Single-center experience of laparoscopic hysterectomy: analysis of one thousand five hundred and fifteen patients

 Gülşen Doğan Durdağ, Songül Alemdaroğlu, Şirin Aydın, Seda Yüksel Şimşek, Erhan Şimşek,
 Hüsnü Çelik

Department of Obstetrics and Gynecology, Başkent University, Adana Dr. Turgut Noyan Application and Research Hospital, Adana, Turkey

Abstract

Objective: Laparoscopic hysterectomy has become an increasingly used surgery in recent years. The aim of this study was to evaluate the clinical features and perioperative outcomes of patients who underwent laparoscopic hysterectomy for benign or malignant indications in a single center during a period of eight years.

Material and Methods: Data of patients who underwent laparoscopic hysterectomy in the gynecological oncology department of a university hospital over a period of eight years was analyzed retrospectively. Two groups were formed based on being operated for benign or malignant indications. Demographic characteristics and perioperative data of these groups were evaluated.

Results: A total of 1,515 patients underwent laparoscopic hysterectomy. The mean age of the patients was 52.0 ± 9.8 years and mean body mass index (BMI) was 31.3 ± 8.5 kg/m². Of these, 1,219 had benign and 296 had malignant histopathology results. In the whole cohort, intraoperative complications were seen in 1.6% and postoperative complications in 3.5%. The patients in the malignant group were older, had a higher BMI and a higher comorbidity rate. The duration of operation and length of hospital stay were significantly longer in this group (p=0.0001 for all parameters). However, intraoperative and postoperative complication rates, rate of blood transfusion and amount of transfusion were similar between the two groups (p>0.05).

Conclusion: Laparoscopic hysterectomy can be performed with low complication rates in benign and malignant indications, regardless of the patient's contributing factors. However, since experience is important, financial resources and personnel training processes should be supported. (J Turk Ger Gynecol Assoc. 2024; 25: 144-51)

Keywords: Hysterectomy indications, intraoperative complications, laparoscopic hysterectomy, postoperative complications

Introduction

Hysterectomy is one of the most common gynecological surgical procedures and can be performed by abdominal, vaginal, laparoscopic or robot-assisted approaches (1). Although abdominal and vaginal hysterectomy have been the most preferred methods for many years, vaginal hysterectomy may not be applicable in cases of endometriosis or malignancy. Laparoscopic surgery, on the other hand, has become an increasingly chosen option in recent years due to better visualization of the abdominal cavity when compared to abdominal surgery, improved perioperative outcomes, less postoperative pain, faster recovery period and better cosmetic outcomes (2-4). However, it has also been reported that, particularly related to the experience of the surgical team, complication rates are higher in laparoscopic hysterectomy when compared to other routes (2). In contrast, several studies have indicated that laparoscopic hysterectomy is

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safe and feasible (1,5,6). It has also been reported that while laparoscopic surgery may prolong the operation time in challenging cases, such as with obesity, previous surgery or a huge uterus, it is a safe procedure regarding intraoperative and postoperative complications (3,7). In addition to benign surgery, laparoscopic hysterectomy is frequently performed in the treatment of endometrial cancer and laparoscopy has been found to be safe in terms of perioperative outcomes for this indication as well (8,9).

The aim of the present study was to evaluate the clinical features and perioperative outcomes of patients who underwent laparoscopic hysterectomy for benign versus malignant indications in a single center over a period of eight years.

Material and Methods

The study was approved by the Başkent University Ethics Committee (approval number: E-94603339-604.01.02-155636, date: 31.08.2022).

Retrospective analyses of data of patients who underwent laparoscopic hysterectomy between 2012 and 2020 in the gynecological oncology department of a university hospital were performed. All patients who had undergone laparoscopic hysterectomy by the same surgical team during this time interval were included in the study. Data of patients were obtained from medical records and the hospital database (Nucleus, Monad Software and Consultancy).

Age, body mass index (BMI), comorbidity, American Society of Anesthesiologists scores, surgical procedure, indication of the intervention, complications, need for re-operation and pathology results were evaluated. In addition, patients were classified into two groups, based on the indication for surgery being benign or malignant. Demographic characteristics, as well as intraoperative and postoperative complications, difference between preoperative and postoperative hemoglobin values and blood transfusion data of these groups were compared.

All patients were operated using the same surgical technique. A pneumoperitoneum was created by inserting a Veress needle through the umbilicus and visualization was achieved through a 10 mm trocar. Subsequently, two 5 mm trocars were introduced from the lateral side of the left rectus muscle. One 5 mm trocar was inserted additionally from the lateral side of right rectus muscle in patients who underwent sacrocolpopexy. Two 5 mm trocars from the lateral side of right rectus muscle and one suprapubic 10 mm trocar were also inserted in patients who underwent bilateral pelvic and paraaortic lymph node dissection. A harmonic scalpel (Ethicon) and bipolar cautery were used for coagulation. Round ligaments, utero-ovarian/infindibulopelvic ligaments, and uterine arteries were coagulated and cut bilaterally. The vaginal cuff was cut with a harmonic scalpel. Clermont-Ferrand (Karl Storz GmbH, Tuttlingen, Germany) was used as the uterine manipulator. In all patients, total laparoscopic hysterectomy was performed and the uterus was removed from the abdomen through the vaginal route. In cases where the uterus was very large, the uterus was removed from the vagina by morseling with a scalpel in a bag. The vaginal cuff was closed intracorporeally with a braided suture (Vicryl, Ethicon) with a figure of eight suturing technique.

In patients who underwent sacrocolpopexy, the promontory was reached from the medial of the right ureter, and the mesh was fixed to the vaginal cuff and promontory with non-absorbable braided sutures (Ti-Cron, Medtronic) and peritonized. In patients who underwent lymph node dissection, lymph nodes were taken out of the abdomen in an endobag. Ureters, bladder and bowels were checked after each operation. At the 10 mm trocar entry site, the fascia was closed with a vicryl suture. The duration of the operation was determined as the time from the skin incision to the closure of the incisions, while hospitalization time was determined as the time from surgery to discharge day. Complications observed within 30 days after surgery were considered to be postoperative complications.

Statistical analysis

SPSS, version 25.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. Categorical measurements are expressed as numbers and percentages, and continuous measurements were summarized as mean and standard deviation (or median for non-normally distributed data). In the comparison of continuous measurements in the two groups formed according to the presence of malignancy, the distributions were controlled, and the Student's t-test was used for the variables with parametric distribution and the Mann-Whitney U test was used for the variables with non-parametric distribution. The categorical variables between the groups were analyzed using the chi-square test or Fisher's exact test. A $p<0.05$ was considered statistically significant in all tests.

Results

During the study period, a total of 1,515 patients underwent laparoscopic hysterectomy. The mean age was 52.0 ± 9.8 years and mean BMI was 31.3 ± 8.5 kg/m^2. More than half (55.1%) had comorbidities, such as hypertension, diabetes, asthma, cardiac disease, thyroid disease, chronic liver disease, or two or more of these together. Indications for hysterectomy were distributed over a wide range, including dysfunctional uterine bleeding, myoma uteri, pelvic pain, uterine prolapse, adnexal mass, cervical dysplasia, endometrial hyperplasia, and endometrial cancer. The size of uteruses varied between the

8th-20th gestational week. The surgical procedures performed were laparoscopic hysterectomy along with salpingectomy or salpingo-oopherectomy, and in addition, sacrocolpopexy or lymph node dissection and omentectomy, depending on the surgical indication of the patient. The clinical features of the patients, indications for surgery, and the surgeries performed are shown in Table 1. Operation duration for different surgical indications are displayed in Figure 1.

Pathology results included myoma uteri, hyperplasia, adenomyosis, endometriosis, cervical dysplasia, ovarian cyst and malignancies, which were mostly endometrial cancer (Table 2).
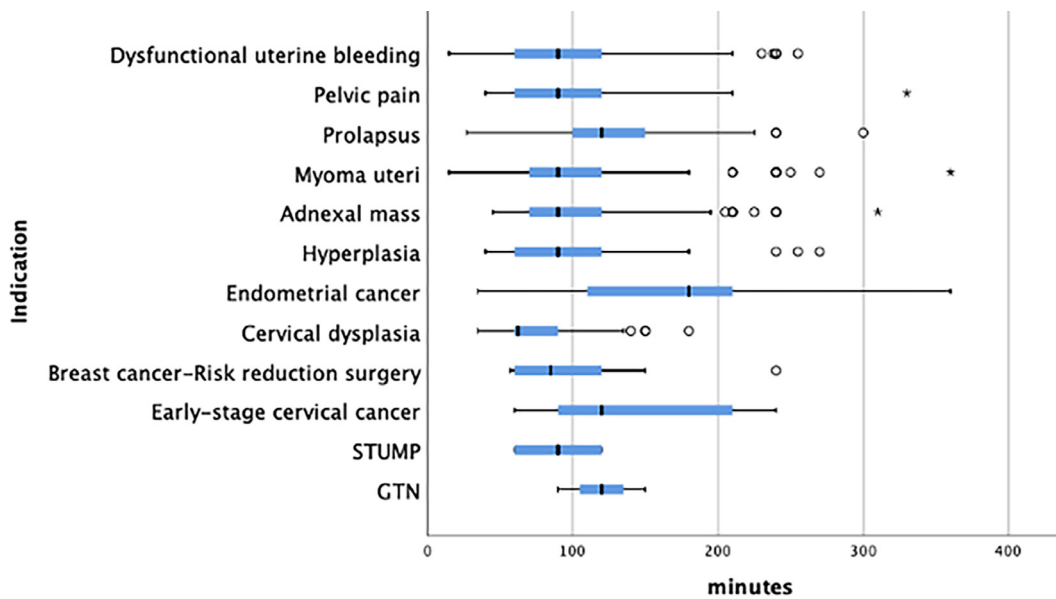
Only 1.6% had intraoperative complications, including vascular damage, bowel injury, bladder or ureter injury. None of these complications occurred during the access to the abdominal cavity. The surgery was completed laparotomically in 17 (1.1%) patients. It was observed that all the bowel, bladder and ureteral injuries and vascular laceration in one patient were sutured and repaired laparoscopically. Out of 17 patients, in whom the procedure was converted to open surgery, three patients had major vascular injury (vena cava in two patients and left iliac artery in one patient), one patient had a fixed presacral mass, three patients had ovarian cancer identified by frozen section, and 11 patients, who needed staging surgery, had dense adhesions or could not tolerate the Trendelenburg position due to comorbidities and sufficient visualization could not be provided laparoscopically. Postoperative complications, including trocar site infection, ileus, abscess, vaginal cuff hematoma, cuff dehiscence, fever, urinary retention, D-J stent application, vesicovaginal fistula, deep vein thrombosis, and pulmonary embolism developed in 3.5% of the patients. Mortality was not observed in any of the patients within 30 days postoperatively. A total of 15 patients underwent vaginal re-suturing under sedation, abscess drainage or re-laparoscopy. As for the four patients who underwent re-laparoscopy, re-operation was performed due to cuff hematoma in two patients, ileus in one patient, and need to remove the mesh in the last patient who had discitis after sacrocolpopexy (Table 3).

When the patients were classified into two groups as those with benign and malignant pathology, 1,219 patients had benign and 296 patients had malignant pathology results. The patients in the malignant group were significantly older, had higher BMI, and a higher comorbidity rate. Furthermore, the duration of the operation, postoperative and preoperative hemoglobin differences, and length of hospital stay were significantly greater in this group (p=0.0001 for all parameters). However, intraoperative and postoperative complication rates, rate of blood transfusion and amount of transfusion were similar between the two groups. The clinical features and perioperative outcomes of the two groups are shown in Table 4.

Table 1. Clinical features, operation indications and types of surgical procedures

Age (year) (mean ± SD)	52.0±9.8
BMI (kg/m²) (mean ± SD)	31.3±8.5
Comorbidity, n (%)	835 (55.1)
Operation indication, n (%)	
- Dysfunctional uterine bleeding	331 (21.8)
- Pelvic pain	63 (4.2)
- Prolapsus	142 (9.4)
- Myoma uteri	286 (18.9)
- Adnexal mass	202 (13.3)
- Hyperplasia	157 (10.4)
- Endometrial cancer	239 (15.8)
- Cervical dysplasia	44 (2.9)
- Breast cancer - risk reduction surgery	40 (2.6)
- Early-stage cervical cancer (stage IA1)	6 (0.4)
- Smooth muscle tumors of uncertain malignant potential (STUMP)	2 (0.1)
- Gestational trophoblastic neoplasia	3 (0.2)
Type of surgical procedure - n (%)	
L/S hysterectomy + salpingectomy/salpingo-oophorectomy	1169 (77.2)
L/S hysterectomy + salpingectomy/salpingo-oophorectomy + sacrocolpopexy	152 (10.0)
L/S hysterectomy + salpingectomy/salpingo-oophorectomy + lymph node dissection	194 (12.8)
BMI: Body mass index, SD: Standard deviation	

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Figure 1. Operation duration for different surgical indications
STUMP: Smooth muscle tumors of uncertain malignant potential, GTN: Gestational trophoblastic neoplasia

Table 2. Pathology results

- Myoma uteri	742 (49.0)
- Adenomyosis	151 (10.0)
- Endometriosis	11 (0.7)
- Hyperplasia	47 (3.1)
- Endometrial cancer	276 (18.2)
- Cervical dysplasia	15 (1.0)
- Cervical cancer	9 (0.6)
- Sarcoma	4 (0.3)
- Lymphoma	2 (0.1)
- Breast cancer metastasis	3 (0.2)
- Trophoblastic invasion	1 (0.1)
- Ovarian cancer	4 (0.3)
- Benign ovarian cyst	78 (5.1)
- Hydrosalpinx	3 (0.2)
- Other (endometritis, cervicitis, irregular proliferative endometrium, polyp)	169 (11.2)

Table 3. Complications and need of re-operation

Intraoperative complications, n (%)	
None	1491 (98.4)
Large vessel injury	4 (0.3)
Intestinal injury	9 (0.6)
Bladder injury	8 (0.5)
Ureter injury	3 (0.2)
Conversion to laparotomy	17 (1.1)
Postoperative complications, n (%)	
None	1461 (96.5)
Pulmonary thromboembolism	2 (0.1)
Surgical site infection	4 (0.3)
Ileus	3 (0.2)
Pelvic abscess	9 (0.6)
Fever	15 (1.0)
Vaginal cuff hematoma	12 (0.8)
Vaginal cuff dehiscence	3 (0.2)
Urinary retention	1 (0.1)
Vesicovaginal fistula	1 (0.1)
D-J stent application	2 (0.1)
Deep vein thrombosis	1 (0.1)
Re-operation, n (%)	
Vaginal re-suturation under sedation	6 (0.5)
Abscess drainage under sedation	4 (0.3)
Re-laparoscopy	4 (0.3)
Repair of incisional hernia	1 (0.1)

Discussion

In the present study, the clinical data, surgical indications, and intraoperative and postoperative complication rates of patients who underwent laparoscopic hysterectomy in a single center were evaluated in a large series, and it was shown that laparoscopic hysterectomy may be safely performed in both benign and malignant pathologies with low complication rates. Total laparoscopic hysterectomy was first described in 1989 and this operation has been performed for more than 20

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years for various indications. In the literature, fibroids are the most common benign indication for this procedure. In the study of Bettaiah and Reddy (6), indication of surgery was myomas in 54.4% and treatment-resistant menometrorrhagia in 17.8% of patients. In the surgical indications of Puntambekar et al. (1), fibroids (33.8%) and adenomyosis (22.3%) were the most common. In the present study, 21.8% of the indications were treatment-resistant dysfunctional bleeding and 18.9% were fibroids. However, the rate of myomas in our pathology results was 49.0%, which demonstrates the frequent association of fibroids with different clinical findings in the foreground. In addition, 16.5% of our patients were operated due to malignancy, which may contribute to the difference between our indication rates and previous reports. Apart from the other indications, the treatment of cervical dysplasia is generally limited to loop electrosurgical excision procedure (LEEP) but in the presence of accompanying pathologies or absence of adequate tissue for re-LEEP in case of positive surgical margins, hysterectomy is performed.

The postoperative recovery period is shorter, hospital stay is shorter and patient satisfaction is therefore higher in laparoscopic hysterectomy when compared to abdominal surgery (1). Although it has been shown to be a safe method in many studies, a certain learning curve should be completed (2). The learning curve is defined as the shortening of the operation time without increasing complications, and it has been reported that a plateau can be reached after experience gained in 75 patients for this process, but implementing the learning curve does not warrant a complication-free surgery (10). In several studies it has been reported that 25, 30, 50, 75, or 100 cases are required to complete this process (2). In addition, it has been reported in many studies that the experience of the surgeon plays an important role in reducing complications, and the complication rate of high volume surgeons is lower (1,2,4,11).

Laparoscopic surgery has still not completely replaced open surgery due to fear of possibility of encountering intraoperative complications or conversion to open surgery. However, while a large uterus with multiple fibroids, previous abdominal surgery and obesity were relative complications for minimally invasive approach, today laparoscopy is the method of choice in such challenging cases with obesity or previous surgery in most centers (3). In these cases, abdominal access is particularly important, and the use of alternative sites such as Palmer's point or Lee Huang's point for abdominal entry can reduce complications (3,7). In the present study, the maximum dimension of the large uteruses was up to 20th gestational week-magnitude. In our center, if the uterus is located too near the umbilicus, the Lee-Huang point is used. Likewise, if the patient has previous surgeries, the Palmer point, at which the adhesions are less likely, is preferred.

Puntambekar et al. (1) reported intraopeartive complication rates as 2% (1.5% bladder injury and 0.5% ureter injury) in their series of 1200 cases. Bettaiah and Reddy (6) reported a major complication rate of 0.9% and the conversion rate to laparotomy of 0.93% in their data, which included 858 patients. In another study involving 209 patients, the rate of intraoperative and postoperative complications was reported as 12.9% and the rate of major complications was 3.8%, no vascular damage occurred and the surgery was converted to laparotomy in 3.3% of the patients (5).

Table 4. Clinical features and peri-operative outcomes of patients with benign and malignant pathological results

	Benign (n=1219), (mean/median)	Malignant (n=296), (mean/median)	p
Age (years)	50.6±9.2	58.0±10.2	**0.0001**
BMI (kg/m²)	30.1±6.4	34.9±12.1	**0.0001**
Comorbidity presence, n (%)	627 (51.4)	208 (70.3)	**0.0001**
ASA 3, n (%)	68 (5.6)	106 (35.8)	**0.0001**
ASA 4, n (%)	1 (0.1)	2 (0.7)	
Operation duration (minutes)	90 (15-360)	165 (35-360)	**0.0001**
Hb difference (g/dL)	1 (-5-6)	1 (-2-4.9)	**0.0001**
Intraoperative complications, n (%)	17 (1.4)	7 (2.4)	0.295
Postoperative complications, n (%)	52 (4.3)	11 (3.7)	0.748
Blood transfusion, n (%)	142 (11.6)	40 (13.5)	0.371
Amount of transfusion (units)	2 (1-8)	2 (1-4)	0.962
Time of hospitalization (days)	2 (2-12)	3 (2-15)	**0.0001**
BMI: Body mass index, ASA: American Society of Anesthesiologists, Hb: Hemoglobin			

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Intraoperative complications often include vascular damage and organ injuries related to the urinary or gastrointestinal systems. Wong et al. (12) reported that lower urinary tract injury was 0.33% in gynecological laparoscopy with benign indications, and bladder injury was three times more common than ureteral injury (0.24% and 0.08% for bladder and ureter injury, respectively). Urinary injury rates of up to 3% during laparoscopic hysterectomy have been reported in different publications (13-15). Particularly in surgeries performed for endometriosis or large fibroids, the risk of urinary injury is reported to be higher (14,16). If the recognition of these types of damage is delayed, further complications such as infection, fistula, and renal failure may occur. Although there are studies advocating that cystoscopy can be performed following hysterectomy in order to reveal damage intraoperatively, its benefit is controversial (17). Our urinary tract complication rate was 0.7%, which is consistent with the literature. All of our cases with ureteral injury were operated for myoma. As for our eight patients with bladder damage, five were operated for myoma, one for ovarian cyst and two for endometrial cancer. All of our urinary tract injuries were recognized intraoperatively, and primary suturation was performed with minimal invasive route, with only one patient requiring D-J stent postoperatively. The rate of intestinal damage during hysterectomy has been reported to be 0.39%, with particularly higher risk in advanced aged patients and for operations performed with the indication of endometriosis. It has been reported that 55% of such injuries occur during Veress or trocar insertion, and 82.3% of them are repaired intraoperatively (18,19). Our rate of 0.6% is consistent with the literature. None of the intestinal injuries occurred during the access to the abdominal cavity in our cases, which is probably due to the careful choice of the abdominal entry point in risky situations. All injuries were recognized immediately and primary repair was performed laparoscopically. The rate of vascular injury, which is another major complication of laparoscopy in benign gynecological surgeries, is 0.09%, mostly involving the epigastric vessels, and 82% of vascular injuries occur during entry into the abdomen. All of our vascular complications, which was at the rate of 0.3%, occurred at vena cava and iliac arteries during lymphadenectomy, while no vascular injury was observed in patients operated with benign indications. In total, our intraoperative complication rate was 1.6% and postoperative complication rate was 3.5%, and only 2 (0.13%) patients underwent laparotomy due to vascular complications. Our overall rate of conversion to laparotomy was 1.1%, which is also similar to the literature.

Postoperative complication rates for laparoscopic hysterectomy have been reported to be around 4-5% (20). In our series, the rate of postoperative complications such as fever, ileus, urinary retention, pelvic fluid collection/abscess, and port site infection was 3.5%, consistent with the literature. In the large series of Puntambekar et al. (1), postoperative complication rates were reported as 7.58%, postoperative hemorrhage was not reported in any patient, 0.67% mild pelvic collection was drained under ultrasound guidance, and other complications including fever, infection, paralytic ileus, and urinary retention were managed conservatively with medical treatment, with no requirement of re-exploration in any of the patients (1). Hematoma or abscess formation on the vaginal cuff, or cuff dehiscence, are reportedly relatively common complications, with cuff dehiscence reported to occur in 1.27% of laparoscopic surgery (21). In the present study, 0.3% of the patients had vaginal cuff dehiscence, 0.8% had hematoma on the cuff, 0.5% of the patients underwent resuturation under sedation, 0.3% had abscess drainage, and 2 (0.1%) patients underwent re-laparoscopy due to cuff hematoma. In a recent review, it was demonstrated that different suture techniques or suture materials do not affect cuff dehiscence (22). However, meticulous vaginal cleaning before the operation, using a harmonic scalpel instead of monopolar energy when cutting the cuff, and obeying the prohibition on postoperative intercourse may be effective in preventing cuff dehiscence (23).

While 1.2% of the patients were re-operated due to complications, others were managed medically. In this context, although 15 (1%) of the patients had fever requiring hospitalization in the postoperative period, no pathology was identified to explain the cause. However, small hematomas or collections, as well as pulmonary atelectasia, may be the cause of this symptom. Nevertheless, the complaints of the patients resolved with follow-up and medical treatment.

In the present study, when patients with benign and malignant pathology were compared, intraoperative and postoperative complication rates, blood transfusion rates and transfusion amounts were found to be similar in both groups. In our center, hysterectomy and surgical staging are performed laparoscopically in almost all patients diagnosed with endometrioid endometrial cancer. In the LAP2 study, in which a randomized comparison of laparoscopy and laparotomy in endometrial surgery was performed for the first time, and in many subsequent studies, perioperative outcomes were evaluated and it was reported that laparoscopy is a safe procedure in endometrial cancer surgery (8,24,25). Low rates of complication and necessity of complication-related laparotomy in our study support the literature. Until recent years, early-stage cervical cancers were also operated laparoscopically in appropriate cases in our center. However, following publication of the results of the Laparoscopic Approach to Cervical Cancer study, patients with cervical cancer are now treated with traditional open surgery (26). Nevertheless, perioperative complication rates were also found to be low in this group of

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patients. When the complications that caused the conversion to open surgery were considered, they were found to be vascular complications related to lymphadenectomy procedure, and not the hysterectomy operation itself.

Study limitations

The important limitation of the study is its retrospective design. Also, the focus of this study was laparoscopic hysterectomy and additional surgical procedures other than laparoscopic hysterectomy may cause bias regarding the complication rates. However, the present study aimed to evaluate and compare laparoscopic hysterectomy for both benign and malignant indications, and the complications related to additional procedures were clarified. Assessment of the surgery performed with the same standard technique in a single center with the same surgical team, and the large population included in the study are the strengths of the study.

Conclusion

Laparoscopic hysterectomy may be widely applied in experienced centers with low complication rates for both benign and malignant indications, regardless of the patient's comorbidities, BMI and operation indication. Laparoscopic surgery is becoming increasingly popular due to its technical advantages and patient satisfaction. Therefore, we suggest that the financial resources and personnel training processes of the centers should be supported in this perspective.

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