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Total laparoscopic hysterectomy: Preoperative risk factors for conversion to laparotomy

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KEYWORDS:
Total hysterectomy;
Operative laparoscopy;
Laparotomy;
Conversion risk

Abstract

STUDY OBJECTIVE: To identify the preoperative factors affecting the risk of conversion to laparotomy during total laparoscopic hysterectomy (TLH) indicated for benign conditions (surgery performed in cases of genital prolapse and/or urinary stress incontinence was excluded).

DESIGN: Retrospective comparative study (Canadian Task Force classification II-2).

SETTING: University tertiary referral center for gynecologic endoscopic surgery.

PATIENTS: Four hundred sixteen consecutive patients who underwent TLH during the first 5 years of our experience performing TLH.

INTERVENTION: Total laparoscopic hysterectomy.

MEASUREMENTS AND MAIN RESULTS: The rate of conversion to laparotomy was 7% (29 patients). Factors that were found to be independently related to the risk of conversion to laparotomy are the following: body mass index (adjusted OR 1.09; 95% CI 1.01–1.18); uterine width on transvaginal ultrasonography (US) between 8 and 10 cm (adjusted OR 4.01; 95% CI 1.54–10.45); uterine width on US greater than 10 cm (adjusted OR 9.17; 95% CI 2.74–30.63); lateral myoma measuring greater than 5 cm on US (adjusted OR 3.57; 95% CI 0.97–13.17); history of adhesion-causing abdominopelvic surgery (adjusted OR 2.92; 95% CI 1.23–6.94).

CONCLUSION: Transvaginal US evaluation is essential before performing TLH. Awareness of the risk factors for conversion to laparotomy is essential for proper patient information and better selection of patients.

Hysterectomy is the most common major gynecologic operation, with up to 60 000 procedures performed annually in France and about 500 000–600 000 in the United States.[1] Since the first total laparoscopic hysterectomy (TLH) reported by Reich in 1989,[2] many studies have proved that this technique is feasible and repeatable.[3–10] Laparoscopy is indicated for hysterectomy in situations where vaginal sur-

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gery is difficult,[11,12] where there is poor vaginal accessibility,[13] where there is associated adnexal pathology,[14–16] and in the context of endometriosis or history of adhesion-causing surgery.[13,14,16–18]

Several randomized trials have demonstrated the advantages of operative laparoscopy as compared with laparotomy: lower morbidity rate,[19] reduced estimated blood loss,[20–22] less analgesic administration,[19,20,23–25] and a significant decrease in the length of hospital stay[19–24,26–28] and recovery period.[21,23,26–28] Finally, although like any operative technique laparoscopic surgery presents a risk of complications,[29–32] this risk is no greater than that observed when the operation takes place by laparotomy.[33] Despite all these encouraging observations with respect to laparoscopic surgery, as things stand and whatever the country, the percentage of hysterectomies that take place by laparoscopic surgery remains low.[1,34–37] The reason why this technique has not become very widespread over the past 15 years is the fact that it is a laparoscopic procedure requiring experienced surgeons.

If laparoscopy can replace laparotomy in selected patients undergoing hysterectomy, it is necessary to know which situations will be mandatory to convert a laparoscopic procedure to laparotomy. The risk factors for conversion must be known in order to ensure patients are sufficiently informed as to the chances of a successful operation by laparoscopy. Since we started performing this operation, we have collected systematic data from women on whom TLH was performed in our department. The aim of our study was to identify the preoperative factors affecting the risk of conversion to an open procedure during the first 5 years of our experience.

Materials and methods

Patients

All consecutive patients with an adequate transvaginal ultrasound (US) who underwent TLH during the first 5 years of our experience were included in the study. All the operations took place using a technique described previously.[4] The main characteristics of this technique are as follows: 1) All the operations concerned total hysterectomy for a benign condition; 2) The duration of laparoscopic surgery started with the adnexal phase (conservative or extirpative after having identified the route taken by the ureters) up until and including the colpotomy; 3) All operations were carried out using reusable equipment; and 4) Hemostasis was achieved in every case with bipolar coagulation. Patients with precancerous lesions (e.g., dysplasia, cancer in situ) and those with genital prolapse and/or urinary stress incontinence were excluded.

For each operation, the following data were systematically collected and entered into a database: age; parity; gravidity; postmenopausal state; body mass index (BMI); indications for TLH; preoperative transvaginal US results; history of vaginal delivery, caesarean section, or adhesion-causing abdominopelvic surgery; surgeon's experience; operating time; associated surgical procedure during TLH (e.g., adhesiolysis, adnexectomy, myomectomy); conversion to laparotomy; uterine weight; hospital stay; and intraoperative complications. By definition, we considered the following situations as constituting a history of adhesion-causing surgery: two pelvic surgical operations by laparotomy whatever the indication (simple appendicectomy excluded); one or more myomectomies; documented history of peritonitis or salpingitis; stage 3 or 4 endometriosis; and adhesiolysis in a context of pain or occlusion. Patients with a history of caesarean section and/or simple appendicectomy were not considered as having a history of adhesions-causing surgery. Criteria for adequate US were the following: measurements of the diameter of the entire uterus (length, thickness, and width); number of myomas; and at least the characteristics of the dominant myoma (i.e., type [intramural, subserous, pedunculated], size, and location). By definition, we also considered that only those practitioners who had carried out more than 10 TLH procedures could be considered as senior surgeons.[22,38]

Conversion to laparotomy was defined as the need for a standard laparotomy at any time during the procedure, either because of complications or technical difficulties. Patients who had conversion to an open procedure were compared with the others.

Statistical analysis

Data are reported as mean ± 1 standard error or number (percentage). Wilcoxon test and $\chi 2$ tests were used to compare groups with and without conversion. Two-tailed p values were used. Odds ratios and 95% CIs were used to describe the association between conversion and potential risk factors. Unconditional multiple logistic regression models were used to study the effect of several risk factors simultaneously. A forward stepwise procedure was used to include in the final model only the factors with significant explanation of outcome (enter and remove p values = .05).

Results

A total of 416 women were operated on during the study period. The baseline characteristics of the patients and the indications for TLH are reported in Table 1. The rate of conversion to laparotomy was 7% (29 patients). For seven patients (24%), conversion to laparotomy was decided during the diagnostic phase of laparoscopy. For the other 22 patients (76%), the decision to convert to laparotomy was made during the operation. Reasons for conversion to laparotomy are detailed in Table 2. Only one complication (epigastric vessel injury) occurred during the set-up of laparoscopy (Table 2). We observed no gastrointestinal tract

Table 1 Patient characteristics and indications for total laparoscopic hysterectomy

Characteristic	No. (%) (N = 416)	Mean ± SD
Age (yrs)		47.9 ± 6.7
Parity		1.6 ± 1.3
Gravidity		1.9 ± 1.5
Body mass index (kg/m2)		21.1 ± 7.5
Postmenopausal state	88 (21.2)	
No previous vaginal delivery	122 (29.3)	
History of adhesion-causing abdominopelvic surgery	132 (31.7)	
Stages 3 and 4 endometriosis	30 (7.2)	
Uterus measurements (cm)		
Length		82.4 ± 21.6
Width		67.2 ± 18.0
Thickness		61.1 ± 18.2
Indications for TLH*		
Menometrorrhagia with myomas	278 (66.8)	
Menometrorrhagia without myomas	60 (14.4)	
Menometrorrhagia with associated nonsuspicious ovarian cysts	35 (8.4)	
Pelvic pain	62 (14.9)	
Surgical experience		
Senior	325 (78.1)	
Junior	91 (21.9)	

TLH = total laparoscopic hysterectomy.
*Some patients had more than one indication.

complications. The mean operating time was 141.7 ± 41.5 minutes (95% CI: 139.7-143.7). The mean uterine weight was 245.9 ± 161.7 g (95% CI: 237.8-254.0). The mean hospital stay was 3.5 ± 1.3 days. The main associated surgical procedures were the following: adnexectomy for nonsuspicious ovarian cysts (35 patients; 8%); adnexectomy for age (124; 30%); adhesiolysis (92; 22%); myomectomy (7; 2%). During the study period, TLH was performed by 14 surgeons. Four surgeons (29%) were considered as senior. Most of the TLH procedures were carried out by senior surgeons (325 procedures; 78%).

Risk factors for conversion to laparotomy are shown in Table 3. Note that age (47.5 ± 4.8 years vs 47.9 ± 6.8; p = .70), parity (1.2 ± 1.4 vs 1.6 ± 1.3; p = .10), and gravidity (1.8 ± 2.1 vs 1.9 ± 1.4; p = .60) were not associated with conversion to laparotomy. Variables that were found to be independently related to the risk of conversion to laparotomy in the final logistic regression model were the patient's BMI, surgeon's experience, uterine width on US, history of adhesion-causing surgery, and presence of lateral myomas of more than 5 cm, which was the limit for significance (Table 4).

Discussion

The rate of conversion to laparotomy was 7%. The risk of conversion to laparotomy was significantly higher with increased BMI, in cases with inexperienced surgeons, in patients with uterine width measuring more than 8 cm on US, in patients with lateral myoma measuring more than 5 cm on US, and in patients with previous adhesion-causing abdominopelvic surgery. Three of the conversions to laparotomy were done in order to suture a bladder injury. These surgeries were performed early during the first 5 years of our experience with TLH. Today, diagnosis of a bladder injury is no longer an indication to convert to laparotomy, because the defect is sutured by laparoscopy.

These results are interesting for day-to-day practice, because four out of the five risk factors identified can be detected preoperatively. The fact that the width of the uterus and the existence of large lateral myomas (>5 cm) significantly increase the risk of conversion underlines the importance of a high-quality US investigation during the preoperative workup. In addition to the exact dimensions of the uterus (length, width, thickness), the preoperative US investigation must provide a precise map of uterine myomas, specifying the number, size, and location.[39] Although the presence of serious adhesions may be suspected preoperatively, it can be properly assessed only during the initial diagnostic phase of the laparoscopy. When there is a history of potentially adhesion-causing surgery, the patient must be warned of the increased risk of conversion; and when there are severe adhesions, there must be no hesitation to convert to laparotomy. Conversion to laparotomy must not be considered as a failure, but rather as the most reasonable solution to avoid serious complications in certain situations. Thanks to this wise approach in this series, we observed no bowel injuries or postoperative peritonitis secondary to perioperative complications unnoticed at the time.

In our experience, uterine weight is not a factor with a statistically significant effect on the risk of conversion to laparotomy after TLH. This result agrees with those of several publications that report that it is perfectly feasible to

Table 2 Reasons for conversion to laparotomy

Reason for conversion	No. (%) (n = 29)
Technical difficulties without complications*	21 (72.4)
Dense adhesions	16 (55.2)
Uterine size	12 (41.4)
Difficulties in exposure of uterine vessels	6 (20.7)
Intraoperative complications†	8 (27.6)
Bladder injuries	3 (10.3)
Hemorrhage > 500 mL	4 (13.8)
Epigastric vessel injuries	1 (3.4)

*More than one difficulty was encountered in some patients.
†Sometimes associated with technical difficulties: dense adhesions, uterine size, and difficulties with uterine vessel exposure.

Table 3 Risk factors for conversion to laparotomy

Risk factor	Conversion (n = 29)	Successful TLH (n = 387)	p	OR (95% CI)‡
Mean body mass index	24.15 ± 6.76	20.87 ± 7.56	.01†	1.09 (1.01–1.18)
No. (%) postmenopausal	6 (20.7)	82 (21.2)	.97*	0.97 (0.38–2.46)
Mean No. of vaginal deliveries	1.0 ± 1.48	1.48 ± 1.29	.02†	0.71 (0.51–1.00)
No. (%) with previous vaginal delivery	14 (48.3)	108 (27.9)	.02*	2.41 (1.17–5.16)
No. (%) with previous laparotomy	11 (37.9)	120 (31.0)	.44*	1.36 (0.62–2.97)
No. (%) with previous adhesion-causing abdominopelvic surgery	13 (44.8)	119 (30.7)	.17*	1.83 (0.85–3.92)
No. (%) with inexperienced surgeon	10 (34.5)	81 (20.9)	.09*	1.90 (0.89–4.44)
Uterine measurement (cm) on US/No. (%)				
Length > 10	17 (58.6)	111 (28.7)	.0001*	0.28 (0.13–0.61)
Thickness < 6	11 (37.9)	202 (52.2)	.0001*	1.00 (reference)
Thickness 6–8	7 (24.2)	134 (34.6)		.96 (0.36–2.55)
Thickness > 8	11 (37.9)	51 (13.2)		4.06 (1.66–9.90)
Width < 8	13 (44.8)	307 (79.3)	.0001*	1.00 (reference)
Width 8–10	9 (31.0)	63 (16.3)		3.37 (1.38–8.23)
Width > 10	7 (24.4)	17 (4.4)		9.72 (3.44–27.53)
No. (%) with lateral myoma > 5 cm	5 (17.2)	14 (3.6)	.001*	5.55 (1.85–16.70)

TLH = total laparoscopic hysterectomy; US = ultrasound.
*$\chi 2$ test.
†Wilcoxon test.
‡For quantitative risk factors, the OR indicates the increase in the risk of conversion associated with an increment of one unit of this variable.

carry out TLH for enlarged uteri.[40,41] If a heavy uterus is suspected preoperatively, this should not in itself constitute an obstacle to carrying out TLH. This study stresses it is the shape rather than weight of the uterus that is important to take into consideration when assessing the risk of conversion to laparotomy. A wide uterus and the existence of large lateral myomas hinder access to uterine pedicles and increase the risk of perioperative difficulties with exposure of uterine vessels. In situations such as these, after inserting the optics trocar the surgeon should adjust the position of the suprapubic trocars according to the size and shape of the uterus. When there are uterine myomas that have developed laterally, it may be necessary to carry out myomectomy before starting TLH in order to access the uterine pedicles easily (seven patients in our study). In patients with a large uterus, a preoperative course of gonadotropin-releasing hormone may facilitate laparoscopic hysterectomy[42] by reducing both uterine volume and myoma size.[43]

Table 4 Factors independently related to the risk for conversion to laparotomy using a logistic regression model

	Final model	
Variable	Adjusted OR (95% CI)	p
Body mass index		
Mean*	1 (reference)	
Mean†	1.09 (1.01–1.18)	.03
Inexperienced surgeon		
Yes	1 (reference)	
No	2.68 (1.11–6.45)	.03
Uterine width on US (cm)		
< 8 cm	1 (reference)	
8–10	4.01 (1.54–10.45)	.005
> 10	9.17 (2.74–30.63)	.000
Lateral myoma of more than 5 cm		
No	1 (reference)	
Yes	3.57 (0.97–13.17)	.056
History of adhesion-causing abdominopelvic surgery		
No	1 (reference)	
Yes	2.92 (1.23–6.94)	.015

US = ultrasound.
*Mean body mass index for the whole population.
†For each point over the mean body mass index, the risk for conversion is multiplied by 1.09

Even if TLH is feasible and safe for patients with high BMI,[44] in our experience higher BMI results in greater risk of conversion to laparotomy. Although this result confirms that of other studies,[45] in a large series[44] it was reported that no patients were converted to laparotomy because of difficulties attributed to high BMI. Obesity is not an absolute contraindication for carrying out laparoscopy.[46,47] The operative technique needs to be adjusted, notably during the set-up, and take into account the fact that the umbilicus, usually located 2 cm above the aortic bifurcation, is located all the lower as the degree of excess weight increases.[48] Insertion of the Veres needle through the umbilicus must be more vertical in direction than usual. In obese patients, the Trendelenburg position is not always very well tolerated because the weight of the abdominal wall, bowel, and omentum reduces ventilatory compliance during the operation.[46]

Our experience is the same as that of other authors who report that the risk of conversion to laparotomy is inversely

proportional to the surgeon's experience.[38,45,49] The fact that a novice surgeon has a 2.5 higher risk of conversion underlines the fact like any surgical technique, TLH needs to be learned and therefore, taught. This raises the problem of defining the minimum number of operations that must be carried out in order to become a senior surgeon for TLH and underlines the advantages of following a learning curve.[50] Given that a study[22] demonstrated that over and beyond 10 TLH procedures there is no significant difference in terms of blood loss and operating times, in this study we took this figure of 10 operations as representing the threshold beyond which the surgeon is considered to be senior. It is possible that a higher number of operations should be imposed.[50] The results of another study[37] report a very statistically significant drop in the risk for the ureter when the surgeon has carried out a minimum of 30 operations.

Conclusion

Awareness of the risk factors for conversion to laparotomy after TLH is essential for two reasons. First, it means the patients can be better informed preoperatively concerning the chances that the operation will be a success. Second, it allows the surgeon to improve the selection process when deciding which patients can benefit from operation. Knowledge of the risk factors also underlines the importance of preoperative questioning, surgeon experience, and high-quality preoperative US investigation. This preliminary study needs to be followed by a comparable study—this time prospective—in order to refine the conclusions and to propose a scoring system to predict the risk of conversion to an open procedure.

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