



## Original Article

## Trend changes in the proportion of minimal invasive hysterectomies over a five-year period: A single-center experience

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## ABSTRACT

**Objectives:** The aim of this study was to assess the trend changes in the proportion of laparoscopic assisted vaginal hysterectomy (LAVH) at a single center over a 5-year period and to compare the surgical morbidity associated with LAVH and total abdominal hysterectomy (TAH).

**Materials and Methods:** A retrospective chart review was conducted covering all hysterectomies performed in 2002 and in 2006.

**Results:** A total of 101 patients in 2002 and 99 patients in 2006 had benign gynecological indications for hysterectomy. Out of these patients, 67 patients in 2002 and 53 in 2006 received TAH, while 34 patients in 2002 and 46 patients in 2006 received LAVH. Thus in 2002, 66.3% of patients underwent TAH, while in 2006 53.5% of patients underwent TAH. The percentage of patients with a previous surgical history was higher in the TAH group (57.4 % vs. 20.5% in 2006) but the blood loss was less in the LAVH group compared to the TAH group [median 200 mL (range 20–700 mL) in LAVH group vs. median 300 mL (50–1500) in TAH group;  $p < 0.001$ ]. The average operative time and hospital stay were shorter for the LAVH group than the TAH group [120 minutes (60–400) vs. 121 minutes (60–240);  $p = 0.03$  and 5 days (2–18) vs. 6 days (3–78);  $p < 0.001$ , respectively].

**Conclusions:** The use of LAVH increased from 33.7% to 46.5% over a 5-year period, perhaps due to improved techniques, the lower blood loss associated with LAVH, and LAVH's shorter operation time. Nevertheless, there remains a need to further increase the proportion of patients undergoing LAVH and to further improve the minimal invasive surgery techniques used for hysterectomy.

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## 1. Introduction

Hysterectomy is the most common gynecological surgery performed in the United States and in many other countries [1]. The indications include leiomyoma, menstrual disorders, endometriosis, uterine prolapse, and cancers of the cervix, uterus or ovary [1]. A steady rate of 5.1 to 5.8 hysterectomies per 1000 women in the USA has been reported [2]. In Taiwan, the incidence of hysterectomy is approximately 2.68 to 3.03 hysterectomies per 1000 women during the period 1996 to 2001 [1].

The surgical approach to hysterectomy can be via an abdominal route (TAH), via a vaginal route (TVH) or via laparoscopy (LAVH). In

the US, the reported proportion of TAH, TVH, and LAVH were 66.1%, 21.8%, and 11.8%, respectively, in 2003 [3]. However, with advances in operative laparoscopy, LAVH offers a minimally invasive approach to the treatment of uterine lesions. This has been accepted worldwide and has revolutionized gynecological practice.

Surgical treatment using laparoscopy or laparotomy is performed with the objective of destroying or removing a pelvic tumor and restoring normal anatomy. Laparoscopy has several advantages over laparotomy for the patient, particularly in terms of faster recovery time. For the surgeon, laparoscopy offers two primary benefits, magnification and illumination, both of which are particularly helpful when diagnosing pelvic pathology [4].

The objectives of this study were to investigate the trend changes in usage of various hysterectomy surgical procedures at a single hospital and compare the intraoperative and postoperative outcomes and complications.

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**Table 1**

Baseline characteristics of patients undergoing laparoscopic assisted vaginal hysterectomy (LAVH) or total abdominal hysterectomy (TAH).

Year	2002		2006		Total	
	LAVH	TAH	LAVH	TAH	LAVH	TAH
Operation						
Number of patients	34	67	46	53	80	120
Age (y)	42.5 (15–83)	46 (32–81)	46 (20–79)	44 (27–68)	45 (15–83)	45 (27–81)
Parity	3 (0–10)	2 (0–6)	2 (0–7)	2 (0–4)	2 (0–10)	2 (0–6)
Uterine size (cm)	8 (5–12)	9 (3–19)	10 (4–14)	10 (5–16)	10 (4–14)	10 (3–19)
Prior abdominal surgery	17 (50%)	27 (40%)	8 (17.3%)	27 (50.9%)	25 (31.2%)	54 (45%)

## 2. Materials and methods

### 2.1. Patient selection

This study was a retrospective case-control study comparing TAH and LAVH operations performed in 2002 and 2006. Patients who underwent TAH and LAVH surgery were retrospectively investigated without selection. The Institutional Review Board of the hospital approved this study.

### 2.2. Operative procedure

TAH involved a Pfannenstiel incision or longitudinal incision whereas the LAVH required three ports (one 12-mm trocar in the infra-umbilicus and two 5-mm trocars in lateral abdominal walls). Briefly, in the LAVH procedure, the patient was placed in the dorsal lithotomy position. A uterine manipulator was inserted to effectively make a surgical field and pneumo-peritoneum was achieved by Veress needle gas infusion. A 10-mm, 0° rigid laparoscope and an articulating instrument (Karl Storz Endoscopy, Culver City, CA, USA) were used to avoid any clashing of the instruments and to optimize the range of motion. The ovarian ligaments, round ligament, and broad ligament were dissected with a bipolar grasper and unipolar dissection scissors. When the ligaments had been dissected bilaterally and the bleeding was controlled, the vaginal approach was started. After all of the procedures were completed, skin adhesive for the LAVH group was used to close the skin because of its good cosmetic effects and patient convenience.

### 2.3. Patient data collection

Each patient's hemoglobin level was measured on post-operative Day 1. A Foley catheter was maintained until the morning of the first day after surgery. Patients were discharged when they could tolerate food. Demographic information, uterine size, operative indication, final pathology, operative time (from skin incision to skin closure), additional procedures, estimated blood loss (EBL), failed cases, transfusion requirements, change in serum hemoglobin (%), and postoperative hospital stay were recorded.

### 2.4. Statistical analysis

Statistical analysis was performed using SPSS v15.0 (SPSS Inc., Chicago, IL, USA). A two-sample Wilcoxon rank-sum (Mann-Whitney) test and Fischer's exact test were performed as appropriate. Statistical significance was set at  $p < 0.05$ .

## 3. Results

The patients' baseline characteristics were similar between the two groups (Table 1). However, previous abdominal surgical history was higher in the TAH group. The surgical procedures were performed successfully for all patients.

The trend changes in TAH and LAVH between 2002 and 2006 at the study hospital are listed in Table 1. There was a significant shift in use of the various types of hysterectomy surgery over the study period. The use of TAH decreased by 20.8%, from 67 in 2002 to 53 in 2006, whereas the use of LAVH increased, from 34 in 2002 to 46 in 2006, a growth rate for LAVH of 26.1%.

Intraoperative blood loss among the LAVH group was significantly less than that among the TAH group ( $p < 0.001$ ; Table 2). The operative time was not significantly different between the two groups in 2002, but was significantly different in 2006, being shorter in the LAVH group ( $p < 0.001$ ). The duration of hospitalization in the LAVH group was also significantly lower than in the TAH group ( $p < 0.001$ ). The frequency of intraoperative blood transfusion was significantly higher in the TAH group (Table 3).

## 4. Discussion

Based on the information from the hospital database, this observational study demonstrates that there were considerable changes in the type of hysterectomy surgery performed at the study hospital over the study period, even though the annual number of hysterectomies remained almost constant. The trends involve a decreased in TAH of 20.8% and increased in LAVH of 26.1%. A previous study in the United States revealed that TAH had decreased from 73.6% in 1990 to 63% in 1997, then to 66.1% in 2003 and that LAVH had increased from 0.3% in 1990 to 9.9% in 1997, then to 11.8% in 2003 [3]. A Danish study also showed that the number of TAH procedures decreased by 38% [5]. Recently, a Taiwanese study

**Table 2**

Intraoperative and postoperative outcomes of patients undergoing laparoscopic assisted vaginal hysterectomy (LAVH) or total abdominal hysterectomy (TAH).

Year	2002			2006			Total		
	LAVH	TAH	<i>p</i>	LAVH	TAH	<i>p</i>	LAVH	TAH	<i>p</i>
Number of patients	34	67		46	53		80	120	
Estimated blood loss (mL)	200 (50–700)	300 (50–1500)	0.024	200 (20–650)	300 (100–1200)	0.04	200 (20–700)	300 (50–1500)	<0.001
Operation time (min)	120 (60–255)	120 (100–240)	0.348	120 (60–400)	122 (60–200)	<0.001	120 (60–400)	121 (60–240)	0.03
Postoperative hospitalization	5 (2–8)	6 (4–41)	<0.001	5 (2–18)	6 (3–78)	<0.001	5 (2–18)	6 (3–78)	<0.001

**Table 3**  
Intraoperative complications of patients undergoing laparoscopic assisted vaginal hysterectomy (LAVH) or total abdominal hysterectomy (TAH).

Year	2002		2006	
	LAVH	TAH	LAVH	TAH
Operation				
Number of patients	34	67	46	53
Hemorrhage requiring blood transfusion	0	6 (8.9%)	0	2 (3.7%)

revealed that TAH had decreased by 35% and LAVH had increased by 75.5% in 10 years (1996–2005) [1].

Many factors may influence the surgical treatment used for uterine lesions and menstrual disorders. Information in the press about the various treatment modalities and on patients' rights has increased significantly over the last decade [5]. Although a laparotomy may initially seem advantageous to the surgeon, a large abdominal incision, a prolonged hospital stay, the increased postoperative analgesic requirement, and the increased morbidity are disadvantages for patients [6]. Such factors influence the surgical choice of both the patient and the surgeon [7]. A Taiwan population study revealed that surgeons at medical centers and regional hospitals were more likely to perform LAVH than surgeons at local hospitals. A change in attitude and changes to the training system of surgeons may be important to choosing a surgical hysterectomy procedure.

The results of this study support the observation that there is a trend whereby the use of LAVH is increasing and that LAVH is being used instead of traditional TAH. The reasons for performing LAVH include improved intraoperative and postoperative outcomes, such as decreased blood loss, fewer pelvic adhesions, and a shorter hospital stay. Moreover, the patient's quality of life may also be an influencing factor [8,9].

Comparing the advantages and disadvantages of LAVH and TAH, LAVH is associated with a higher rate of major complications and a longer operating time, but involves less pain and a shorter hospital stay, compared to TAH [9]. The Cochrane Reviews have also revealed that LAVH is associated with less intraoperative blood loss, a smaller decrease in hemoglobin concentration, a shorter hospital stay, a shorter interval before returning to work, and fewer wound or abdominal wall infections; nevertheless the operating time tends to be longer and there are more urinary tract injuries [10].

Despite advances in technology and accumulating experience, laparoscopic complications remain an issue, even when patients and surgeons accept that LAVH is an efficacious and minimal invasive technique suitable for the treatment of uterine lesions [11,12]. The complication rate of LAVH ranges from 2.24% to 6.59% [11,13–16]. However, this can be reduced by accumulating surgical experience and carrying out preventive measures [11].

This observational study demonstrates the considerable shift in use of the two types of surgical hysterectomy at a single hospital over 5 years. The annual total number of hysterectomies has remained steady but the number of LAVH procedures has increased significantly and the number of TAH procedures has decreased proportionately. The benefits of LAVH over the traditional TAH include less intraoperative blood loss, fewer postoperative blood transfusions, and a shorter postoperative hospital stay; furthermore, there is no difference in operative time. These results provide relevant information for decision-making regarding the surgical approach used for hysterectomy via a laparoscopic approach.

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