JOURNAL OF GYNECOLOGIC SURGERY
Volume 35, Number 3, 2019

DOI: 10.1089/gyn.2018.0097

Impact of Uterine Weight on the Surgical Outcomes of Vaginal Hysterectomy

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Abstract

Objective: The aim of this research was to determine the association between uterine weight and surgical outcomes of vaginal hysterectomies (VHs).
Materials and Methods: This retrospective cohort study was conducted through a residency training program for performing VH operations ($N=87$) in the Hacettepe University Hospital, Sıhhıye/Ankara, Turkey. VHs performed for benign gynecologic conditions were included in the study. The patients were divided into 2 groups: (1) uterine weight <100 g and (2) uterine weight ≥100 g. Clinical characteristics, demographic features, surgical characteristics, and operative complications were compared between the groups.
Results: There were 57 patients (65.5%) in group 1 (uterine weight <100 g) and 30 patients (34.5%) in group 2 (uterine weight ≥100 g). Mean uterine weights were 61.56 ± 17.98 g in group 1 and 146.30 ± 45.16 g in group 2. There was no statistically significant difference between the groups in terms of surgical procedures performed concomitantly. A statistically significant difference was found between the groups in terms of age (59.35 ± 9.95 for group 1 and 47.37 ± 3.64 for group 2; $p<0.001$). In group 2, the following were statistically significantly higher: mean operation time ($p<0.001$); delta Hb ($p<0.001$); blood loss ($p<0.001$); surgical complications ($p<0.005$); mean total hospital stay ($p<0.001$); analgesic needs ($p<0.001$); blood transfusions ($p<0.02$); and readmissions to the hospital ($p<0.001$).
Conclusions: All patients should be evaluated and scanned prior to VH to determine uterine size and weight in order to choose the best surgical approach. (J GYNECOL SURG 35:184)

Keywords: vaginal hysterectomy, complication rate, uterine weight, minimally invasive surgery

Introduction

Hysterectomy is one of the most-common surgical procedures performed worldwide for various indications, such as dysfunctional uterine bleeding, uterine myomas, uterovaginal prolapse, endometriosis, adenomyosis, pelvic pain, adnexal masses, and gynecologic cancers.[1–3] Hysterectomy can be performed vaginally, laparoscopically, or abdominally, depending on the surgeon's experience and the patient's clinical characteristics.[1,2] Vaginal hysterectomy (VH) is considered to be the safest and most cost-effective hysterectomy; hence, it should be the first-line approach whenever possible.[2,4]

No absolute contraindication for VH have been defined.[5] Some of the relative contraindications that discourage surgeons from performing VH are malignancy, extremely enlarged uterine size, significant pelvic adhesions, nulliparity, increased body mass index (BMI), history of pelvic radiation, narrow pelvis, and lack of uterine descent.[5] Although optimal BMI, smaller uterine size, multiparity, and/or presence of uterovaginal prolapse are generally associated with favorable outcomes, no ideal indicator can currently predict the success of the procedure.[6]

Uterine size is one of the main factors affecting the surgeon's choice to perform VH.[7–10] Although the upper limit of uterine size for VH has not been established, a 16-week uterine size has been regarded as a reasonable upper limit by many surgeons.[11] Enlarged uterine size has been associated with greater blood loss, visceral injuries, and prolonged operative times in some studies.[7,12,13] However, VH can be performed safely by experienced surgeons even in patients with extremely enlarged uteri.[14–16] Uterine-size–reduction

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methods—such as intramyometrial coring, bivalving techniques, or vaginal myomectomy—can facilitate the surgical procedure in appropriate cases.[17] Yet, the optimal uterine size for performing VH is a matter of debate for physicians.[7,9]

This study was conducted to determine the association between uterine weight and surgical outcomes of VHs performed by residents in training who were supervised by a single expert surgeon at a tertiary center.

Materials and Methods

Written informed consent was obtained from all the patients, and the study was approved by the institutional ethics committee of Hacettepe University, in Ankara, Turkey. No funding was used for this study.

Study design

This retrospective cohort study involved a single-surgeon residency training program. For this program, procedures for VH cases ($N=87$) were performed by residents under the supervision of an expert surgeon at the Hacettepe University Hospital, in Sıhhıye/Ankara, Turkey, between January 1, 2007, and December 31, 2017. Located in the capital city, this hospital is a public tertiary-referral center that serves patients from all over Turkey.

VHs performed for benign gynecologic conditions were included in the study. Laparoscopic-assisted VHs were excluded from the study. Data were obtained from the electronic database of patients' treated at the hospital.

The weights of the uterine specimens were recorded, and the cases were divided into 2 groups based on their uterine weights: (1) uterine weight <100 g; and (2) uterine weight ≥100 g. Mean age, BMI, parity percentages, diabetes mellitus rates, percentages of current smokers, rates of previous intra-abdominal surgeries, indications for hysterectomy, percentages of surgical procedures performed concomitantly with hysterectomies, mean operative times, preoperative hemoglobin (Hb) levels, postoperative Hb levels, delta Hb (ΔHb; difference between the mean pre- and postoperative Hb levels), blood losses, rates of readmissions to the hospital or outpatient treatment facility, and percentages of surgical complications were compared between the groups.

Procedures

Each patient was admitted to the hospital 1 day prior to her surgery. A detailed pelvic examination, together with pelvic ultrasonography (USG), was performed preoperatively. Standard preoperative tests (blood-cell count, coagulation tests, electrocardiography, and posterior–anterior pulmonography) were performed. Each patient was referred to any necessary medical departments, depending on her medical history. Prophylactic antibiotic (cefazolin 2 g, intravenously) was administered 30 minutes preoperatively. Antithrombotic prophylaxis was administered based on the recommendations of the American College of Obstetricians and Gynecologists and the American College of Chest Physicians.[1,18,19]

Each patient was placed in the Trendelenburg position just before the surgical procedure. A bladder catheter was inserted. Thereafter, disinfection and sterile coverage were performed by the surgeon. The portio cervicis was grasped using two Jacobs vulsellum forceps. A circumferential incision was made. The overlying vaginal epithelium was pushed off the underlying cervical stroma bluntly with the aid of a surgical sponge. Avascular planes anterior and posterior to the uterus were exposed. Either an anterior or posterior *cul-de-sac* entry was preferred, based on the clinical characteristics of the patient. The bladder was retracted from the anterior cervix, and the spatium vesicouterinum was opened. A Heaney or Deaver retractor was placed into this space to elevate and protect the bladder and allow visualization of the abdominal anatomy. The Douglas peritoneum was opened, and a larger speculum was placed.

Hysterectomy was performed using the Heaney technique. Uterosacral ligaments were clamped, cut, and ligated first. Subsequently, the cardinal ligaments were identified, clamped, cut, and suture-ligated. Afterward, the uterine vessels were ligated with the double-clamp technique. Finally, the utero-ovarian ligament–fallopian tube complex was clamped, cut, and ligated twice, and the uterus was pulled gently through the vagina for delivery. After removal of the uterus, the fallopian tubes and ovaries were inspected. Salpingo-oophorectomy was performed if there was an indication for that procedure. The peritoneum was closed circumferentially with extraperitonealization.

Anterior and posterior colporrhaphy was performed in all cases to repair the vaginal-wall defects. For anterior colporrhaphy, an Allis clamp was placed 1 cm proximal to the urethra along the midline of the anterior vagina, and two more Allis clamps were placed on either side of the vaginal cuff. A transverse incision was made between the two Allis clamps on the vaginal cuff. A pair of Metzenbaum scissors was used to dissect the vaginal mucosa off the underlying tissues anteriorly. Dissection of the mucosa from the underlying tissues was performed bilaterally until the mucosa was dissected off the complete bladder. Plication of the vaginal muscularis and adventitia was then performed. For posterior colporrhaphy, a triangular-shaped incision was made into the perineal skin with the base of the triangle at the hymen. The skin was dissected away from the perineal body. The vaginal epithelium was opened in the midline, extending the incision to an area superior to the defect. The posterior vaginal epithelium was dissected bilaterally away from the underlying fibromuscularis layer until the levator muscles were seen on the lateral margins. The posterior vaginal wall, stripped of its epithelium, was plicated midline with interrupted vertically or transversely placed sutures that involved a large portion of the fibromuscularis.

Rectal examination was performed to detect areas of weakness that required further stitches and to check for any evidence of rectal injury or presence of sutures in the rectal mucosa. Suburetral plication, using the Kelly–Kennedy technique, was performed during the anterior colporrhaphy in stress urinary incontinence cases. The vaginal cuff was closed using the running–locking technique with 1–0 polyglactin-braided suture. Vaginal packing soaked with iodine solution was placed in the vagina immediately postoperatively.[4,20,21]

The urinary catheter and vaginal packing were kept in place for 1 day. However, in cases of bladder injury, the urinary catheter was left in place for 1 week. A voiding trial was performed to ensure adequate bladder function. Postoperative pain management included pethidine hydrochloride and diclofenac sodium. The patients were mobilized 6–8

hours postoperatively. Oral intake was allowed 8 hours after the procedure in uncomplicated cases. Oral broad-spectrum antibiotic therapy was administered for 3–5 days postoperatively. Sexual activity or any physical activities more strenuous than a slow walk were avoided by the patients for 3 weeks postoperatively.[18,20]

Statistical analyses

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS.22, IBM SPSS Statistics for Windows, version 22.0. Armonk, NY). The Kolmogorov–Smirnov test was used to evaluate the normally distributed data, which were presented as means and standard deviations. Parametric and categorical variables were compared using the independent-sample *t*-test and χ^2 test, respectively. Significance level with a *p*-value of <0.05 was determined.

Results

Group 1 had 57 patients (65.5%) and group 2 had 30 patients (34.5%). The overall mean age of the patients was 55.22 ± 10.9 years and the overall mean BMI of the patients was $27.61 \pm 2.09\,kg/m^2$. The mean ages were 59.35 for group 1 and 47.37 for group 2 ($p < 0.001$); this was a statistically significant difference between the groups. However, the mean BMI ($p = 0.32$, percentage of parity ($p = 0.23$), incidence of diabetes mellitus ($p = 0.48$), current smoking status ($p = 0.90$), previous intra-abdominal surgery ($p = 0.78$), and indications for hysterectomy ($p = 0.23$) did not show not statistically significant differences between the groups. Table 1 shows the clinical characteristics and demographic features of the patients. Uterovaginal prolapse was the leading indication for hysterectomy in both groups (77.2% for group 1 and 70% for group 2).

Mean uterine weight was 61.56 ± 17.98 g in group 1 and 146.30 ± 45.16 g in group 2. There were no statistically significant differences between the groups with respect to surgical procedures performed concomitantly (anterior and posterior colporrhaphy, Kelly–Kennedy plication, unilateral/bilateral salpingo-oophorectomy) with hysterectomy ($p = 0.69$). In addition, the mean preoperative Hb level did not have a statistically significant difference between the groups ($p = 0.07$).

In contrast, the mean operative time ($p < 0.001$), postoperative Hb level ($p = 0.01$), ΔHb level ($p < 0.001$), blood loss ($p < 0.001$), surgical complication rate ($p = 0.005$), total hospital stay ($p < 0.001$), analgesic requirements ($p < 0.001$), blood transfusion rate ($p = 0.02$), and rate of readmission ($p < 0.001$) to the hospital or outpatient treatment facility did not show statistically significant differences between the 2 groups. Table 2 shows the surgical characteristics and operative complications of the patients. The mean operative time, ΔHb, blood loss, rate of surgical complications, mean total hospital stay, analgesic requirements, rate of blood transfusions, and rate of readmissions to the hospital were higher in group 2.

The study demonstrated that urinary-system organ injury rates were 1.7% in the low-weight uterine group and 8.7% in the high-weight uterine group; and minor surgical complication rates were 10% in the low-weight uterine group and 40% in the high-weight uterine group. No urinary-system organ injury cases necessitated conversion to laparotomy, and ureteral injury in 1 case was managed with a cystoscopic approach (a double-J catheter) without further complications. All bladder injury cases ($n = 3$) were repaired using a two-layer technique with urethral catheter drainage for 1 week without any further complication. Table 2 shows that 8.7% of patients in the low-weight uterine group and 43.3% of patients in the high-weight uterine group were readmitted to the hospital with various complaints. All patients were treated successfully without any additional complications, and no patient needed further surgical intervention.

Discussion

Uterovaginal prolapse was the leading indication for VH in this series. Hysterectomy is generally performed as part of surgical management procedures in patients with pelvic

Table 1. Clinical Characteristics & Demographic Features of the Study Patients

Demographics	*Group 1* (n = *57*)	*Group 2* (n = *30*)	p-*Value*
Age (yrs; mean ± SD)[a]	59.35 ± 9.95	47.37 ± 3.64	<0.001
BMI (kg/m^2; mean ± SD)[a]	27.37 ± 2.27	28.08 ± 1.64	0.32
Parity (*n*,%)[b]			0.23
0	1 (1.7%)	2 (6.6%)	
1	32 (56.1%)	12 (40%)	
≥ 2,	24 (42.2%)	16 (53.4%)	
Diabetes mellitus (*n*, %)[b]	11 (19.3%)	4 (13.3%)	0.48
Current smoker[c] (*n*, %)[b]	12 (21.1%)	6 (20%)	0.90
Previous intra-abdominal surgery (*n*,%)[b]	10 (17.5%)	6 (20%)	0.78
Indications for hysterectomy (*n*,%)[b]			0.23
Uterovaginal prolapse	44 (77.2%)	21 (70%)	
Menometrorrhagia resistant to medical treatment	6 (10.5%)	7 (23.3%)	
Chronic pelvic pain	7 (12.3%)	2 (6.7%)	

[a]Student's *t*-test was performed to calculate the *p*-values.
[b]χ^2 test was performed to calculate the p-values.
[c]Smoked within 1 year prior to surgery.
yrs, years; SD, standard deviation; BMI, body mass index.

Table 2. Surgical Characteristics & Operative Complications of the Study Patients

Characteristics & complications	*Group 1* (n = *57*)	*Group 2* (n = *30*)	p-*Value*
Uterine weight (g; mean ± SD)[a]	61.56 ± 17.98	146.30 ± 45.16	<0.001
Surgical procedures performed concomitantly with hysterectomies (*n*,%)[b]			0.69
Anterior colporrhaphy	57 (100%)	30 (100%)	
Posterior colporrhaphy	57 (100%)	30 (100%)	
Kelly–Kennedy plication	43 (75.4%)	20 (66.7%)	
Unilateral salpingo-oophorectomy	3 (5.3%)	3 (10%)	
Bilateral salpingo-oophorectomy	3 (5.3%)	1 (3.3%)	
Operation time (min; mean ± SD)[a]	67.54 ± 6.95	84.67 ± 12.52	<0.001
Preoperative Hb (g/L; mean ± SD)[a]	11.18 ± 0.52	11.26 ± 0.35	0.07
Postoperative Hb (g/L; mean ± SD)[a]	10.39 ± 0.51	9.74 ± 0.76	0.01
ΔHb (g/L; mean ± SD)[a]	0.79 ± 0.22	1.52 ± 0.78	<0.001
Blood loss (mL; mean ± SD)[a]	175.96 ± 13.64	235.33 ± 71.37	<0.001
Surgical complications (*n*,%)[b]	6 (10.5%)	15 (50%)	0.005
Bladder injury (*n*,%)	1 (1.7%)	2 (6.6%)	
Ureteral injury (*n*,%)	0 (0%)	1 (3.3%)	
Pelvic hematoma (*n*,%)	1 (1.7%)	4 (13.3%)	
Urinary-tract infection (*n*,%)	3 (5.3%)	4 (13.3%)	
Vaginal cuff infection (*n*,%)	0 (0%)	2 (6.6%)	
Wound infection (*n*,%)	1 (1.7%)	2 (6.6%)	
Total hospital stay (d; mean ± SD)[a]	2.40 ± 1.14	4.60 ± 2.66	<0.001
Analgesic needs (d; mean ± SD)[a]	2.32 ± 0.92	4.60 ± 2.62	<0.001
Blood transfusion (*n*,%)[b]	1 (1.7%)	4 (13.3%)	0.02
Readmission to hospital (*n*,%)[b]	5 (8.7%)	13 (43.3%)	<0.001

Note: Δ Hb was defined as the difference between the mean preoperative and mean postoperative hemoglobin values.
[a]Student's *t*-test was performed to calculate the *p*-values.
[b]χ^2 test was performed to calculate the *p*-values.
SD, standard deviation; min, minute(s); Hb, hemoglobin; ΔHb, delta hemoglobin; d, day(s).

organ prolapse (POP).[9,20] There are various reasons underlying this approach. First, the most commonly performed techniques for apical prolapse repair require concomitant hysterectomy.[22] Furthermore, preservation of the uterus was commonly believed to increase the risk of recurrent prolapse.[23] In addition, hysterectomy eliminates current and future uterine pathologies.[9,20] Moreover, ease of access to the uterine vessels is the key point for a successful VH. Uterovaginal prolapse can make VH easier, as mild-to-moderate descent of the uterus improves access to the uterine vessels.[21] Therefore, physicians often choose to perform VH in patients with symptomatic POP.[2,3]

This study showed that increased uterine weight (normal uterine weight varies between 50 and 60 g) was associated with longer operative times, greater blood losses, lower postoperative Hb levels, higher rates of surgical complications, longer total hospital stays, prolonged analgesic requirements, higher rates of blood transfusions, and higher rates of readmissions to the hospital.[24,25]

VH is the first procedure of choice of the surgeons due to its documented advantages and relatively lower complication rates in suitable cases.[2,8,9] However, the route of hysterectomy should be individualized. Physicians should consider the extent of the gynecologic pathology, relative risks and benefits of the procedure, concomitant pathologies, the patient's preferences, and available support facilities when choosing the most-appropriate hysterectomy method.[2,8,9,26] Furthermore, VH had the best outcomes based on a recent systematic review and meta-analysis that consisted of 47 randomized trials comparing abdominal hysterectomy, laparoscopic hysterectomy, and VH in 5102 women.[2] Shorter hospitalization durations (mean difference [MD]: 1.07 days; 95% confidence interval [CI] CI: 1.22–0.92), faster returns to normal activities (MD: 9.47 days; 95% CI: 12.57–6.37), and fewer infections or fevers (odds ratio [*OR*]: 0.42; 95% CI: 0.21–0.83) were reported for VH patients compared with patients who had abdominal hysterectomies.[2] Similar outcomes, except longer operative times (MD: 39.29 minutes; 95% CI: 38.72–39.86), were found in patients who underwent laparoscopic hysterectomies, compared with patients who underwent VHs.[2]

Another meta-analysis, comparing total laparoscopic hysterectomy and VH, that included 24 articles (trials and observational studies) reported that VH was associated with a shorter operative time (MD: 42 minutes; 29.34–55.91), lower rate of vaginal cuff dehiscence (*OR*: 6.28; 2.38–16.57), and conversion to laparotomy (*OR*: 3.89; 2.18–6.95). In addition, although not statistically significant, the cost associated with the procedure was lower for VH (MD: $3,889.9; $21,20.3–$89,000).[27] Furthermore, the risk of urinary-tract injury and vaginal cuff dehiscence has been reported to be higher with the laparoscopic approach.[28, 29] Bowel and retroperitoneal vascular injuries related to abdominal access for port placement and insufflation might also be observed in laparoscopic and robot-assisted hysterectomies.[30] Moreover, thermal injury to the adjacent tissue due to the use of electrosurgical devices during laparoscopic/robotic surgery is another concern for surgeons.[31] Thus, VH is the optimal route of hysterectomy, based on the literature.[2,27]

Enlarged uterine size is one of the leading factors that limit the performance of VH for many surgeons.[11] However, the upper limit of uterine size for VH has not yet been established.[11] VH may be accomplished with the help of uterine-size–reduction techniques—such as wedge morcellation, uterine bisection, and intramyometrial coring—even in patients with extremely enlarged uterine sizes.[17] Decreased operative times, febrile morbidities, postoperative narcotic usage, and hospital stays were reported for patients who underwent VH in a randomized trial with 119 women with enlarged uteri (200 g–1300 g).[17]

Heavier uterine weight was found to be associated with increased perioperative complications and conversions to laparotomy in a retrospective study of 743 VHs.[32] The uterine size should be suitable for the surgeon to be able to visualize vascular pedicles in order to extract the specimen from the pelvis safely.[33] In addition, the shape and mobility of the uterus are other important factors that affect the success of the surgical procedure.[33] Furthermore, the presence of uterine fibroids may interrupt VH, depending on their location, size, and vascularization.[33] Thus, a comprehensive pelvic examination, together with detailed USG, should be performed before choosing the route of hysterectomy.

Clinical characteristics and demographic features of the patients were similar between the groups in the current study, except for the mean age. Although the high-weight uterine group (group 2) was comprised of younger patients, this group had worse surgical outcomes. Longer operative times, greater blood losses, increased rates of surgical complications, longer total hospital stays, higher rates of readmissions to the hospital, increased blood transfusion rates, and prolonged requirements for analgesics were reported in group 2, compared to the cases in group 1 (the low-weight uterine group). The surgical complication rate was 50% and the readmission to hospital rate was 43.3% in group 2. In addition, the blood transfusion rates were 1.7% in group 1 and 13.3% in group 2. These findings were consistent with those reported in the current literature.[2,6,7,10,17,32,33]

Although the current cohort consisted of residency training program cases, the rates of surgical complications were comparable to those reported in the literature. Urinary-tract infection accounted for 50% of the complications in group 1 and ~25% of the complications in group 2. Two of 3 bladder-injury cases and a single ureteral injury case were seen in group 2. There were 4 pelvic hematoma cases in group 2, whereas only 1 case was seen in group 1. Both cases of vaginal cuff infection were in group 2. Wound infection occurred in 1 patient in group 1 and in 2 patients in group 2.

The strength of this study was the homogeneity of the clinical characteristics of the patients and the relatively higher number of parameters compared between the groups. However, the retrospective design and relatively small number of patients included were limitations of the study.

Conclusions

A larger uterine size is associated with longer operative time, greater blood loss, lower postoperative Hb level, higher rate of surgical complications, longer total hospital stay, prolonged analgesic requirements, higher rate of blood transfusions, and higher rate of readmissions to the hospital. Thus, surgeons should be more cautious when performing VH in patients with enlarged uteri.

Acknowledgment

Special thanks to all the perinatology division staff who work with devotion for the treatment of patients with high-risk pregnancies.

Author Disclosure Statement

No financial conflicts of interest exist.

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