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ORIGINAL ARTICLE

Laparoscopic supracervical hysterectomy: impact of body mass index and uterine weight

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Abstract Obesity is a risk factor for the development of uterine fibroids and dysfunctional uterine bleeding which may require hysterectomy. Vaginal hystectomy for enlarged uteri due to fibroids can be difficult and challenging while abdominal hysterectomy increases the risk of infection and bleeding. This prospective study was conducted to compare the operative outcome of laparoscopic supracervical hysterectomy in women with high body mass index (BMI) with enlarged or normal sized uteri. Patients were divided in to four groups according to body mass index and uterine weight. Group 1 included patients with BMI≥25 kg/m^{2}and uterine weight of ≥280 g, group 2 included patients with BMI≥25 kg/m^2 and uterine weight of <280 g, group 3 (BMI ≤25 kg/m^2 and uterine weight ≥280 g) and group 4 (BMI≤25 kg/m^2 and uterine weight of ≤280 g) were not included in the final analysis. There was no conversion to laparotomy, any intraoperative complications or difference in the mean duration of hospital stay in both groups. However, the operative time and blood loss in group 1 was more as compared to group 2. Laparoscopic supracervical hysterectomy is feasible and can be safely performed regardless of BMI or uterine weight.

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Background

Despite the introduction of various alternative therapies for menorrhagia, hysterectomy still remains one of the most commonly performed procedures worldwide [1]. Vaginal hysterectomy should be the preferred choice but when it is not feasible or possible, laparoscopic hysterectomy is the next preferred procedure as this is associated with less postoperative pain and quick recovery. Enlarged uteri due to fibroids pose difficulty in choosing the route of hysterectomy; although vaginal hystectomy is possible, it can be technically difficult and challenging. Laparoscopic hysterectomy, on the other hand, is considered hazardous in majority of these cases due to lack of expertise. Consequently, most hysterectomies for enlarged uteri are still being performed abdominally and often with midline incision with all its associated complications [2].

Obesity is an increasing problem and is a risk factor for the development of uterine fibroids and dysfunctional uterine bleeding which may require hysterectomy [3]. Obesity increases the risks of bleeding and infection after abdominal as well as vaginal hysterectomy [4]. Laparoscopic supracervical hysterectomies (LSH) are gaining popularity because of their safety and faster postoperative recovery [5, 6]. To reduce the complications of abdominal hysterectomies, LSH may be an alternative for large uteri in women with high body mass index (BMI). As there is very limited literature on this specific subject, we conducted this prospective observational study to analyze the operative outcome of LSH performed in women with high body mass index with enlarged and normal sized uteri.

Material and methods

This prospective comparative study was conducted in advanced laparoscopic surgery unit of Whipps Cross University Hospital London from June 2007 till June 2011. This was conducted as a continuous prospective audit of clinical practice after obtaining approval from the hospital research and development committee.

Body mass index (BMI) was calculated by measuring the weight in kilograms divided by height in meters squared. Patient's BMI was graded as overweight (BMI 25–30 kg/m^2), obese (BMI 30–40 kg/m^2) or morbidly obese (BMI>40 kg/m^2) as proposed by the World health Organization classification system of obesity. The uterine weight was measured in grams and stratified into two groups, weight≤280 g and ≥280 g. Patients were divided into four groups according to their BMI and uterine weight. Group 1 included patients with BMI≥25 kg/m^{2}and uterine weight of ≥280 g, group 2 included patients with BMI≥25 kg/m^2 and uterine weight of <280 g, group 3 included patients with BMI≤25 kg/m^2 and uterine weight ≥280 g and group 4 included patients with BMI≤25 kg/m^2 and uterine weight of ≤280 g.

Preoperative clinical evaluation included assessment of uterine size and mobility, pelvic ultrasonography or MRI if required, and endometrial sampling was performed with or without hysteroscopy if clinically indicated. Patients were fully counseled regarding the proposed procedure and available alternatives, written information was provided and an informed consent was taken. Patients were included in the study if menorrhagia was resistant to medical treatment or had failed endometrial ablation therapy, history of at least three normal cervical smears and were happy to have cervical screening in the future. Previous pelvic surgery or endometriosis was not a contraindication to LSH. Exclusion criteria were a history of abnormal cervical smears, endometrial hyperplasia or carcinoma, suspicious adnexal mass, uterine prolapse or patients not willing to retain the cervix. No upper limit of the uterine size was set as exclusion criteria. All procedures were performed by one surgeon.

Surgical procedure

A modified five-port technique to perform LSH in women with enlarged uteri where the uterus extended beyond the true pelvis is explained in a previous article [7]. Briefly, all patients underwent the procedure under general anesthesia with endotracheal intubation and in modified lithotomy position. Their bladders were catheterized and a Clearview™ (Clinical Innovations) uterine manipulator was inserted through the cervix for manipulation of the uterus. Pneumoperitoneum was created by Veress needle at the left subcostal region 2 cm below the costal margin in the midclavicular line, i.e., Palmers point, and a 5-mm port was then inserted at this point. A 0° 5-mm laparoscope was used to inspect the abdomen for the duration of the operation. A second 5-mm port was placed on the contralateral side, in the right hypochondrium, and two other ancillary (5 mm) ports were inserted laterally at the level of the umbilicus depending upon the size of the uterus, above the level of the ovarian ligaments lateral to the epigastric vessels and a 10-mm suprapubic port 4 cm above the pubic symphysis in the midline (Fig. 1). The right side of the procedure was carried out with the laparoscope in the right subcostal port and likewise the left side was carried out with the laparoscope in the left subcostal port. Bipolar diathermy forceps were used for coagulation and harmonic scalpel was used for coagulation and cutting the pedicles. On both sides, the infundibulopelvic or ovarian ligament with the tube and round ligaments were coagulated and divided, the uterovesical fold was then opened and bladder resected downwards (this was important especially where there is a large fibroid at the level of isthmus of the uterus). On both sides, the uterine arteries were skeletonized, coagulated and divided. Then, the uterus was transected from the cervix using the Lap Loop™ (Roberts Surgical). Endocervical canal was cored out to destroy any remnant endometrial tissue. A tissue morcellator was then used to remove the uterine specimen from the abdominal cavity.

Data collection, power calculation and statistical analysis

Data was prospectively collected on a standardized proforma and entered onto a computerized database. The

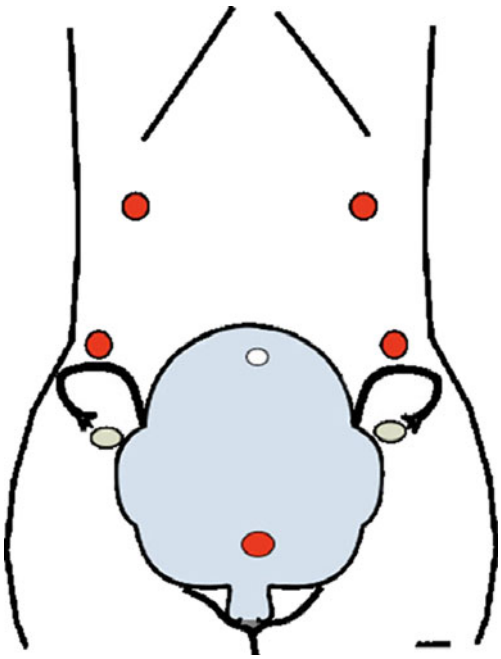

Fig. 1 Port sites in the modified five-port technique of LSH for large uteri [7]. Reproduced with kind permission from Springer Science+ Business Media

database included patient demographics, examination findings, operative indications, operative time, blood loss, operative complications, uterine weight and duration of hospital stay and details of histology of the uterine specimens. Operative blood loss was calculated by measuring the volume of fluid in the suction system and subtracting the amount of irrigation used during the procedure. The operating time was calculated from the insertion of the Veress needle to skin closure of the last port site.

The study was powered as a two-group study to detect medium to large effects which would be of clinical relevance and powered on the basis that the Mann–Whitney test would be used to investigate the significance of differences. On this basis, for a medium to large effect size, a minimum sample size of at least n=40 per group would have at least 80% power for standard level of significance (alpha=0.05) in a two-sided test.

Continuous data were reported as mean±1SD with 95% confidence intervals and were compared by unpaired Student's t-test, while noncontinuous data were reported as median and interquartile range and compared by Mann–Whitney U test. Categorical variables were presented as percentages and 95% CI and compared by Fisher's exact test. Deviation of variables from Gaussian distribution was assessed by Shapiro–Wilk test. A probability value of <0.05 was considered to be statistically significant. Statistical analysis was performed using intercooled Stata, ver.8.0 (Stata Corporation, College Station, TX).

Results

Table 1 shows the patients' demographic characteristics and operative parameters. There were 44, 41, 14 and 12 patients in groups 1, 2, 3 and 4, respectively. Due to the small number of patients in groups 3 and 4, they were not included in the final analysis.

Patients in groups 1and 2 were comparable with respect to age, parity, BMI, operative indications and operative procedure performed. The mean BMI in groups 1 and 2 were 33 and 34 kg/m^2, respectively; however, 18% (8/44) patients in group 1 and 17% (7/41) patients in group 2 were morbidly obese (BMI>40 kg/m^2). The uterine size and the weight of the uterine specimens were substantially bigger (P< 0.0001) in group 1. In group 1, the mean uterine size was 20 weeks; however, 50% (22/44) of the uteri were more than 20 weeks in size; likewise, the mean uterine weight was 574 g, but 52% (23/44) of the uteri weighed were more than 500 g and 17% (4/23) out of these uteri weighed more than 1 kg. The operative time and blood loss was statistically more in group 1 as compared to group 2.

There was no conversion to open procedure, no intraoperative complications, no blood transfusion and no difference in the mean duration of hospital stay in both groups. Histopathology confirmed leiomyoma in 97% and 94% cases and adenomyosis in the remaining 3% and 6% cases in groups 1 and 2, respectively, and there were no malignancies.

Table 1 Patient characteristics and operative parameters

Parameter observed	Group I (n=44)	Group II (n=41)	P value
Age (years)[a]	45.8±4.3 (44.5–47.1)	47.0±4.9(45.3–48.4)	0.28
Parity[a]	1.8±1.3 (1.4–2.2)	1.8±1.2 (1.4–2.0)	0.96
BMI (kg/m^2)[a]	33.5±5.7 (31.8–35.2)	34±6.1 (32.1–35.9)	0.69
Indications of Hysterectomy[b]			
Menorrhagia and fibroids	41 (93%, 95% CI 81–99)	39 (95%, 95% CI 83–99)	>0.999
Menorrhagia and D.U.B	1 (2%, 95% CI 0–1.2)	1 (2.4%, 95% CI 0–1.3)	
Chronic pelvic pain	2 (5%, 95% CI 0–1.5)	0	
Pressure symptoms	0	1 (2.4%, 95% CI 0–1.3)	
Uterine size (weeks)[c]	20 (10–30)	10 (8–16)	<0.0001
Operative procedure[b]			
LSH	36 (82%, 95% CI67–92)	33(80%, 95% CI65–91)	>0.999
LSH+BSO	8 (18%, 95% CI8–32)	8 (20%, 95% CI8–35)	>0.999
Operative time (minutes)[a]	97.3±38.9 (85.5–108.2)	56.5±20.5 (50.0–63.0)	<0.0001
Intraoperative blood loss (ml)[a]	273±171 (221–324)	180±103 (147–212)	0.003
Uterine weight (g)[a]	574±246 (499–649)	147±47(132–162)	<0.0001
Hospital stay (days)[a]	2.1±0.52 (1.9–2.2)	2.0±0.53 (1.7–2.0)	0.04

DUB dysfunctional uterine bleeding, *BSO* bilateral salpingoophrectomy

[a] Data are mean±1SD (95% CI) and analyzed by unpaired Student's t-test

[b] Data are percentage and 95% confidence interval, analyzed by Fisher's exact test

[c] Data are median (range), analyzed by Mann–Whitney U test

Discussion

In this study, majority (>90%) of the hysterectomies in both groups were performed due to menorrhagia and fibroids in the uterus. The uterine size and the weight of the uterine specimens were substantially higher in group 1 resulting in long operative time and more blood loss as compared to group 2. The median operative times and blood loss was more in our study as compared to other studies on this subject [7–9]. Considering the larger uterine size in our study, it is not surprising to observe that it took us more time to operate, and there was more blood loss. It has been shown that uterine weight is an independent factor to increase the operative time, blood loss and complications during abdominal and laparoscopic hysterectomy especially when the uterine weight is more than 500 g [10, 11]. Although the median blood loss was more in group 1, it was in such a limited amount that none of the patients required blood transfusion in either group. Moreover, most of the actual operative time in group 1 was spent in morcellation of the enlarged uteri due to fibroids, adding to the total length of the procedure. Additional factor of high BMI might also have contributed towards more operative time as the laparoscopic entry and actual procedure is difficult in this group of women. Although laparoscopic hysterectomy in obese women is safe and feasible, it can be associated with more operative time, more blood loss and conversion to laparotomy [12]. We did not encounter any operative complications and there was no conversion to open procedure. Thus, despite the longer operative time and relatively more blood loss, LSH was completed with low morbidity while maintaining the benefits of minimally invasive surgery in a high risk group of women with high BMI and enlarged uteri.

Despite the increasing prevalence of obesity with associated menstrual problems and proven benefits of LSH, there is still limited literature on the specific subject of LSH for obese women with large uteri. Although few studies have addressed LSH for large uteri [7, 9], while others [13–15] have shown the safety and feasibility of total laparoscopic and supracervical hysterectomy for large uteri, none have specifically addressed LSH for large uteri in obese women.

The increasing prevalence of obesity with associated fibroids uterus and menstrual problems the world over is such that the practicing gynecologist would expect more patients from this group attending for hysterectomy [16]. Originally, obesity was considered as a relative contraindication for laparoscopic surgery, but with improved technology and skills, the current evidence suggests that laparoscopic hysterectomy is feasible and safe in obese women; however, it is associated with relatively more operative time and risk of bleeding [12, 17–19]. Although our data is specifically for laparoscopic supracervical hysterectomy, it is consistent with the results of the above-mentioned studies with regard to operative time, blood loss, complication rate and duration of hospital stay and has highlighted the limited role of BMI in the surgical outcome of LSH.

LSH is gaining popularity not only among gynecologists but also among the patients. Traditionally, gynecologists have been trained for either abdominal or vaginal hysterectomy, and the choice of route of hysterectomy depends on the uterine size and mobility as well as the preference and experience of the surgeon. [2]. In our opinion, LSH can be successfully performed in obese women with enlarged uteri by modifying the operative technique. We suggest a modified five-port technique for LSH in enlarged uteri as explained in "Material and methods". It is our particular placement of the ports that enabled us to remove large uteri satisfactorily. Despite the large uterus, this operative technique provides good exposure of both pelvic side walls because the laparoscope can be placed on the left side for left-sided pedicles and likewise on the right side for the right-sided pedicles.

The limitations of this study include observational nature and the relatively small number of patients; however, it has sufficient power to detect medium to large effect size of clinical relevance. We believe this study is an important contribution to the very limited literature available on the subject of laparoscopic supracervical hysterectomy for women with high BMI and enlarged uteri. This study will encourage other surgeons to consider this procedure in this group of women to prevent the complications associated with abdominal hysterectomy. However, more gynecologists will have to master their skills to operate upon obese women with enlarged uteri.

Conclusions

This study suggests that laparoscopic supracervical hysterectomy is feasible and can be safely performed in large women with large uteri rather than the traditional approach of laparotomy by midline incision. However, relatively longer operative times and more blood loss can be expected in this group of women. Larger prospective studies are needed to complement our results.

Conflict of interest The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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