorectomy, salpingectomy, bilateral tubal ligation, ovarian cystectomy, surgical treatment of ectopic pregnancy, and both total and partial hysterectomy [5-7]. Transumbilical single port laparoscopic hysterectomy (TSPLH) is still a new field to explore. The first case of TSPLH was reported by Langebrekke in 2009 [8], but due to technical and instrumental limitations, TSPLH has developed slowly. We report our initial experience of 20 cases of TSPLH performed with some traditional standard laparoscopic instruments, and evaluate the safety and feasibility of the operation.

## Methods

From February to July 2011, 20 patients (12 uterine myomas and 8 adenomyomas) were admitted to our department and underwent TSPLH. The average age was 46.8 years. The size of the uterus ranged from 8-12 gestational weeks. All procedures were performed by the same surgeon under general anesthesia and accomplished by one articulating grasper and other standard laparoscopic instruments (Table 1). No prophylactic antibiotic was administered.

Data regarding patient operation time, blood loss, conversion rate, gas pass time, activity time, and postoperative analgesic rate were prospectively collected. Pain perception by visual analogue score (VAS) [9], port site infection, port hernia, postoperative hospital stay, postoperative fever rate, patient satisfaction (0-100) scores [10] were also measured during the perioperative period.

Patients were placed on the operating table in the dorsal supine lithotomy position with legs apart. A 2 cm intraumbilical incision was made for tri-port access, then the tri-port device was placed into the umbilicus; CO<sub>2</sub> pneumoperitoneum with pressure average 12 mmHg (1 mmHg = 0.133 KPa) was set up. A 10-mm laparoscope was inserted into the abdominal cavity through a major manipulating port (Figure 1 and 2). Finally, the whole uterine specimen was removed through the vaginal incision, and the vaginal cuff was sutured through the vagina.

Data analysis was performed by software of SPSS 11.0. All data are expressed as mean  $\pm$  standard deviation (SD) and were performed by analysis of variance; *p* value < 0.05 was considered as statistically significant.

## Result

TSPLH was successfully performed in all 20 cases, and no case was transferred to 4-port LH. No intraoperative complication occurred. Ancillary trocars were not necessary in any of the cases. All patients recovered from the operation and no postoperative complication occurred during a median follow-up period of 60 days. Results of the observed items are as follows. Average operation time was  $126.4 \pm 26.7$  minutes, one of the longest procedure times due to patients having a history of cesarean section accompanied by uterine isthmus subserous myoma, which increased the difficulty of surgery. Mean blood loss was  $179.3 \pm 103.7$  ml; no case needed blood transfusion intraoperatively. Time of postoperation pass gas was  $19.3 \pm 8.7$  hours, out of bed activity time was  $9.5 \pm 4.2$  hours, postoperative analgesic rate was 2.1%, and almost no one needed intravenous analgesic. The average VAS score was 356, port site infection rate was mean 0.12%, no port hernia occurred, time of average hospital stay was  $5.1 \pm 1.42$  days, and patient satisfaction score was  $91.2 \pm 6.9$  (0-100).

We compared the last ten subjects of the TSPLH with the initial ten cases, however, the mean operation time obviously decreased (Table 2).

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Table 1. — *Instruments of TSPLH.*

Instruments	Company
Triport single port system	Olympus (USA)
Articulating grasper	Yida (China)
Bipolar forcep	Olympus (USA)
Unipolar hook	Olympus (USA)
Suction apparatus	Olympus (USA)
Laparoscopic scissors	Olympus (USA)
Laparoscopy (10 mm)	Olympus (USA)
Ultrasonic scalpel	Olympus (USA)

Table 2. — *Operation results of the first ten cases compared to the last ten cases.*

	First 10 cases (n = 26)	Last 10 cases (n = 10)	F	p
Operation time (min)	136.4 ± 24.9	113.7 ± 19.1	9.7	0.03
Hospital day (days)	5.3 ± 1.54	5.4 ± 1.37	1.8	0.67
Patient satisfaction score (0-100)	91.34 ± 6.83	94.7 ± 6.11	0.7	0.61

p value < 0.05: significant; F ratio: degrees of freedom.

## Discussion

The hysterectomy procedure has evolved tremendously over the last century. The benefits of minimally invasive surgery – including less pain, faster recovery, and improved cosmesis are well known [11]. Standard laparoscopic hysterectomy is performed with two 10 mm major manipulating trocars and two 5 mm ancillary trocars. There has been increasing attention to decreasing incisional morbidity and improving cosmetic outcomes in laparoscopic surgery by using fewer and smaller ports. In recent reports, traditional laparoscopy has been replaced by single-port operative laparoscopy from a great array of procedures. Innovative techniques of natural orifice transluminal endoscopic surgery (NOTES) and single-incision laparoscopic surgery (SILS) have been applied in gynecologic disease as a step towards even less-invasive procedures. SPLS represents the latest advance in minimally invasive surgery. Using flexible endoscopes and articulating instruments, the surgeon can complete complex procedures through a single 2-cm incision in the umbilicus. In the early years, only a few works were reported in journals and most surgeons did not think such a “difficult” operation, other than providing scar reduction, would be beneficial for patients. In recent years, total laparoscopic thyroidectomy and cholecystectomy have been widely performed in many medical centers, and the concept of a mini-invasive esthetic operation has been accepted by many mini-invasive surgeons because it has been welcomed by many patients [12]. More general surgeons found single-incision laparoscopic cholecystectomy was not as difficult as before with the development of laparoscopic technology and instrument upgrades, and moreover there is no visible scar on the body [13]. Today, natural orifice transluminal endoscopic cholecystectomy, such as endoscopic cholecystectomy through gastric and vaginal access, has been successfully performed in some hospitals [14, 15]. Some gynecologists began to explore

the technique of TSPLH. In the early period of TSPLH use, surgeons were mainly confronted with the difficulty of how to abate interactions between working apparatus when they were operating through three trocars in the same incision.

We present a novel technique to perform a single-port, total laparoscopic hysterectomy in patients with benign uterine diseases. Through our study we found that three methods could be adopted to solve the problem: (1) using articulating instruments [16] such as a flexible-tip laparoscopic [17] articulating grasper which can provide adequate working room; (2) using a triport trocar or self-made apparatus, such as sterile gloves; (3) suturing the cuff through the vagina can make the operation possible and easier using the standard instrument. All of these reduce operative difficulty, but increase operation fees. In our study, we used one articulating grasper combined with other traditional instruments to complete the whole procedure. Suturing through a single port can be a challenge. When possible, closure of the vaginal cuff following a total laparoscopic or laparoscopic-assisted vaginal hysterectomy should be performed from below. When endoscopic suturing is required, standard suturing using both intracorporeal and extracorporeal methods is possible. Since we have no bidirectional self-retaining sutures [8], we suture the cuff through the vagina. During the surgery, instrument interaction is a crucial problem which needs to be resolved and it could be overcome by a surgeon's adroit skill. Twenty cases of TSPLH were successfully performed without transference to 4-port LH; TSPLH is feasible in practice. No postoperative complication such as incision hernia or wound infection occurred. It seemed that TSPLH showed the same safety as traditional LH. In the last ten subjects of the TSPLH group, however, the mean operation time obviously decreased from the initial cases. More time may be needed to complete the operation in the early period (Figure 3). We are convinced that as experience increases and instruments develop, operation time will become as short as traditional LH. TSPLH achieved a high patient satisfaction score indicating it was attractive, especially to young women. The authors' experience has shown that single-port laparoscopic hysterectomy with the TriPort system is safe and feasible. Prospective randomized studies comparing single-access and conventional multi-port laparoscopic hysterectomy with long-term follow-up evaluation are needed to confirm the initial experience.

Although all TSPLH procedures were successfully performed, further research is still needed to solve many operative difficulties. In TSPLH, all three ports enter into the abdominal cavity from the same incision, and it is difficult to work from two directions as in traditional LH, without the 3<sup>rd</sup> assistant grasper aid. The mobile range of the laparoscopic apparatus was also restricted by other ports and the operating field was extremely narrow [18]. A recent article from Korea reports an inventive technique to perform single-incision laparoscopy using standard instrumentation: the authors fitted a self-retaining ring retractor with a surgical glove that had three of the



Fig. 1

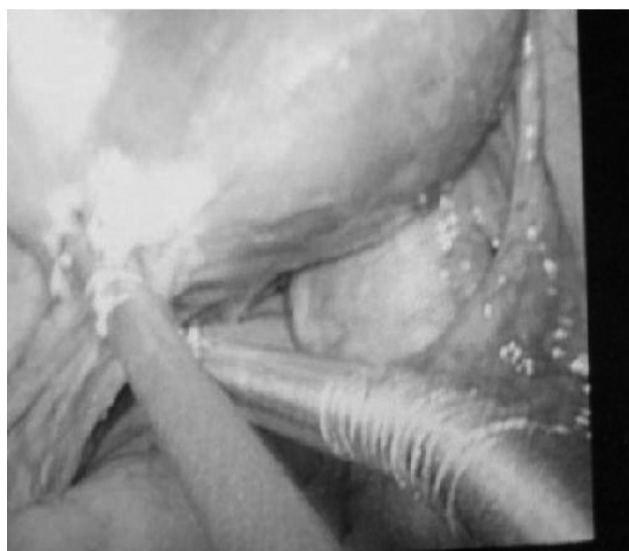


Fig. 2

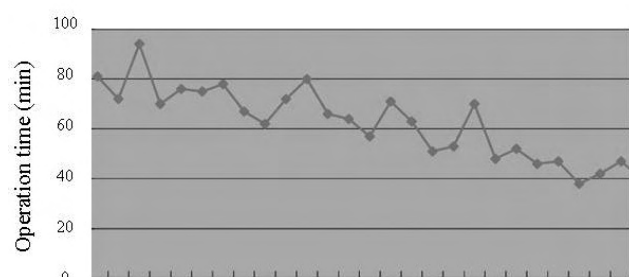


Fig. 3

Figure 1. — Triport Single Port System.

Figure 2. — Intraoperative views of TSPLH (Articulating grasp combined with traditional bipolar).

Figure 3. — The learning curve of TSPLH.

fingers cut off and replaced by trocars [19]. The latest instruments are designed to dissect cauterize, and cut, thereby decreasing the number of instrument exchanges necessary. Thus, concurrent manipulations are very important and necessary to work effectively, and to avoid having the apparatus suddenly disappear from view. The surgeon requires considerable experience with laparoscopic operations to overcome these difficulties.

The potential benefits of single access include decreased pain, a shorter recovery period, lower morbidity, reduced cost, and superior cosmesis. Careful case selection and a low threshold of conversion to conventional laparoscopic surgery are essential. Multicenter, randomized, prospective studies are needed to compare short- and long-term outcome measures against those of conventional laparoscopic surgery.

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