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Total laparoscopic hysterectomy for uterine pathology: Impact of body mass index on outcomes☆

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Abstract

Objective. We sought to analyze surgical results of women with uterine cancers having TLH ± staging, stratifying data by body mass index (BMI).

Methods. This is a retrospective analysis of data from 9 years, using Pearson and Spearman correlations, ANOVA and Fisher's Exact Test with significance at $P < 0.05$, stratifying by BMI (kg/m^2): underweight (<18.5 kg/m^2), ideal (18.5–24.9 kg/m^2), overweight (25 to 29.9 kg/m^2), obese (30 to 39.9 kg/m^2) and morbidly obese (40 kg/m^2 or more).

Results. Of 702 patients having TLH over 9 years, 90 patients had uterine pathology. Two (2%) procedures were converted to laparotomy due to unsuspected widespread metastasis and excluded from analysis. BMI ranged from 18 to 60 kg/m^2, with 31 patients having ideal, 19 having overweight and 38 having obese BMI. Of these, 19 patients had hyperplasia, while 63 had endometrial carcinoma, 1 had both ovarian and endometrial carcinoma and 5 had sarcoma. Of these 88 patients, 61 had TLH while 27 patients had indicated pelvic and aortic node dissection. The mean age was 60 years, and mean parity was 1.5 for all BMI groups. There were no significant differences in mean duration of surgery (150 min), blood loss (129 cm^3) and days in hospital (1.7 days) for all BMI groups. There was no significant difference in uterine weight (140 gm) or number of nodes dissected (21 nodes). Complications occurred in 4 patients (4.5%): 1 diverticulitis, 1 ureteral injury, 1 laparotomy for bleeding and 1 incisional hernia.

Conclusions. Total laparoscopic hysterectomy is feasible and safe for women with uterine neoplasia for every BMI category and extends the benefits of minimally invasive hysterectomy to more women, regardless of BMI.

Keywords: Laparoscopic surgery; Obesity; Staging; Endometrial cancer

Introduction

Standard therapy for both uterine neoplasia and hyperplasia has consisted of open laparotomy with hysterectomy, bilateral salpingo-oophorectomy and pelvic and aortic lymph node dissection, when indicated [1]. More recently, laparoscopic-assisted vaginal hysterectomy (LAVH) has been suggested as an alternative to open incisional laparotomy since it offers a shorter hospital stay and less postoperative pain than vertical incision laparotomy [2]. In randomized trials comparing abdominal hysterectomy with LAVH for benign indications, similar overall complications, less blood loss, longer operating times, fewer transfusions, less pain, shorter hospital stay and disability were observed with the endoscopic procedure [3–7]. However, to perform an LAVH, one must be able to perform the dissection of the cervix and lower uterine segment through the vagina. LAVH can be difficult or impossible to perform for many nulliparous or obese patients. Yet, obesity and nulliparity are common risk factors for uterine neoplasia, accounting for over half of patients with endometrial cancer [8,9]. The total laparoscopic hysterectomy (TLH) has been described over the last 10 years as potentially quicker, more efficient and associated with less blood loss than LAVH [10–12] and is also more feasible for nulliparous women [13]. Obesity was originally seen as a relative contraindication for advanced laparoscopic

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procedures, but this has recently come under review [14]. Now, with improved instrumentation and techniques, many advanced laparoscopic procedures have generally been regarded as safe and feasible in women with high body mass index (BMI) [15–17]. According to a recent Cochrane analysis of hysterectomy in which 2% of cases were performed entirely laparoscopically, more research needs to be done to serve as the basis for randomized controlled trials of TLH [18]. A randomized clinical trial is the standard for confirming the indications, safety, efficacy and complication rates of TLH for women with uterine pathology, but there are, as yet, no large cohort reviews to serve as pilot data focusing on outcomes specifically related to BMI. In this retrospective report, the patient demographics, preoperative indications, surgical data and complications were recorded for women with suspected uterine pathology from a single surgeon's teaching practice. The relationships among these variables and BMI were examined.

Methods

Retrospective study design

By definition, TLH implies that the entire case was performed through the laparoscopic ports, including dissection of the cervix and closure of the vagina [19]. In the primary author's practice, all hysterectomy patients are scheduled for the laparoscopic approach unless they had prior operative records documenting severe intestinal adhesions or radiographic evidence of metastatic uterine carcinoma. All patients with grade 1 and 2 carcinomas had frozen section examination of their uteri for the presence of all indicators of the need for lymph node dissection: cervical invasion, myometrial invasion deeper than 50% or lymphatic space invasion. Pelvic and aortic nodes were also dissected whenever patients had grade 3 carcinoma. The actual TLH procedure is described elsewhere [20].

With Investigational Review Board approval maintained at Sequoia Hospital in Redwood City, CA, the office and hospital charts were reviewed. Of 702 cases of total laparoscopic hysterectomies performed over a nine-year period, there were 90 cases of TLH initiated for management of uterine carcinoma, hyperplasia or sarcoma. All surgeries were assisted by a categorical Obstetrics and Gynecology resident or, less often, by an Obstetrics and Gynecology attending surgeon actively learning the technique or a General Surgeon.

Data management and analyses

Body mass index (BMI) was calculated by dividing the patient's weight in kilograms by the square of her height in meters. Cases were divided into five standard BMI categories: underweight (<18.5 kg/m^2), ideal (18.5–24.9 kg/m^2), overweight (25 to 29.9 kg/m^2), obese (30 to 39.9 kg/m^2) and morbidly obese (40 kg/m^2 or more) [21]. The data were analyzed on a JMP (SAS Institute, Cary, NC) statistical analysis package as well as SPSS® (www.spss.com), using ANOVA for comparison of continuous data; chi-square analyses (including Fisher's Exact Test) for nominal data; and Pearson and Spearman correlational techniques. A value of $P < 0.05$ was accepted as significant.

Results

Among 90 patients identified with uterine neoplasia, two cases were found to have widespread metastatic disease at initial placement of the laparoscope and were immediately converted to open laparotomy for completion of debulking and staging. These two cases are therefore not included in the analyses, leaving a sample of 88 women. The typical subject in this study had an average age of 60.3 (SD = 13.1; range 32–90); an average BMI of 30.2 (SD = 8.7; range 18–60.7); and was parous (67%). There was no significant difference in BMI by parity ($t = 0.065$, $P = 0.948$) nor was there a significant association between age and BMI ($r = 0.04$; $P = 0.711$). Fig. 1 describes age by BMI category for the sample.

The mean duration of surgery was 150.4 (SD = 51.7; range 55–305) min. There was no significant difference in the duration of surgery by category of BMI (see Table 1 for details of the surgical outcomes by BMI category) nor was there a significant association between BMI and surgical duration ($r = -0.04$; $P = 0.689$). For 27 patients who had 50% or greater invasive carcinoma, cervical invasion, involvement of lymph channels or grade 3 histology, a pelvic and aortic lymphadenectomy was performed yielding a mean of 21.1 (range 4–56) nodes. There was no significant association between BMI and the number of nodes removed ($r = -0.14$; $P = 0.505$). As might be expected, these cases requiring lymph node dissection required a significantly longer surgical time (185.0 vs. 134.2 min, $P < 0.0001$). The surgical time for most (55.6%) of the women having node dissection was 3 h or less, yielding a mean of 21 nodes ($P = 0.5151$) in all three BMI categories.

Additionally, a number of patients had other procedures including 21 appendectomies, 3 omentectomies, 1 ureterolysis and 5 colpocystopexies, 2 hernia repairs, 1 posterior repair, 3 uterosacral ligament plications and 1 lipoma resection. However, the specific times employed for these other procedures were neither recorded nor subtracted from the reported duration of the overall surgical procedure. Blood loss was estimated by viewing the fluid aspirated in the suction canister prior to irrigation. The estimated blood loss averaged 128.6 (SD = 148.2; range 0–1000) cm^3 per case. During the procedure, most (68.2%) of the patients lost less than 100 cm^3 of blood. There was no significant difference in blood loss by BMI category (Table 1) nor was there a significant association between BMI and blood loss ($r = 0.04$; $P = 0.716$). Transfusions were required by two (2.2%) women: one received 2 units and one received five.

The mean uterine weight was 139.0 (SD = 102.2; range = 31–730) g. There was a significant associate between BMI and uterine weight ($r = 0.305$; $P = 0.008$) with a higher BMI associated with an increase in uterine weight. Six women (7.8%) had uteri weighing between 250 and 730 g. In two cases where it was not feasible to remove the enlarged uterus through the vagina, the uterus was placed within a Lapsac (Cook Surgical, Chicago, IL) ripstop nylon bag, and its opening was then pulled out through the vagina, allowing morcellation inside the bag through the vagina with no intraperitoneal spillage. The pieces could still be recognizably "reassembled" to permit a reliable pathologic examination for frozen section.

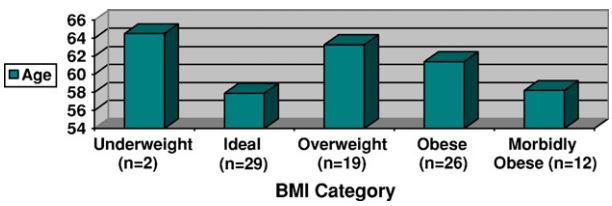

Fig. 1. Mean age by BMI category.

Table 1
TLH outcomes by BMI category

Outcome	Underweight *M* (SD)	Ideal *M* (SD)	Overweight *M* (SD)	Obese *M* (SD)	Morbidly obese *M* (SD)	Statistic *F*	*P* value
Duration of surgery (min)	89.5	142.6	168.4	152.6	145.6	1.51	0.209
Estimated blood loss (cm^3)	37.5	87.1	181.3	156.0	101.7	1.74	0.149
Number of transfusions	0	0	0.11	0.18	0	0.46	0.766
Hospitalization time (days)	1.5	1.6	2.2	1.7	1.2	1.81	0.135
	Underweight *N* (%)	Ideal *N* (%)	Overweight *N* (%)	Obese *N* (%)	Morbidly obese *N* (%)	χ^2	*P* value
Appendectomy	1 (50)	7 (24.1)	5 (26.3)	4 (15.4)	4 (33.3)	2.44	0.656
Omentemectomy	0	1 (3.4)	1 (5.3)	1 (3.8)	0	0.71	0.950
Node dissection	0	8 (27.6)	8 (42.1)	7 (26.9)	4 (33.3)	2.39	0.664
Cystoscopy	1 (50)	9 (31.0)	10 (52.6)	10 (38.5)	4 (33.3)	2.53	0.640
Complications	0	1 (3.4)	1 (5.3)	2 (7.7)	2 (16.7)	2.60	0.627

Most (52.8%) of the patients were able to leave the hospital following their TLH after 1 day ($M = 1.7$; SD = 1.1; range 1–8 days). There was no significant difference in length of stay by BMI category (Table 1) nor was there a significant association between BMI and length of stay ($r = -0.12$; $P = 0.274$). The overall complication rate for the series was 6.8% ($n = 6$), including 1 colotomy repaired intra-operatively, 1 incisional hernia requiring re-operation, 1 vaginal perforation after coitus at 6 weeks post-surgery which spontaneously healed, 1 ureteral injury during paraaortic lymphadenectomy requiring re-operation, 1 conversion to open laparotomy for persistent bleeding of an infundibulopelvic artery and 1 prolonged hospital stay secondary to diverticulitis. There was no significant association between BMI and having a complication ($r = 0.10$; $P = 0.348$).

The final pathologic diagnosis was endometrial carcinoma for 72.7% of the patients ($n = 64$), endometrial hyperplasia for 19 (21.6%) women and endometrial sarcoma for 5 (5.7%) women. There were no significant differences in BMI of the women by pathological diagnosis ($F = 0.98$; $P = 0.379$). One patient with endometrial carcinoma also had a concomitant primary endometrioid ovarian carcinoma. The final surgical stages for those with malignancy were evenly distributed for all BMI categories: 26 with stage IA; 21 with stage 1 IB; 8 with stage IC; 4 with stage II; 2 with stage IIIA; and 5 with stage IIIC. There was no significant association between BMI and stage of their cancer ($r = 0.12$; $P = 0.324$).

Discussion

This retrospective study failed to demonstrate greater risk to patients with BMIs in the overweight and obese categories when undergoing a TLH for treatment of uterine pathology. Furthermore, among these 88 patients with uterine neoplasia, 33% ($n = 29$) were nulligravid, for whom LAVH would be extremely difficult due to the narrow vaginal anatomy. Our data confirm that a total laparoscopic approach is feasible and efficient for women without regard to parity or BMI. Even when descensus and vaginal capacity readily permit conversion to LAVH, the entire surgery was still performed laparoscopically from above because supporting the vaginal apex from above lowers the risk of subsequent urinary incontinence and vault prolapse [22–24]. The authors believe that routinely suturing the lateral vaginal apices to the uterosacral ligaments provides visible elevation and good support to the vaginal apex, which cannot be achieved from a vaginal approach.

There are some important biomechanical challenges to performing TLH on the obese patient with endometrial cancer [15]. Increased intraperitoneal pressure adversely impacts cardiac function [25] and respiratory mechanics for the duration of the pneumoperitoneum [26]. Unusually high inspiratory pressures are sometimes necessary when ventilatory compliance is reduced by the weighty abdominal viscera in steep Trendelenberg position [15]. None of the 12 patients whose BMI was between 40 and 61 required reversal of Trendelenberg to manage hypercapnea. No patients have suffered respiratory complications in this series of 88 or in the 702 from which they were drawn.

There are significant limitations regarding the utility and the validity of the data from this retrospective observational series. The assignment of all patients except those with documented metastatic disease or surgical adhesions to a laparoscopic approach introduces selection bias with regard to comorbidities. However, no patient was excluded from TLH due to her BMI score. Without randomized clinical trials providing clear guidelines for offering patients a laparoscopic approach, we applied these standards that we believe reflect current evidence [27–29].

Generalizability may be limited as some gynecologic surgeons may not yet have the experience reflected in this report. Type seven total laparoscopic hysterectomy comprised only 2% of a recent Cochrane review of hysterectomy because it is still new and perceived as difficult to accomplish [18]. Complication rates may be very different for other surgeons who are operating on patients with high BMI or who are in the early phases of their learning curve [30]. Complications can be minimized while undertaking advanced laparoscopic skills by training, hands-on experience and working with similarly trained colleagues as co-surgeons.

Lastly, there were many additional procedures performed with the hysterectomy/adnexectomy/lymphadenectomy, contributing to length of the procedure, length of stay, blood loss and possibly complications. This does, however, reflect the needs of the typical Gynecologic Oncologic patient, who may present with concomitant pelvic floor dysfunction and/or have other anomalies often found during surgery. Further study

should include the initial recording of the baseline health status and comorbidities and record of actual durations for all additional procedures at the time of surgery.

Conclusions

In our experience, total laparoscopic hysterectomy/adnexectomy with indicated lymphadenectomy is both feasible and safe for patients regardless of BMI or parity. No significant differences were noted in surgical duration, blood loss, length of hospital stay or complication rate, when stratified by BMI. Our series highlights the clinical considerations essential to planning randomized, clinical trials of TLH in women with the full spectrum of BMI.

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