Factors affecting completion of laparoscopic myomectomy

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Summary

Purposes: This study aimed to elucidate the factors affecting completion of laparoscopic myomectomy without unintended surgery. *Materials and Methods:* The medical records of 143 patients who underwent laparoscopic myomectomy desiring to retain their uterus were retrospectively reviewed. Unintended surgery was defined as the need for conversion to other surgical methods including laparotomy or laparoscopic hysterectomy at any time during the procedures. All variables associated with completion of laparoscopic myomectomy in the univariate analysis were selected at the threshold of $p < 0.25$ and then tested in a multiple-logistic regression model. *Results:* The rate of unintended surgery was 13.3%. Univariate analysis revealed that age, previous abdomino-pelvic surgery, current medical disease, transfusion, > five myomas, myoma size > 8.2 cm, posterior wall location of myoma, intramural type of myoma, and the presence of adenomyosis were statistically significant risk factors for unintended surgery. Multivariate logistic regression analysis demonstrated that completion of laparoscopic myomectomy was significantly influenced by a history of previous abdomino-pelvic surgery (odds ratio; 6.46, 95% CI, 0.03-0.41; p value 0.04). *Conclusion:* The risk of unintended surgery during laparoscopic myomectomy is associated with a history of previous abdomino-pelvic surgery.

Key words: Laparoscopic myomectomy; Unintended surgery.

Introduction

Laparoscopic myomectomy has been regarded as a uterine-conserving procedure that involves only a small scar, less postoperative pain, short hospital stay, fast recovery, and early return to work [1]. However, the complex surgical technique and expertise of the involved surgeon are important limiting factors constraining the widespread use of laparoscopic myomectomy. The indication for surgery, surgical techniques, and associated risks remain debatable issues for laparoscopic myomectomy.

The purpose of this retrospective study was to assess the rate of unintended surgery among patients who underwent laparoscopic myomectomy and to elucidate the risk factors affecting completion of laparoscopic myomectomy without unintended surgery

Materials and Methods

The medical charts of 143 women who underwent laparoscopic myomectomy between January 2007 and August 2010 in a teaching university hospital were reviewed retrospectively. The Institutional review board approval was obtained prior to performing the chart review.

Any symptomatic women who desired a uterus-conserving treatment were included in this study. Inclusion criteria were: the presence of at least one symptomatic myoma with longest dimension of 5-12 cm, fewer than seven myomas as measured by ultrasound examination, and uterine size < 16 gestational weeks by pelvic examination.

Preoperative characteristics of the patients are summarized in Table 1. The gonadotropin-releasing hormone agonist (GnRHa) therapy was not given preoperatively in any patient. Prophylactic antibiotics were injected and prostaglandin (estradiol) E2 was administered via the rectum just prior to each operation. A diagnostic hysteroscopy was performed if there was suspicion of endometrial involvement of myoma just prior to laparoscopic myomectomy. Laparoscopic myomectomy was performed by technique described elsewhere [2]. Supraumbilical placement of a primary trocar, or in situ morcellation while the myoma remained attached to the uterus, was applied as necessary when manipulation of the uterus in a limited space was difficult. Diluted pitressin was injected into the myometrium for hemostasis. The enucleated myomas were removed with an electromechanical morcellation. Suturing was performed at the sites of deep subserosal or intramural myomas with one to three layers, depending on the depth, with continuous or interrupted 0 polyglactin sutures. Two experienced surgeons performed all the surgical procedures.

Unintended surgery was defined as the need for conversion to other surgical methods including laparotomy or laparoscopic hysterectomy at any time during the procedures, either because of complications or technical difficulties. Patients whose procedure was converted to open surgery or laparoscopic hysterectomy were compared with those of successful laparoscopic myomectomy.

Statistical calculations were performed using SAS statistical software (SAS Institute, Cary NC) and R (version 2.2.0). All the results are expressed as median and range. Variables were compared with Mann-Whitney test and Pearson χ^2 test between two groups. The binary variable for the number, size, weight, and location of myoma were decided with the classification and regression tree (CART) analysis. All variables associated with completion of laparoscopic myomectomy in the univariate analysis were selected at a threshold of $p < 0.25$ and then tested in a multiple-logistic regression model. In the final logistic regression model, the adjusted odds ratios (OR) and their confidence interval (CI) were calculated from the model's coefficients and their standard deviation.

Results

Of the 143 patients who were scheduled to receive a laparoscopic myomectomy, 19 (13.3%) patients had

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Table 1. — *Preoperative characteristics of the cohort.*

Characteristics	Laparoscopic myomectomy Median	Range	Proportion	Unintended surgery Median	Range	Proportion
Age (years)	44.0[#]	43.0		47.0[#]	19.0	
Gravidity	2.0	9.0		3.0	6.0	
Parity	2.0	4.0		2.0	3.0	
Body mass index (kg/m^2)	23.0	34.6		24.7	6.9	
Previous abdomino-pelvic surgery			36/123 (29.3%)[$]			10/19 (52.6%)[$]
Medical diseases*			11/123 (8.9%)[$]			3/19 (15.8%)[$]

*Medical diseases: hypertension, diabetes, thyroid disorder, hypercholesterolemia, etc.; [#] $p < 0.05$ by Mann-Whitney test; [$] $p < 0.05$ by Chi-square test.

Table 2. — *Characteristics of the removed myomas.*

Characteristics	Laparoscopic myomectomy *n.*	Proportion	Unintended surgery *n.*	Proportion
Number of removed myomas	123		19	
1	63	63/261 (24.1%)	8	8/44 (18.2%)
2	16	32/261 (12.3%)	6	12/44 (27.3%)
3	24	72/261 (27.6%)	1	3/44 (6.8%)
4	10	40/261 (15.3%)	1	4/44 (9.1%)
5	7	35/261 (13.4%)	2	10/44 (22.7%)
6	2	12/261 (4.6%)	0	0/44
7	1	7/261 (2.7%)	1	7/44 (15.9%)
Type of myoma	261		44	
Intramural		121/261 (46.4%)		43/44 (97.7%)
Subserous		140/261 (53.6%)		1/44 (2.3%)
Entered uterine cavity		6/261 (2.3%)		2/44 (2.3%)
Location of myoma	261		44	
Fundus		26/261 (10.0%)		7/44 (15.9%)
Anterior		104/262 (39.8%)		12/44 (27.3%)
Posterior		92/261 (35.2%)		22/44 (50.0%)
Lateral		13/261 (5.0%)		2/44 (4.5%)
Cervical		23/261 (8.8%)		1/44 (2.3%)
Intraligamentary		3/261 (1.1%)		0/44
Size of single myoma	63		8	
< 60 mm		21/63 (33.3%)		3/8 (37.5%)
60-100 mm		37/63 (58.7%)		4/8 (50.0%)
> 100 mm		5/63 (7.9%)		1/8 (12.5%)
Associated pathology	123		19	
Endometriosis		15/123 (12.2%)		3/19 (15.8%)
Adhesion		21/123 (17.1%)		13/19 (68.4%)
Adnexal mass		17/123 (13.8%)		2/19 (10.5%)
Intrauterine abnormality		11/123 (8.9%)		0/19
Adenomyosis		20/123 (16.3%)*		9/19 (47.4%)*

*$p < 0.05$ by Chi-square test.

unintended surgery. The conversion to unintended surgery was related to intraoperative complications and technical difficulties as follows: adenomyosis and pelvic adhesion in nine cases, technical difficulty in five cases, severe pelvic adhesion in four cases, and severe hemorrhage in one case. Therefore, seven cases of open myomectomies, six cases of laparoscopically-assisted vaginal hysterectomies, three cases of laparoscopic subtotal hysterectomies, and three cases of total abdominal hysterectomies were performed.

The perioperative characteristics including myomas are summarized in Tables 2 and 3. In the successful laparoscopic myomectomy group, 261 myomas were removed in 123 patients. During dissection of the myoma, the endometrial cavity was opened in 2.3% and adenomyosis was confirmed in 16.3% in the pathology reports.

CART analysis revealed that characteristics of removed myomas that included fewer than five myomas, intramural type, < 8.2 cm in size, and location in the posterior wall were significant binary variables of laparoscopic myomectomy compared to the group of unintended surgery. Those who had unintended surgery were older and had a history of abdomino-pelvic surgery, current medical disease, adenomyosis, more complications, and longer hospital stay.

Table 3. — *Perioperative characteristics of the cohort.*

Characteristics	Laparoscopic myomectomy Median	Range	Proportion	Unintended surgery Median	Range	Proportion
Operation time (minutes)	130.0	250.0		170.0	243.0	
Change of hematocrit (%) at						
1st postoperative day	-4.7	21.0		-6.2	25.6	
3rd postoperative day	-7.9	30.4		-9.8	22.8	
Complications			15/123 (12.2%)*			4/19 (21.1%)*
Intraoperative transfusion			5/123 (4.1%)			4/19 (21.1%)
Bladder injury			1/123 (0.8%)			
Postoperative transfusion			1/123 (0.8%)			
Pleural effusion			2/123 (1.6%)			
Paralytic ileus			1/123 (0.8%)			
Febrile morbidity			4/123 (3.3%)			
Repeat surgery due to Delayed bleeding			1/123 (0.8%)			
Hospital stay (days)	3.0[#]	3.0		5.0[#]	3.0	

*$p < 0.05$ by Chi-square test; [#] $p < 0.05$ by Mann-Whitney test.

In the univariate analysis, the following factors were found to have p values of < 0.25: age, history of abdomino-pelvic surgery, current medical disease, transfusion, > five myomas, myoma size > 8.2 cm, posterior wall location of myoma, intramural type of myoma, and presence of adenomyosis. In the final multivariate logistic regression analysis, the important factor affecting completion of laparoscopic myomectomy was history of abdomino-pelvic surgery (OR; 6.46, 95% CI, 0.03-0.41; p value 0.04).

Discussion

The conversion rate to open surgery during laparoscopic myomectomy varies widely from 0 - 41.4% [3-7]. The reason for variable conversion rate is not clear, and may simply reflect reports of successful laparoscopic myomectomy. In case of failed laparoscopic myomectomy, the alternatives include not only open surgery but also laparoscopic hysterectomy. Therefore, the purpose of this study was to elucidate the rate of unintended surgery (i.e., conversion to other alternatives any time during the procedure), not the rate of open surgery.

The indications of laparoscopic myomectomy are debatable and include limitation in surgical expertise and characteristics of the myoma. However, with increasing surgical expertise, the criteria have grown from less than two to three in number to less than eight, and from a maximum dimension of nine cm to the lack of influence of size, number, or location of the myoma [1, 8-11]. The presence of at least one symptomatic myoma having longest diameter of 5-12 cm, ≤ seven myomas, and ≤ 16 gestational weeks of uterus measured by pelvic examina-

tion were included in this study. The characteristics of the myoma have been regarded as important predictors of conversion to open surgery. Dubuisson et al. proposed a prediction model for conversion that comprised myoma size five cm, intramural type, anterior location, and preoperative use of GnRHa [12]. Marret *et al*. identified the surgeon's experience as another important risk factor of laparoconversion [13]. Also, they confirmed that size and intramural type of myoma were important risk factors, but not an anterior location. The CART analysis in this study showed significant binary variables between characteristics of myomas and conversion to unintended surgery. The cut-off points included a myoma number of five, size of 82 mm, posterior location, and intramural type. However, these variables disappeared with multivariate logistic regression analysis. The selection criteria based on the characteristics of myoma used in this study seemed not to affect the completion of laparoscopic myomectomy; rather, the surgeon's expertise may be a more important factor for unintended surgery, which is consistent with other studies [9, 13].

A history of abdomino-pelvic surgery was revealed as the only significant risk factor of unintended surgery. In several studies, previous laparotomy was closely related with increased complications and laparoconversion [14, 15]. The abdominal wall and bowel adhesions are more prevalent and lysis of bowel and abdominal wall requires more surgical skill and expertise of surgeon in such cases of previous laparotomy, contrary to adhesions in the cases of benign gynecologic diseases. Therefore, patients should be informed that they have a higher risk of unintended surgery if they have adhesions.

Although the retrospective study design was a limitation, the suggested inclusion criteria for selecting patients suitable for laparoscopic myomectomy can be used as a useful decision-making tool. Therefore, clinicians and patients can ponder laparoscopic myomectomy on the basis of these findings when minimally-invasive uterine-preserving surgery is the goal.

Conclusion

The risk of unintended surgery during laparoscopic myomectomy is associated with a history of previous abdomino-pelvic surgery.

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