

# Comparison of Different Surgical Approaches for Hysterectomy: A Single-Institution Experience

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## ABSTRACT

**OBJECTIVE:** We aimed to compare surgical outcomes and postoperative complications among different hysterectomy approaches such as total abdominal hysterectomy, vaginal hysterectomy, multiport access laparoscopic hysterectomy, and single-port access laparoscopic hysterectomy.

**STUDY DESIGN:** This retrospective, single institution, case - control study was carried out at the Obstetrics and Gynecology Department of Baskent University in Ankara, Turkey. We evaluated 86 consecutive patients who underwent hysterectomy for benign gynecological conditions.

**RESULTS:** A total of 86 women underwent hysterectomy: 20 (23.3%) total abdominal hysterectomy, 20 (23.3%) vaginal hysterectomy, 27 (31.3%) multiport access laparoscopic hysterectomy, and 19 (22.1%) single-port access laparoscopic hysterectomy using a transumbilical single-port system. There was no significant difference in uterine size between groups ( $Z=5.705$ ;  $p=0.127$ ). A statistically significant ( $p<0.001$ ) difference in operation time (duration of surgery) was observed among the following groups. The duration of surgery for the multiport access laparoscopic hysterectomy, and single-port access laparoscopic hysterectomy groups were similar, with these two laparoscopic procedures requiring significantly more time than total abdominal hysterectomy and vaginal hysterectomy procedures. There was no statistically significant difference between hemoglobin levels before and after operation between groups. There was no statistically significant difference between groups in intraoperative and postoperative complications. Six patients experienced complications, one intraoperative and five postoperative. The Intraoperative complication was ureter injury in single-port access laparoscopic hysterectomy group. The postoperative complication rate was 5.8% (5 cases) in 86 patients. Perirectal abscess in one patient and wound infection in two patients occurred in total abdominal hysterectomy group (15%). Urinary tract infection in one patient and vaginal cuff cellulitis in one patient occurred in vaginal hysterectomy group (4%). No complications were reported in multiport access laparoscopic hysterectomy, and single-port access laparoscopic hysterectomy groups. Post-surgery, all patients who underwent single-port access laparoscopic hysterectomy reported that they were satisfied with their incision and cosmetic results.

**CONCLUSIONS:** When technically feasible, multiport access laparoscopic hysterectomy, and single-port access laparoscopic hysterectomy may be performed instead of total abdominal hysterectomy because of rapid recovery and shorter hospitalization however, there is longer operating time.

**Keywords:** Hysterectomy, Minimally invasive surgery, Single-port laparoscopic surgery

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## Introduction

Hysterectomy, the removal of the uterus via surgery, is the most common surgical procedure performed by gynecologists for malignant and benign gynecological indications (1). There are four surgical approaches for hysterectomy include abdominal, vaginal, laparoscopic, and robotic techniques (1).

Total abdominal hysterectomy (TAH) is traditionally the most preferred technique in the world. However, in recent years this technique is preferred only in appropriate conditions

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such as an enlarged uterus, dense adhesions, or gynecological malignancy preclude other techniques (2). The other methods for hysterectomy is vaginal approach which is performed to patients with uterine prolapses. Vaginal hysterectomy (VH) has many advantages compared to the abdominal method, as it is less invasive and has lower risk of ureter injury, fewer blood transfusions, less febrile morbidity, and shorter hospitalization. Disadvantages of VH includes risk of bladder injury and increased complications related to bleeding (3,4).

The first VH was performed by Conrad Langenbeck in 1813, and the first abdominal hysterectomy (subtotal, in which the cervix is conserved) was performed by Charles Clay in 1843 (5). These two surgical technique were performed for hysterectomy until 1988 and the first laparoscopically assisted vaginal hysterectomy was performed in this year (6), and then developments in minimally invasive surgery led to additional related techniques such as multiport access total laparoscopic hysterectomy (MPA-TLH), single-port access laparoscopic hysterectomy (SPA-TLH), and finally robotic assisted hysterectomy (7).

In the last 20 years, minimally invasive surgery has become more popular than open surgery for many malign and benign gynecological procedures due to less postoperative pain, shorter hospital stay, earlier return to normal daily activities, and better aesthetic results (8). Recently, SPA-TLH has been used for different gynecological procedures such as hysterectomy and myomectomy (9, 10). SPA-TLH has many advantages over the MPA-TLH, including better aesthetic results, decreased visceral and vascular injuries, and less wound infection and pain (11,12).

This retrospective case control study compared surgical outcomes and postoperative complications among different hysterectomy techniques such as abdominal, vaginal, multiport laparoscopic, and single-port laparoscopic.

## Material and Method

This retrospective, single institution, case - control study was carried out at the Obstetrics and Gynecology Department of Baskent University in Ankara, Turkey. We evaluated 86 consecutive patients who underwent hysterectomy for benign gynecological conditions in 2012, specifically: 20 (23.3%) TAH; 20 (23.3%) VH; 27 (31.3%) MPA-TLH; and 19 (22.1%) SPA-TLH. Patients who had uterine, cervical, or ovarian malignancy; uterus larger than sixteen gestational weeks; and minimally invasive cases converted to laparotomy were excluded from this study. This study was approved by Baskent University Institutional Review Board (Project no: KA18/283).

Patient data were extracted from medical records include demographic characteristics (age, parity, and general health status), type and duration of surgery, uterine size, intraoperative complications such as urinary, bowel, or vessel injury,

postoperative complications such as urinary or bowel injury, bleeding, or infections, hemoglobin values before and after surgery, and length of hospitalization. Duration of surgery was defined as the time from skin incision to completion of skin closure. Duration of hospitalization was calculated by subtracting the date of admission from the date of discharge, coded as one day when these occurred on the same date.

Oral nonsteroidal anti-inflammatory drugs and antibiotics were given regularly postoperatively. All patients were discharged from the hospital after tolerating an oral diet with normal bowel and urinary functions and mobilization with well-tolerated pain.

### Statistical Method

All statistical analysis was performed using MS-Excel 2007 and IBM SPSS Statistics (Version 21.0 for Windows; Chicago IL, USA). All tests were conducted using a p-value of 0.05 for statistical significance. Data were expressed as follows: continuous variables such as age, duration of surgery, length of hospitalization, and hemoglobin values were expressed using the Shapiro-Wilk test; parametric variables were expressed as mean  $\pm$  standard deviation (SD); non-parametric variables such as the number of cases (n) were expressed using Interquartile Range (IQR); and categorical variables were expressed in terms of the percentage of the occurrence.

Group differences were analyzed using one-way ANOVA for parametric continuous variables, such as preoperative to postoperative hemoglobin drop, and using the Kruskal-Wallis test for categorical data, such as age, parity, duration of surgery, length of hospitalization, and uterus size. When the Kruskal-Wallis test revealed a difference within the four treatment groups, a post hoc comparison was conducted using the Bonferroni corrected Mann-Whitney test in which the new p-value equals the original p-value times the number of comparisons, with the null hypothesis rejected if the new p-value  $<0.05$ .

## Results

A total of 86 women underwent hysterectomy: 20 (23.3%) TAH, 20 (23.3%) VH, 27 (31.3%) MPA-TLH, and 19 (22.1%) SPA-TLH using a transumbilical single-port system. There was no significant difference in uterine size between groups ( $Z=5.705$ ;  $p=0.127$ ). The indications for the hysterectomies are shown in table 1.

The age of patients ranged from 34 to 84 years old, with a mean age of 51.5 years (IQR=12.25) in the TAH group, 63.0 (IQR=14.75) in the VH group, 51.0 (IQR=12.0) in the MPA-TLH group, and 54.0 (IQR=16.0) in the SPA-TLH group. There was a statistical difference between groups in terms of ages ( $Z=10.740$ ;  $p=0.013$ ); specifically, VH patients were older than both TAH ( $Z=2.978$ ;  $p=0.002$ ) and MPA-TLH ( $Z=2.844$ ;  $p=0.004$ ) groups, although no significant differences were observed among other groups.

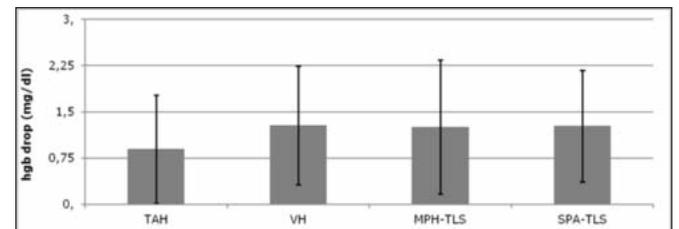
The operative outcomes of the four groups are shown in Table 2. A statistically significant ( $p < 0.001$ ) difference in operating time (duration of surgery) was observed among the following groups: TAH and MPA-TLH ( $Z = 3.878$ ); TAH and SPA-TLH ( $Z = 3.634$ ); VH and MPA-TLH ( $Z = 3.916$ ); and VH and SPA-TLH ( $Z = 3.975$ ). No statistically significant difference was found between the VH and TAH ( $Z = 0.435$ ;  $p = 0.678$ ) or between the MPA-TLH and SPA-TLH ( $Z = 1.240$ ;  $p = 0.215$ ) groups. The total duration of surgery was shortest in the VH group, followed by the TAH group. The duration of surgery for the MPA-TLH and SPA-TLH groups was similar, with these two laparoscopic procedures requiring significantly more time than TAH and VH procedures (Table 2).

There was a statistically significant difference in the length of hospitalization (days) between the groups ( $Z = 9.474$ ;  $p = 0.024$ ). However, when the difference was investigated from which group, it was decided that the length of the hospitalization was not different between the groups as a result of the bilateral comparisons made (Bonferroni correction). Although the length of hospitalization of MPA-TLH and SPA-TLH groups was shorter than the abdominal group, there was no significant difference due to small patient population (Table 2).

There was no statistically significant difference in between hemoglobin values before and after operation between groups;

$0.90 \pm 0.88$  mg/dL in the TAH group,  $1.28 \pm 0.96$  mg/dL in the VH group,  $1.25 \pm 1.09$  mg / dL in the MPA-TLH group and  $1.27 \pm 0.91$  mg/dL in the SPA-TLH group ( $F = 0.472$ ;  $p = 0.530$ ) (Figure 1).

**Figure 1:** Differences of pre-op and post-op Hg (mg/dL) (with standard deviations)



TAH: Total abdominal hysterectomy, VH: Vaginal hysterectomy, MPA-TLH: Multiport access laparoscopic hysterectomy, SPA-TLH: Single-port access laparoscopic hysterectomy

There was no statistically significant difference between groups in intraoperative and postoperative complications. Six patient experienced complications, one intraoperative and five postoperative. Intraoperative complication was ureter injury in SPA-TLH group. The postoperative complication rate was 5.8% (5 cases) in 86 patients. Perirectal abscess in one patient and wound infection in two patient occurred in TAH group (15%). Urinary tract infection in one patient and vaginal cuff

**Table 1:** Indication of hysterectomy, n (%)

Indications	TAH n (%)	VH n (%)	MPA-TLS n (%)	SPA-TLS n (%)
Myoma uteri	14 (%70)	1 (%5)	16 (%59.2)	13 (%68.4)
Abnormal uterine bleeding	5 (%25)	5 (%25)	10 (%37)	5 (%26.3)
Breast cancer prophylaxis	1 (%5)	-	1 (%3.8)	-
Uterine prolapsus	-	14 (%70)	-	1 (%5.3)
Total	20 (%100)	20(%100)	27 (%100)	19 (%100)

TAH: Total abdominal hysterectomy, VH: Vaginal hysterectomy, MPA-TLH: Multiport access laparoscopic hysterectomy, SPA-TLH: Single-port access laparoscopic hysterectomy

**Table 2:** Operation time and length of hospitalization

	Min	Max	Median	IQR	$\chi^2$	$p$
Operation time (minute)						
TAH	40.0	115.0	67.5	27.5	30.692	<0.001
VH	32.0	135.0	70.0	31.3		
MPA-TLS	50.0	200.0	105.0	45.0		
SPA-TLS	60.0	220.0	110.0	90.0		
Hospital stay (days)						
TAH	1.0	8.0	2.0	1.0	9.474	0.024
VH	1.0	3.0	2.0	0.8		
MPA-TLS	1.0	4.0	2.0	1.0		
SPA-TLS	1.0	3.0	2.0	0.0		

TAH: Total abdominal hysterectomy. VH: Vaginal hysterectomy. MPA-TLH: Multiport access laparoscopic hysterectomy. SPA-TLH: Single-port access laparoscopic hysterectomy. mni: Minimum. max: Maximum. IQR: Inter quartile range.  $\chi^2$ : Chi-squared test

cellulitis in one patient occurred in VH group (10%). No complications were reported in MPA-TLH and SPA-TLH groups.

Post-surgery, all patients who underwent SPA-TLH reported that they were satisfied with their incision and cosmetic results.

## Discussion

In the present study, we compared the surgical outcomes and postoperative complications between different hysterectomy techniques such as abdominal, vaginal, multi-port laparoscopic and single-port laparoscopic. In our institution, MPA-TLH was performed since 2008 and SPA-TLH since 2014 for adnexal surgery and hysterectomy. The results of this retrospective single institution study showed that SPA-TLH is a feasible technique for hysterectomy with similar postoperative outcomes to other hysterectomy techniques and better cosmetic results at our institution.

In recent years, surgical procedures were changing rapidly with advances in surgical instrumentation and techniques. These changes in the surgical procedure is often towards to minimal invasive methods due to obtain better cosmetic and postoperative results such as reduced postoperative pain, early mobilization and oral feeding with little difficulty and better recovery time (13,14). However, minimal invasive surgery such as single port or multiport laparoscopic surgery is characterized by extended operation time and technical difficulty during learning period (14). In our cases, operation time of SPA-TLH was longer than other techniques and the reason for this is that these cases are our first SPA-TLH cases which are at the beginning of the learning curve.

Since the late 1980s, the option of laparoscopy for hysterectomy has raised questions about which technique is the most appropriate procedure for hysterectomy, however laparoscopic technique for hysterectomy had a higher complication rate than TAH especially during the learning period and had a longer learning curve (15). In the study published in 2004 when laparoscopic hysterectomy was a new technique for gynecologist, complication rates were higher in laparoscopy group compared to abdominal hysterectomy (16). In the VALUE study that included a total of 37.512 hysterectomy patients from England, Wales and Northern Ireland, authors recorded severe operative and post-operative complications and reported that the operative complications rate was in laparoscopic assisted vaginal hysterectomy group was 6.1 % and that in abdominal hysterectomy 3.6 % (17). In our study, one intraoperative complication (ureter injury) was observed in SPA-TLH group (5%), whereas there was no intraoperative complication in other groups. In the same study, postoperative complications rates was 0.9% in TAH group, 1.7% in laparoscopy group and 1.2% in vaginal group (17). Although, there was no statistically significant difference between groups for intraoperative and postoperative complications due

to small patient population, postoperative complications were not observed in group of patients performing SPA-TLH and MPA-TLH, whereas the rate of postoperative complication in TAH group was 15%, and that in VH group was 4%. In our study, despite the high rate of postoperative complications in the TAH and VH groups, four of these five complications were minor infection such as wound and urinary tract infection. But in the VALUE study, serious intraoperative and postoperative complications such as deep venous thrombosis, pulmonary embolism, septicemia, necrotizing fasciitis, secondary hemorrhage, death, fistula, ureteric obstruction, and visceral damage were reported (17).

The present study has some limitations; The first limitation is a small patient population and retrospective design. The other limitation is the possible bias due to evaluating consecutive cohorts despite the initial learning curve for SPA-TLH in our institutions. In addition, cosmetic outcomes will need to be assessed objectively in patients with performed SPA-TLH.

In conclusion, when technically feasible, MPA-TLH and SPA-TLH may be performed instead of TAH because of more rapid recovery and shorter hospitalization however there is a longer operating time. In addition, SPA-TLH is a feasible technique for hysterectomy in benign indications with comparable postoperative complications and better cosmetic results when compared with other techniques such as TAH, VH, MPA-TLH. Additional well-designed prospective large-scale studies are required. to fully evaluate the benefits of this minimally invasive surgery.

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