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A retrospective comparison of abdominal, vaginal, and laparoscopic hysterectomies performed in our clinic during the previous decade: A tertiary center experience

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ABSTRACT

Introduction: To evaluate the three types of hysterectomy performed at our clinic over the previous 10 years and to compare their operative outcomes.

Materials and Methods: A total of 5,731 patients who underwent abdominal hysterectomy (AH, n=2,552), vaginal hysterectomy (VH, n=309), and laparoscopic hysterectomy (LH, n=2,870) procedures between January 2010 and December 2024 were included in the study. Age, body mass index, parity, uterine weight, operative time, blood loss, length of hospital stay, days of analgesia requirement, conversion rates from laparoscopy to laparotomy, surgical indications, additional surgical procedures, and major and minor intra- or postoperative complications were recorded and compared.

Results: AH procedures predominated in 2015, although the rate of application decreased rapidly over the following two years. From 2017 onward, LH became the predominant method. Statistically significant differences were observed in terms of age (AH 51.14±3.72 vs. VH 57.12±5.32 vs. LH 56.26±5.84, respectively; $p<0.05$), operative time (76.91±14.41 vs. 73.03±12.35 vs. 85.02±19.27, respectively; $p<0.05$), blood loss (247.02±65.49 vs. 187.88±56.07 vs. 159.38±63.73; $p<0.05$), length of hospitalization (3.84±0.88 vs. 2.61±0.76 vs. 2.36±0.52; $p<0.05$), analgesia requirements (4.05±1.68 vs. 3.57±1.02 vs. 3.29±1.23; $p<0.05$), and uterine weight (251.84±86.48 vs. 128.76±52.79 vs. 204.30±71.67; $p<0.05$). No significant differences were detected between the groups in terms of major or minor intra- or postoperative complications.

Conclusion: The study findings show that LH should be preferred by gynecologists as the primary type of hysterectomy due to its less invasive nature, faster postoperative recovery, and shorter hospital stay.

Keywords: Abdominal hysterectomy; complications; laparoscopic hysterectomy; operative outcomes; vaginal hysterectomy

Introduction

The most common gynecological operation worldwide, hysterectomy is performed due to treatment-resistant menometrorrhagia, myoma uteri, uterine prolapse, chronic pelvic pain, and certain gynecological cancers, although there is no consensus regarding the optimal procedure.[1] Due to recent advances in technology (light sources, optics, and cameras), laparoscopic hysterectomy (LH) has become more common than abdominal hysterectomy (AH) and vaginal hysterectomy (VH) in recent years, currently ac-

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counting for 60% of all hysterectomies.[2,3] The size and dimensions of the uterus, previous abdominal surgeries, and the gynecologist's experience and skill are important factors in determining which type of hysterectomy to perform.[4] The advantages of LH include a shorter hospitalization time, minimal blood loss, reduced postoperative analgesia requirements, a faster recovery and return to daily activities due to very small surgical incisions, and lower economic impacts for the patient. However, its disadvantages are a longer operative time than with the other procedures, the fact that not every hospital is equipped with the necessary laparoscopic set, and the specific learning curve involved for gynecologists.[1,5,6]

Laparoscopic hysterectomy may be preferred in cases in which VH is not appropriate. However, despite the numerous advantages of LH, many gynecologists unfortunately still prefer AH. Furthermore, LH should also be preferred over AH since intrapelvic and intra-abdominal anatomy can be evaluated more clearly during laparoscopic procedures. Lymphadenectomies can also be safely performed using laparoscopy in gynecological oncology surgeries.[7,8]

Due to the limited number of studies comparing AH, VH, and LH, the present research was intended to contribute to the literature by presenting our experience with the three types of hysterectomy performed at our clinic over the previous 10 years and by comparing our operative outcomes.

Materials and Methods

Following receipt of approval from the Antalya Training and Research Hospital Clinical Research Ethics Committee (reference number 2024/15), information was collected retrospectively from the hospital archive files for 5,731 patients who underwent AH (n=2.552), VH (n=309), and LH (n=2,870) procedures between January 2010 and December 2024. Written informed consent was obtained from the patients for potential future research use. The surgical procedures were performed by six senior gynecologists and their assistants in our clinic. At least one of the six senior gynecologists participated in each operation.

The inclusion criteria were the absence of cardiac and pulmonary disease and no contraindications for lithotomy and Trendelenburg positions. The exclusion criteria consisted of the presence of gynecological malignancy, supracervical hysterectomy, and laparoscopic-assisted vaginal hysterectomies.

The distribution of the three types of hysterectomies by year, participants' age, body mass index (BMI), parity, uterine weight, surgical operation time, blood loss, length of hospital stay, days of analgesia requirement, conversion rates from laparoscopy to laparotomy, surgical indications, additional surgical procedures, and major and minor intra- or postoperative complications were recorded in the SPSS database and compared between the groups.

Preoperative Preparation

Patients scheduled for surgery were admitted to the hospital one day before the procedures, where they underwent preoperative evaluations, including complete blood count, coagulation tests, electrocardiography, and posterior-anterior pulmonary radiography, together with abdominal and transvaginal ultrasonography. Prophylactic intravenous (IV) antibiotics (cefazolin 2 g) were administered half an hour before surgery. A urinary catheter was installed preoperatively and removed after mobilization, 8–12 hours postoperatively. Antithrombotic prophylaxis was implemented in line with the recommendations of the American College of Obstetricians and Gynecologists and the American Thoracic Society.

In the AH procedure, the abdominal cavity was first accessed through a Pfannenstiel incision above the symphysis pubis, and the intestines were pushed away from the pelvis towards the diaphragm. The bilateral ligamenta teres uteri were clamped, cut, and ligated. The bilateral ureters were then visualized. The anterior peritoneum of the bilateral ligamenta ovarii proprium was dissected up to the infundibulopelvic ligament, where the infundibulopelvic ligaments were clamped, cut, and ligated. The ovaries intended to be left in place were separated from the uterus. The bladder was bluntly pushed down towards the anterior cervix. Bilateral uterine vessels were ligated, and once the parametric tissue surrounding the cervix had been dissected, the uterus was cut off and ligated at its base. Finally, the uterus was removed below the cervical portio, and the vaginal cuff was closed with absorbable sutures.

In the VH procedure, the patient was placed in the Trendelenburg position, the surgical area was disinfected, and sterile draping was performed. The cervix was held with two forceps, and a circular incision was made. The bladder was carefully separated by pushing

it upward from the anterior cervix, creating a vesicouterine space. Subsequently, the Douglas peritoneum was opened, and a larger retractor was installed. The bilateral sacrouterine ligaments were then clamped, cut, and ligated. After the parametrial tissues had also been dissected, the fallopian tubes and adnexa were separately ligated. The uterus was then removed, and the peritoneum was closed using the extraperitonealization technique.

In the LH procedure, the patient was first placed in the dorsal lithotomy position under sterile drapes under general anesthesia. After placing a uterine manipulator on the cervix, the anesthesia team temporarily inserted an orogastric tube to evacuate the stomach contents. A 1-cm vertical incision was made approximately 1 cm above the umbilicus. The abdominal wall was then lifted with clamps, and a 10-mm trocar was installed using a closed technique. A 00 telescope was then inserted through the trocar, thus enabling the peritoneal cavity to be visualized and the intra-abdominal organs (liver, intestines, uterus, and adnexa) to be examined, while the abdomen was insufflated with CO_2 at a pressure of 15 mmHg. Subsequently, two auxiliary trocars (one 10 mm and one 5 mm) were placed in the right mid-abdomen. Perioperative intra-abdominal pressure was maintained at 12–13 mmHg using an automatic insufflator. After placing the patient in the Trendelenburg position, the hysterectomy was initiated.

Using bipolar electrosurgery (LigaSure™, Covidien Co., MA, USA) energy modalities, the bilateral ligamenta teres uteri were clamped, cauterized, and cut. The anterior peritoneum of the broad ligament was dissected up to the infundibulopelvic ligament, clamped with LigaSure, cauterized, and cut. The bladder was moved away from the uterus, and the bilateral uterine vessels were clamped and cauterized. An environmental colpotomy was performed with the aid of a uterine manipulator, and the uterus and adnexa were removed vaginally, except for the sacrouterine ligaments. The vaginal portion was closed with absorbable sutures. In some cases, a drainage tube was inserted to remove lavage fluid and gas from the abdominal cavity.

Statistical Analysis

Statistical analyses were performed using SPSS version 26.0 software (SPSS, Chicago, IL, USA). The Kolmogorov-Smirnov test was used to examine the normality of distribution of continuous variables. One-way analysis of variance (ANOVA) was employed for normally distributed continuous variables, and the Kruskal-Wallis test for non-normally distributed continuous variables. When the Kruskal-Wallis test showed statistically significant differences, the reasons for these differences were determined using the Bonferroni-adjusted Mann-Whitney U test. Nominal variables were analyzed using the Pearson chi-square test or Fisher's exact test, as appropriate. Continuous variables were presented as mean ± standard deviation (SD) or median (25^{th}–75^{th}), and categorical variables as case numbers and percentages. Type I error was controlled by applying Bonferroni correction for all possible multiple comparisons. Statistical significance was set at $p<0.05$.

Results

Table 1 shows the participants' clinical characteristics and outcome measures. While BMI (AH 25.66±2.67 vs. VH 25.59±2.33 vs. LH 25.78±2.51, respectively; $p>0.05$), parity (2.0 [2.0–3.0] vs. 3.0 [2.0–3.0] vs. 2.0 [2.0–3.0]; $p>0.05$), and preoperative Hb levels (11.99±2.61 vs. 11.95±2.66 vs. 11.89±2.92; $p>0.05$) were comparable between the groups, statistically significant differences were determined in age (AH 51.14±3.72 vs. VH 57.12±5.32 vs. LH 56.26±5.84; $p<0.05$), operative time (76.91±14.41 vs. 73.03±12.35 vs. 85.02±19.27; $p<0.05$), blood loss (247.02±65.49 vs. 187.88±56.07 vs. 159.38±63.73; $p<0.05$), length of hospitalization (3.84±0.88 vs. 2.61±0.76 vs. 2.36±0.52; $p<0.05$), analgesic requirements (4.05±1.68 vs. 3.57±1.02 vs. 3.29±1.23; $p<0.05$), and uterine weight (251.84±86.48 vs. 128.76±52.79 vs. 204.30±71.67; $p<0.05$). No difference was observed between the AH (536 [20.5%]) and LH (545 [19.9%]) groups, but the incidence of previous intra-abdominal surgery was lower in the VH (15 [4.0%]) group ($p<0.001$).

A total of 5,731 patients underwent surgical procedures: 2,552 (44.53%) AH, 309 (5.4%) VH, and 2,870 (50.07%) LH. Figure 1 summarizes the distribution of the three types of hysterectomy by years. AH predominated in 2015 but decreased rapidly over the next two years, LH becoming the predominant method from 2017 onward.

A comparison of hysterectomy indications according to the three types of procedure is presented in Table 2. Myoma uteri and treatment-resistant menometrorrhagia were the most prominent indications in AH and LH, compared to uterovaginal prolapse in VH.

Table 1. The participants' clinical characteristics and outcome measures

	Abdominal Hysterectomy (Group 1) (n=2,552)	Vaginal Hysterectomy (Group 2) (n=309)	Laparoscopic Hysterectomy (Group 3) (n=2,870)	p (groups)		
				1 vs 2	1 vs 3	2 vs 3
Age (years)	51.14+3.72	57.12+5.32	56.26+5.84	<0.001*	<0.001*	<0.012*
BMI (kg/m^2)	25.66+2.67	25.59+2.33	25.78+2.51	0.157		
Parity	2.0 (2.0-3.0)	3.0 (2.0-3.0)	2.0 (2.0-3.0)	0.419		
Operative time (minutes)	76.91+14.41	73.03+12.35	85.02+19.27	<0.001*	<0.001*	<0.001*
Preoperative Hb (gr/L)	11.99+2.61	11.95+2.66	11.89+2.92	0.137		
Postoperative Hb (gr/L)	9.42+2.21	10.45+2.16	10.74+1.73	<0.001*	<0.001*	0.005*
Blood loss (ml)	247.02+65.49	187.88+56.07	159.38+63.73	<0.001*	<0.001*	<0.001*
Hospital stay (days)	3.84+0.88	2.61+0.76	2.36+0.52	<0.001*	<0.001*	<0.001*
Analgesia requirements (days)	4.05+1.68	3.57+1.02	3.29+1.23	<0.001*	<0.001*	<0.001*
Uterine weight (g)	251.84+86.48	128.76+52.79	204.30+71.67	<0.001*	<0.001*	<0.001*
Previous intra-abdominal surgery (%)	536 (20.5%)	15 (4.0%)	545 (19.9%)	<0.001*	0.563	<0.001*
Conversion rate from laparoscopy to laparotomy	-	-	32 (1.11%)		-	

BMI: Body Mass Index; Hb: hemoglobin; * Statistically significant.

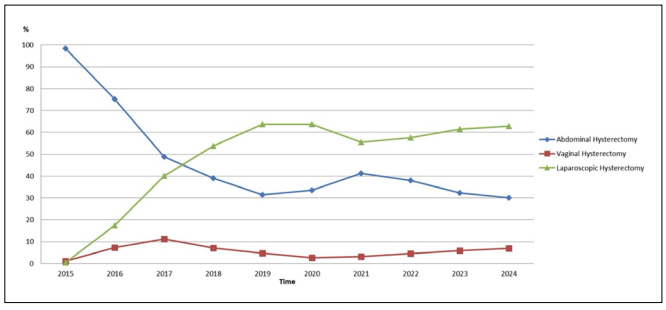

Figure 1. The distribution of the three types of hysterectomy by years.

Table 3 summarizes the additional surgical procedures performed alongside hysterectomy. Oophorectomy was the most frequent additional surgical procedure for all three procedures. Anterior or posterior colporrhaphy was the second most common additional surgical procedure in VH.

No significant differences were detected between the groups' major and minor intra- or postoperative complications (Table 4). In terms of major complications, bladder injury occurred in 35 patients (AH: 14, VH: 2, LH: 19),

Table 2. A comparison of hysterectomy indications among the three groups

Indications	Abdominal Hysterectomy (Group 1) (n=2,552)	Vaginal Hysterectomy (Group 2) (n=309)	Laparoscopic Hysterectomy (Group 3) (n=2,870)	p
Myoma uteri	1020 (39.98%)	39 (12.6%)	861 (30.0%)	<0.001*
Meno-metroragia resistant to medical treatment	612 (23.98%)	89 (28.8%)	775 (27.0%)	
Chronic pelvic pain	143 (5.60%)	13 (4.2%)	241 (8.4%)	
Uterovaginal prolapse	-	168 (54.4%)	215 (7.5%)	
Adnexal masses	498 (19.52%)	-	232 (8.1%)	
Tubo-ovarian abscess	115 (4.50%)	-	221 (7.7%)	
Endometriosis	164 (6.42%)	-	325 (11.3%)	

*Statistically significant.

Table 3. Additional surgical procedures accompanying hysterectomy

	Abdominal Hysterectomy (Group 1) (n=2,552)	Vaginal Hysterectomy (Group 2) (n=309)	Laparoscopic Hysterectomy (Group 3) (n=2,870)
Oophorectomy	2,195 (86.0%)	260 (84.14%)	2640 (91.98%)
Anterior colporrhaphy	33 (1.3%)	229 (74.11%)	315 (10.97%)
Posterior colporrhaphy	28 (1.1%)	219 (71.0%)	337 (11.74%)
Paravaginal repair	20 (0.78%)	34 (11.0%)	158 (5.5%)
Vaginal vault suspension	18 (0.7%)	87 (28.15%)	118 (4.112%)
Anal sphincteroplasty	8 (0.31%)	33 (10.35%)	13 (0.45%)

Table 4. Intra-operative and post-operative complications

	Abdominal Hysterectomy (Group 1) (n=2.552)	Vaginal Hysterectomy (Group 2) (n=309)	Laparoscopic Hysterectomy (Group 3) (n=2.870)	p
Major complications	70 (2.74%)	7 (2.26%)	58 (2.02%)	0.362
Bladder injury	14	2	19	
Ureteral injury	6	1	14	
Bowel injury	13	1	6	
Blood transfusion	17	2	15	
Cuff dehiscence	16	1	4	
Thromboembolism	2	-	-	
Vascular injury	2	-	-	
Minor complications	60 (2.35%)	6 (1.94%)	44 (1.56%)	0.199
Pelvic hematoma	6	2	9	
Urinary tract infection	24	2	29	
Vaginal cuff infection	4	2	2	
Wound dehiscence	4	-	2	
Wound infection	8	-	2	
Postoperative ileus	14	-	1	

ureteral injury in 21 (AH: 6, VH: 1, LH: 14), and bowel injury in 20 (AH: 13, VH: 1, LH: 6), while blood transfusion was required for 34 patients (AH: 17, VH: 2, LH: 15), and cuff dehiscence occurred in 21 (AH: 16, VH: 1, LH: 4). Two patients in the AH group experienced thromboembolism, and two suffered vascular injury.

In terms of minor complications, urinary tract infections were observed in 24 patients in the AH group, two in the VH group, and 29 in the LH group. Pelvic hematomas occurred in six patients in the AH group, two in the VH group, and nine in the LH group. Vaginal cuff infections were noted in four patients in the AH group, two in the VH group, and two in the LH group. Wound dehiscence was present in four patients in the AH group and two in the LH group. Wound infections were seen in eight patients in the AH group and two in the LH group. Finally, postoperative ileus was observed in 14 patients in the AH group and one in the LH group.

Discussion

This retrospective study set out to evaluate the clinical outcomes of three hysterectomy approaches (AH, VH, and LH) performed at a single tertiary medical center between 2010 and 2020. The application of AH decreased from 2015 to 2017, while the performance of LH increased rapidly. The patients were older and operative time was shorter in the VH group, while blood loss, length of hospital stay, and analgesic requirements were lowest in the LH group.

There were no significant differences between the groups in terms of major and minor intra- or postoperative complications.

Vaginal hysterectomy has been preferred for many years for patients with a small uterus, with histories of vaginal births, with no previous abdominal surgeries, and no adnexal pathologies, due to its shorter operative time and lower costs. In contrast, AH has been employed for patients who do not meet these criteria.[9,10] The rate of AH performance varies from one country to another, with reports indicating a figure of approximately 60% in the USA, 65% in the United Kingdom, and 80% in Scandinavian countries.[11–13] With the rapid advances in technology over the last 20 years, improvements have also been made to endoscopic surgical instruments and techniques, making LH the preferred hysterectomy procedure.[12,14] In the present study, the rate of AH use decreased rapidly between 2015 and 2017, while that of LH rose significantly, to as high as 50.07%. In order to further increase this rate and establish LH as a routine surgical procedure, the training of young gynecological surgeons in particular needs to be enhanced for them to gain experience in endoscopy and to make LH more appealing.

Vaginal hysterectomy is a good surgical option for older patients with uterovaginal prolapse, and it can also be performed simultaneously with anterior and posterior colporrhaphy procedures.[1,5] In this study, and in line with the literature, patients in the VH group were older than those in the other two hysterectomy groups, the lowest average age being observed in the AH group. The incidence of prior abdominal surgeries was also lower in the VH group compared to the other groups but was found to be similar in the total abdominal hysterectomy and LH groups. Oophorectomy was the most common additional surgical procedure in all three hysterectomy groups, while anterior and posterior colporrhaphy rates were significantly higher in the VH group. These findings were also consistent with the existing literature.

Obesity, particularly morbid obesity, is known to prolong the duration of all invasive surgical procedures and also extends operative times in endoscopic surgical procedures.[15,16] There was no difference in BMI among the groups in the present study.

In terms of operative times among the three types of hysterectomy, some studies have reported a longer operative time in LH compared to AH and VH.[1,17,18] However, other studies report no significant difference in operative times between LH and AH.[5,19,20] In the present study, VH exhibited the shortest operative time at 73.03±12.35 minutes, compared to 76.91±14.41 minutes for AH and 85.02±19.27 minutes for LH. This longer duration may be expected to decrease with increased experience together with endoscopic training. In terms of uterine weight, and consistent with the literature, the lowest value was observed in the VH group.

The consensus in the literature is that AH involves greater blood loss,[21–23] although there have also been reports indicating that VH may result in more significant blood loss.[5,24] The increased blood loss observed in VH may be attributed to the simultaneous performance of anterior or posterior colporrhaphy. The greatest blood loss in the present research was in the AH group, and the least in the VH group. Additionally, LH and VH were associated with shorter hospital stays and reduced analgesic requirements compared to AH.[5,22,25]

The risk of converting from laparoscopic surgery to laparotomy is exacerbated by factors such as elevated BMI, a large uterus, the hospital's technical capabilities, and insufficient clinician experience.[26,27] Thirty-two patients (1.11%) in our LH group had to be converted from laparoscopic surgery to laparotomy.

In the context of intraoperative and postoperative major and minor complications, some studies have reported that urinary complications are more prevalent with LH, while bowel injury, blood transfusion, and cuff dehiscence occur more frequently in cases of AH.[24,26] However, there are also studies indicating no significant differences between the groups.[1,5] Previous authors have ascribed the higher incidence of urinary complications in LH groups to indications such as endometriosis and previous abdominal surgeries, while attributing the increased rates of bowel injury, blood transfusion, and cuff dehiscence in AH to its more invasive nature. We also observed a higher occurrence of urinary complications in the LH group and more bowel injury, blood transfusion, and cuff dehiscence in the AH group, findings in agreement with the literature. However, we found no significant differences in intra- or postoperative complications among the three types of hysterectomy.

One potential weakness of this study may be that it represents retrospective research and that the data pertain to a tertiary center. However, the large sample size is a particularly strong point.

Conclusion

Laparoscopic hysterectomy should be employed by gynecologists as the primary procedure due to its less invasive nature, faster postoperative recovery, and shorter hospital stay. In order to further increase the popularity of LH, more time should be dedicated to endoscopic training, and operating rooms should be equipped with new technological equipment and devices.

Disclosures

Ethichs Committee Approval: Following receipt of approval from the Antalya Training and Research Hospital Clinical Research Ethics Committee (No:7/14, Date: :23/05/2024), information was collected retrospectively from the hospital archive files for 5,731 patients who underwent AH (n=2.552), VH (n=309), and LH (n=2,870) procedures between January 2010 and December 2024.

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