A single center surgical experience in total laparoscopic hysterectomy and the effect of variables on operation time: Do the uterine volume and the suture type influence the operation time?

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Abstract

Aim: Total laparoscopic hysterectomy has several advantages compared to laparotomy including shorter hospitalization, faster recovery time, less pain, and less hemorrhage. Our aim was to determine the relationship between patient-specific/surgery-related variables and operation times in this study.

Materials and Methods: We recruited 191 patients who underwent total laparoscopic hysterectomy. We compared variables including uterine volume, surgical suture materials, and body mass index with operation time. The study was performed with the permission of the Training Plan and Coordination Board Committee of our institution (18/06/2019- No: 10).

Results: The uterine volume and body mass index of the patient did not influence the operation time whereas the suturing technique by the laparoscopic approach substantially affected the operating time (p=0.902, p=0.117 and p=0.012, respectively). There was a statistically significant difference between suture type and operation time. The cases that used barbed sutures required a shorter operation time.

Conclusion: We investigated the relationship between interesting entities such as uterine volume, type of suture material, and operation times. Laparoscopy should be performed widely in suitable cases. The type of suture material provided an important difference in the operation.

Keywords: Barbed suture/vicryl; total laparoscopic hysterectomy; operation time

INTRODUCTION

Hysterectomy is the most common surgical procedure in gynecology all around the world (1,2). It can be performed by laparoscopic, vaginal, or minimally invasive methods. The first laparoscopic hysterectomy (LH) was performed by Reich et al. in 1989 (3-5). Since then, it has been accepted as a safe and practical choice over traditional laparoscopic surgery and is a great improvement in surgery. Minimally invasive hysterectomy, which includes laparoscopy, robotic-assisted, laparoscopic-assisted vaginal hysterectomy, and total vaginal hysterectomy, have several advantages compared to laparotomy such as shorter hospitalization time, faster recovery time, less pain, less hemorrhage, and fewer infections (6). The American College of Obstetricians and Gynecologists (ACOG) recommends that minimally invasive approaches to hysterectomy should be performed over abdominal hysterectomy in suitable cases (7). These procedures incorporate several surgical techniques. On the other hand, there are risks of urinary tract and bowel injury complications. Of course, LH is not associated with increased rates of major complications, especially in well-experienced hands (6,8-10). Education and training seem to reduce both operation time and the rate of complications related to laparoscopic surgery (5,11,12).

The primer endpoint of this retrospective analysis was to determine the relationship between operation time and patient-specific/surgery-related variables. We specifically compared the suturing technique (polyglactin 910 – Vicryl figure-of-eight versus V-Loc barbed suture), body mass index (BMI) of the patients, uterine volume, and the serum hemoglobin levels in a contemporary cohort.

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MATERIALS and METHODS

The current study was a retrospective cohort study of 191 patients who underwent total laparoscopic hysterectomies (TLH) between May 2013 and June 2019 in a gynecologic oncology department. The study was performed with the permission of the Training Plan and Coordination Board Committee of the institution (18/06/2019- No: 10).

We recruited 191 patients who underwent TLH, and the informed consent of patients was obtained. The clinical charts, pathology reports, preoperative history, patients' demographic data including age, gravity, comorbidity, body mass index (weight in kilograms divided by the square of the height in meters, BMI), uterine volume (calculated by measuring the maximum length and anteroposterior and transverse diameters of the uterine corpus, $V = 0.52*L*AP*T$) (13), intraoperative data included closure of the vagina (transabdominal/transvaginal), suture type (V-Loc/Polyglactin), decrease in the serum hemoglobin level, intraoperative and postoperative complications, hospitalization stay, and operation times were calculated.

All of the cases were performed by a gynecological oncologist who had laparoscopy experience of over five years and an assistant who had received gynecologic oncology fellowship and had previous experience with simple laparoscopic procedures such as ectopic pregnancy, ovarian cystectomy, and tubal ligation. The operating room staff had also laparoscopic experience dating from the year 2010.

All patients received standard prophylactic cephalosporin and general anesthesia was performed via endotracheal intubation.

The patients were placed in the lithotomy position, and both arms were tucked along the patient's side. The surgeon was located at the left side of the patient, and the assistant surgeon was positioned on the right side of the patient.

The 10 mm trocar was inserted from the supraumbilical vertical incision. The pneumoperitoneum was performed with carbon dioxide insufflation until the intra-abdominal pressure reached 15 mm Hg. Two trocars with 5 mm were placed ipsilaterally on the left side of the lower abdomen (one is placed five cm left of the umbilicus, and the other was placed two cm superomedial to the anterior superior iliac spine), and the third trocar with 5 mm was inserted on the contralateral of the inferior one. After performing the pneumoperitoneum, the operating table was tilted nearly 30° in the Trendelenburg position. A V-CARE uterine manipulator was inserted into the cervix so that the forward balloon was located in the uterine cavity. The handle of the manipulator was hold by the third assistant surgeon.

In all cases, the retroperitoneal space was opened, and the uterine arteries and bilateral ureters were identified. The uterine arteries were isolated and ligated at the beginning from the internal iliac arteries.

After the uterus removed from the vaginal cavity, the closure was performed with absorbable sutures (polyglactin 910 – Vicryl Ethicon/Johnson & Johnson; New Brunswick, NJ) or barbed sutures (V-LocTM 90; Medtronic/Covidien; New Haven, CT). The uterine volume was calculated according to the diameters of the uterus by using the Goldstein's formula (13). A decrease in hemoglobin (hemoglobin drop) was calculated as the pre-operative hemoglobin value minus the hemoglobin value on the first post-operative day.

Statistical analysis

The data analysis was performed using SPSS version 17 (SPSS Inc., Chicago, IL, United States). A descriptive analysis was performed. The comparison of the measured values in the study was done with an independent samples t-test. P value less than 0.05 was considered statistically significant. Means are expressed as mean +/- standard deviation.

RESULTS

The demographic features (age, uterine volume, operation time, decrease in the serum hemoglobin level, hospital stay, and body mass index) of all patients were shown in Table 1.

Table 1. Characteristics of the study group	
Age	
Mean ± SD (Range)	51.04 ± 7.70 (28-71)
Median ± SD (Range)	50 ± 7.70 (28-71)
Uterine volume (cm³)	
Mean ± SD (Range)	151.22 ± 104.26 (12.48 – 524.16)
Median ± SD (Range)	118.43 ± 104.26 (12.48 – 524.16)
Operating time (minutes)[1]	
Mean ± SD (Range)	164.24 ± 43.11 (60 - 360)
Median ± SD (Range)	165 ± 43.11 (60 - 360)
Decrease in the serum hemoglobin level	
Mean ± SD (Range)	2.12 ± 0.96 (0.1-5.3)
Median ± SD (Range)	2.2 ± 0.96 (0.1-5.3)
Hospital stay (days)	
Mean ± SD (Range)	2.92 ± 0.77 (2 – 7)
Median ± SD (Range)	3.0 ± 0.77 (2 – 7)
Body mass index (kg/m²)	
Mean ± SD (Range)	30.74 ± 4.96 (19.30-48.0)
Median ± SD (Range)	30.4 ± 4.96 (19.30-48.0)
[1]Only cases who were finished laparoscopically without conversion to laparotomy were analyzed	

The mean patient age among all cases was 51.04 years (min 28; max 71). The mean uterine volume was 151.22 cm³ (min 12.48 cm³; max 524.16 cm³). The average BMI was 30.74 kg/m² (min 19.30 kg/m²; max 48 kg/m²) as shown in Table 1.

Both intraoperative and postoperative complication rate was 3.1% (six cases) (Table 2). One of six was major complication (ureter injury) that was determined in the postoperative period, and the rest of them were minor complications (bleeding, hematoma, and ileus). Thus, the major complication rate was 0.5%. Rate of the conversion from laparoscopy to laparotomy was 3.1%. The reasons for conversion were bleeding (one case) and the need for paraaortic lymphadenectomy (five cases).

According to the final histopathologic results, there were 105 cases (55%) with benign pathology, 19 cases (9.9%) with endometrial intraepithelial neoplasia, and 67 cases (35.1%) with endometrial cancer (Table 2). In the malignity group with endometrial cancer, operating times took longer than the whole of benign and intraepithelial neoplastic group (EIN).

When analyzing the closure of the vagina there was no significance in operation time by the terms of the closure (transabdominal/transvaginal), but in laparoscopic approach there was a statistically significant difference between suture type and operation time (p=0.012). The V-Loc group had significantly shorter operation times than the Vicryl group, 157.58 ± 38.53 vs 178.19 ± 48.4, respectively. There was no difference between operation times in terms of age, previous abdominal surgery, uterine volume, and body mass index (Table 3).

When we compared the decrease in the serum hemoglobin level between the suture materials (V-Loc vs Vicryl) by laparoscopic approach, we determined a statistically significant difference in operation time, 157.61 ± 36.22 vs 170.53 ± 48.10, respectively (p=0.041), as may be seen in Table 3.

Table 2. Characteristics of the surgical features	
	n (%)
Surgery	
Laparoscopic hysterectomy ± BS ± O	165 (86.4)
Laparoscopic hysterectomy ± BS ± O + Pelvic lymphadenectomy	20 (10.5)
Conversion to laparotomy	6 (3.1)
Previous Surgery	
No previous abdominal surgery	150 (78.5)
≥1 previous abdominal surgery	41 (21.5)
Intraoperative Complication	2 (1)
Bleeding	1 (0.5)
Urinary	1 (0.5)
Postoperative Complication	4 (2.1)
Hematoma	2 (1)
Ileus	1 (0.5)
Ureter injury	1 (0.5)
Any Complication	
Yes	6 (3.1)
No	185 (96.9)
Closure of the vagina[1]	
Laparoscopic Suturing	133 (71.9)
V Loc	97 (52.4)
Vicryl 2-0	36 (19.5)
Vaginal Suturing Vicryl 2-0	52 (28.1)
Final Histopathology	
Benign	105 (55.0)
EIN/Atypical Hyperplasia	19 (9.9)
Endometrioid Cancer	67 (35.1)

[1]Only cases who were finished laparoscopically without conversion to laparotomy were analyzed
BS= Bilateral salpingectomy; O= Oopherectomy; EIN= Endometrial intraepithelial neoplasia

Table 3. Factors associated with operating time		Operating Time Mean ± SD (minutes)	P Value
Age	≤50	162.3 ± 44.8	0.516
	≥51	166.44 ± 41.28	
Previous abdominal surgery	No previous surgery	161.11 ± 40.32	0.106
	≥1 previous surgery	175.24 ± 50.77	
Previous abdominal surgery	≤1 previous surgery	163.4 ± 42.2	0.335
	≥2 previous surgery	175.38 ± 54.56	
Laparoscopic surgical experience	Surgeries in the first 2 years	145.44 ± 34.58	<0.001
	After the first 2 years	172.62 ± 44.00	
Laparoscopic surgical experience[1]	Surgeries in the first 2 years	145.44 ± 34.58	0.001
	After the first 2 years	164.21 ± 34.82	
Uterine volume	<119	164.54 ± 46.54	0.902
	≥119	163.85 ± 39.51	
Final histopathology	Benign	156.05 ± 35.43	0.001
	Malign	180.9 ± 52.02	
Closure of the vagina	Laparoscopic suture	163.16 ± 42.25	0.585
	Vaginal suture	167.02 ± 45.54	
Closure of the vagina	Laparoscopic V loc	157.58 ± 38.53	0.012
	Laparoscopic 2-0 vicryl	178.19 ± 48.4	
Closure of the vagina	Laparoscopic V loc	157.58 ± 38.53	0.183
	Vaginal 2-0 vicryl	167.02 ± 45.54	
Performed Surgery	TLH ± BS ± O	157.73 ± 35.77	<0.001
	TLH ± BS ± O + PLND	218 ± 59.52	
Body mass index (kg/m²)	<30	158.73 ± 44.67	0.117
	≥30	168.73 ± 41.48	
Decrease in the serum hemoglobin level (g/dL)	< 2.2	157.61 ± 36.22	0.041
	≥ 2.2	170.53 ± 48.10	

*Patients who were finished laparoscopically without conversion to laparotomy were included to the analyzes
[1]Patients who had undergone lymphadenectomy were excluded in the analyzes
TLH= Total laparoscopic hysterectomy; BS= Bilateral salpingectomy; O= Oopherectomy; PLND= Pelvic lymph node dissection

DISCUSSION

Minimally invasive surgery is the rising preferable technique in gynecology and gynecological oncology in recent years. It has several advantages over laparotomy (5,14,15). There are variable techniques in laparoscopy such as trocar entrance, suture technique, trocar placement, etc. Every surgeon has a special technique from beginning to end.

Endoscopic suture requires a high level of surgical skill. Over the years, the vaginal closure fulfilled by vaginal to abdominal and transabdominal closure has been improved. In a randomized controlled clinical trial (16), no clinical or statistical difference was observed in total operative time for closure of the vaginal cuff when comparing the Vicryl and V-Loc whereas the time of surgery was significantly shorter in the V-Loc suture in our study. Also, in the consideration of the decrease in the serum hemoglobin level with the usage of suture material by the laparoscopic approach, there was no significant difference determined in the current study (p=0.685). Lopez et al. clarified their finding that the impact of an expert gynecologic laparoscopy expert does not affect the statistical significance in total operative time for closure of the vaginal cuff (16). Congruently with the current study, Alessandri et al. and Angioli et al (17,18) reported that the cuff closure was faster, and intraoperative blood loss was less with the barbed suture technic.

Surgery in overweight patients is certainly associated with burdens and risks, and of course, the laparoscopic approach increases the ratio. These problems can be overcome with experienced surgeons, anesthetists, and the staff in the operating room. Shah et al. reported that obesity was not associated with increased incision complications, but it was associated with longer operation times in TLH (19). According to Saito et al., obesity was an independent risk factor that caused difficulty in performing TLH (20). In contrast to these studies, high body mass index was

not related to operation times, according to the current study. In contrast to these studies, Otake et al. reported that obese patients (BMI ≥30) had significantly longer operation times and more perioperative complications than patients with normal weight (21).

There are limited studies in the literature regarding the impact of uterine size on operation times in TLH (22,23). Large uterine volume causes restricted visualization and exposure so these factors may cause greater blood loss and prolonged operating times. In our study, we calculated uterine volume according to the Goldstein formula (13). But no significant difference was determined between the uterine volume and operation times. Unlike our results, Torng et al. used GnRHa (gonadotropin releasing hormone analogues) treatment to decrease the uterine weight and reported that this technique shortened the operation time by 34 minutes (23). O'Hanlan et al. recruited 983 patients for uterine weight analysis and reported that uterine weight was independently predictive of operative time (p < 0.001) (24).

When we consider the type of surgery, in the group that had a pelvic lymph node dissection (PLND) procedure added, the operating times were shorter than the standard TLH± BS (bilateral salpingectomy) ± O (oophorectomy) procedure group (p<0.001). Prolonged operation times were significantly related to the decrease in the serum hemoglobin levels (p=0.041).

In this study, we analyzed our laparoscopic hysterectomy experiences and investigated any relationship between patient-related factors (BMI, uterine volume, previous abdominal surgery, age) and surgery-related variables (cuff closure type, decrease in the serum hemoglobin level, performed surgery) with operating times. We showed that, in the laparoscopic approach, V-Loc suture was superior to Vicryl in shorter operating times, but there were no relationship with BMI and uterine volume when we compared with time of surgery. The weaknesses of our study were the limited number of patients and the fact that it was a retrospective study. The strength of the study was based on the comparisons with regard to the specific parameters especially uterine size, suturing material types, and decrease in the serum Hb levels.

CONCLUSION

In this study we aimed to investigate the association between the operating time and uterine volume, body mass index, and suturing technique. As a result, we reported that uterine volume and body mass index of the patient did not influence the operation time. On the other hand, suturing technique by the laparoscopic approach substantially affected the operating time.

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