Factors Determining Conversion to Laparotomy in Patients Undergoing Total Laparoscopic Hysterectomy

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Abstract

Aims: To identify the risk factors determining conversion to laparotomy during total laparoscopic hysterectomy (TLH) for benign diseases. *Methods:* We retrospectively reviewed medical records of 288 patients that underwent TLH during the first 2 years of performing TLH at Kang-Nam Sacred Heart Hospital. Twenty-three cases were converted to laparotomy. We compared patient characteristics, indications for hysterectomy, operation time, estimated blood loss, adhesion, uterine weight and postoperative complications between failed and successful groups. *Results:* The rate of conversion to laparotomy was 8%. There were no differences in patient characteristics between the two groups. Independent risk factors for conversion were adhesion and uterine weight. The most common cause of the conversion to laparotomy was adhesions (p = 0.000). Uterine weight was found to be heavier in the failed group (331.5 ± 157.1 vs. 270.3 ± 132.5 g, p = 0.038). Estimated blood loss was greater in the failed group (455.6 ± 143.7 vs. 304.2 ± 45.8 ml, p = 0.047). Bladder injury occurred in the failed group more frequently than in the successful group (p = 0.024). *Conclusion:* An

awareness of risk factors for conversion is important for better patient selection for TLH. Indirect measurement of uterine weight by sonography and detailed history taking is helpful in determining the appropriate hysterectomy route.

Introduction

Hysterectomy is the most common gynecological procedure, with up to about 500,000–600,000 operations performed annually in the United States [1]. Since the first laparoscopic hysterectomy was performed by Reich et al. [2] in 1989, laparoscopic hysterectomy has been considered an increasingly important surgical method in treating gynecological disease. Advanced technology and techniques in laparoscopy have enabled surgeons to perform operations endoscopically that previously would have required laparotomy. Laparoscopic hysterectomy is indicated in situations such as poor vaginal accessibility [3], the coexistence of adnexal pathology [4–6], endometriosis [3, 4] and pelvic adhesion [6–8]. With increasing use and wider applications of laparoscopy, like any surgical technique, a risk of complications takes place in laparoscopic surgery [9–12]. However, the complication risk in laparoscopy is no greater than that in laparotomy. Al-

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though many studies have reported complications such as visceral and vascular injury [9, 12], few have mentioned the risk of unintended conversion to laparotomy during laparoscopic hysterectomy. The aim of our study was to identify the incidence and the risk factors of conversion to laparotomy during the first 2 years of our experience and to analyze the outcomes.

Materials and Methods

A retrospective study was performed using the medical records of 288 patients of total laparoscopic hysterectomy (TLH) performed during the first 2 years of the procedure being implemented at Kang-Nam Sacred Heart Hospital. Definition of TLH was that the uterus had to be removed completely laparoscopically and extracted via the vaginal incision, and this circumferential vaginal incision had to be closed by laparoscopic sutures. All TLH procedures were performed by 2 senior surgeons (S.H.P., H.B.K.) using the same technique. By definition, we considered that only those practitioners who had performed more than 10 TLH procedures could be considered as senior surgeons [13]. The medical records of patients whose surgery was converted to laparotomy (study group) were reviewed and compared with those of successful TLH patients (control group). Information was obtained from patient histories, surgical dictations and anesthesia records. Demographic, historical and surgical data obtained from medical records included age, parity, height, weight, body mass index (BMI), prior pelvic laparotomy history, presence of adhesions, indications for hysterectomy, estimated blood loss, operation time, uterine weight and intra-operative complications. BMI was calculated (weight in kilograms divided by height in meters squared). By definition, we considered prior pelvic laparotomy history as the following situations: surgical operations by laparotomy whatever the indication (simple appendectomy excluded) was. We defined conversion to laparotomy as the need for a standard laparotomy at any time during the operation, either because of complications or technical difficulties. Failed TLH was defined as conversion to laparotomy. Intra-operative complications included ureteral injury, bladder injury, bowel injury and any situations which needed additional management. In the study group, the reasons for conversion to laparotomy were recorded. Failed TLH patients were compared with successful TLH patients. Statistical analysis was performed using SPSS, version 15 (SPSS Inc., Chicago, Ill., USA). Data are reported as mean ± 1 standard error or number (with percentage in parentheses). Dichotomous variables were compared by χ^2 test between study and control groups. Continuous variables were compared with the two-sided sample t test. Probability below 0.05 was considered statistically significant.

Surgical Technique

All surgeries were performed with the patients under general anesthesia. All patients received preoperative intravenous prophylactic antibiotics (cefuroxime 1.5 g intravenously) and all patients had bladder catheterization. Before undergoing TLH, all patients had full bowel preparation with clear fluid diet 24 h prior to surgery. During surgery, patients were placed in the deep Tren-delenburg position. The KOH Colpotomizer System which consists of vaginal extenders (KOH Cup Vaginal Fornices Delineator) and a pneumo-occluder (Colpopneumo Occluder; Cooper Surgical, Trumbull, Conn., USA) with the disposable uterine manipulator (RUMI Uterine Manipulator; Cooper Surgical) were introduced vaginally to mobilize the uterus and delineate the vaginal fornix. Carbon dioxide pneumoperitoneum was achieved using a Veres needle. The intraperitoneal pressure was maintained at 12 mm Hg throughout the surgery.

Four laparoscopic disposable ports were used: 11 mm subumbilical, 5 mm right and left lower quadrant, and 5 mm suprapubic. The round ligaments were desiccated with bipolar cautery and divided with monopolar needle cautery. Depending on whether or not the ovaries were to be removed, the utero-ovarian ligaments or the infundibulopelvic ligaments were desiccated and transected. The vesicouterine peritoneum at the level of the vaginal fornix was incised using monopolar needle cautery. With the help of the Colpotomizer system, the bladder was dissected off the lower uterine segment with clear exposure of the vaginal fornices. The uterine vessels were then thoroughly desiccated and cut at the level of the lateral fornix. Anterior colpotomy was achieved by incising the vagina at the level of fornix and continuing laterally and posteriorly, freeing the uterus from its vaginal attachments. The specimen was morcellated if needed and was removed vaginally. The vaginal vault was closed laparoscopically.

Results

A total of 288 patients had a planned TLH during the study period. Of these cases, 23 patients needed conversion to laparotomy. The rate of conversion to laparotomy was 8%.

In each case, the decision to convert to laparotomy was made during the operation. The indications for hysterectomy of 288 patients who consented to a TLH during the study period are summarized in table 1.

The majority of women (83.7%) underwent TLH because of uterine myoma and/or adenomyosis. There were no differences in patient characteristics between the successful TLH group and the failed group (table 2). The mean age of the failed TLH group (23 patients) was 46.3 ± 4.2 (mean ± SD) years, parity was 1.6 ± 1.0 and BMI was 25.3 ± 2.9. Table 3 shows the intra-operative surgical outcomes of the 2 groups. History of pelvic laparotomy which could cause mild or severe adhesion revealed no significant difference between failed and successful TLH patients (p = 0.218). Estimated blood loss was definitely greater in failed TLH patients (455.6 ± 143.7 ml) than in successful TLH patients (304.2 ± 45.8 ml, p = 0.047). Uterine weight was also heavier in failed TLH patients than in successful TLH patients (331.5 ± 157.1 vs. 270.3 ± 132.5 g, p = 0.038). Bladder injuries were significantly higher in failed TLH patients (5 vs. 1 case, 27 vs. 0.4%,

Table 1. Indications for hysterectomy in our 288 patients

Indications	n	%
Myoma	204	70.8
Adenomyosis	37	12.9
CIN	20	6.9
Adnexal mass	14	4.9
Endometrial polyp	8	2.8
Others[1]	5	1.7

CIN = Cervical intraepithelial neoplasia.
[1] Pelvic inflammatory disease, dysfunctional uterine bleeding.

Table 2. Patient characteristics

	Successful TLH (n = 265)	Failed TLH (n = 23)	p value
Age, years	44.7 ± 5.0	46.3 ± 4.2	0.119
Parity	1.5 ± 1.0	1.6 ± 1.1	0.597
BMI	24.5 ± 3.3	25.3 ± 2.9	0.298
Previous medical disease history[1]	0.2 ± 0.6	0.2 ± 0.6	0.961
Previous pelvic laparotomy history[2]	0.2 ± 0.6	0.8 ± 1.0	0.218

[1] Such as diabetes mellitus, hypertension, thyroid disease, among others.
[2] Cesarean section, myomectomy, bowel surgery (except appendectomy).

Table 3. Intra-operative surgical outcomes and postoperative complications

	Successful TLH	Failed TLH	p value
Operation time, min	163.1 ± 43.4	176.7 ± 49.1	0.153
Estimated blood loss, ml	304.2 ± 45.8	455.6 ± 143.7	0.047
Uterine weight, g	270.4 ± 132.5	331.5 ± 157.1	0.038
Ureter injury	0	0	NS
Bladder injury	1	5	0.024
Bowel injury	0	0	NS
Hemoglobin change, g/dl	1.4 ± 0.9	1.6 ± 1.4	0.664
Fever	7	1	0.738
Hematoma formation	1	0	0.769
Pelvic adhesion during operation	0.3 ± 0.6	1.4 ± 0.8	0.000

NS = Not significant.

Table 4. Main causes for conversion to laparotomy in 23 failed TLH patients

Variables	Patients
Pelvic adhesion during operation	17 (73.9%)
Technical difficulty due to uterine size	5 (21.7%)
Bladder injury	1 (4.4%)

p = 0.024). Pelvic adhesions occurred in 73.9% (17 patients) of the failed TLH patients. Thirteen patients of 17 failed TLH patients with pelvic adhesions had previous laparotomy history (myomectomy: 7 patients; cesarean section: 6 patients) and 13 patients had once or twice pelvic surgery history (once: 6 patients; twice: 7 patients). There was no difference of conversion rate due to previous pelvis surgery type or number. The most frequent cause for conversion to laparotomy was pelvic adhesions, followed by difficulties in exposure of uterine vessel due to large uterine size (tables 3, 4). There were no differences in postoperative complications such as fever, wound infection, hematoma, transfusion and hemoglobin change between the two groups (table 3). There was no difference of conversion rate between the two surgeons. There were no incidents of reoperation for patients in either group.

Discussion

Laparoscopy is being increasingly used in gynecological procedures. The development of laparoscopic techniques and technology has enabled gynecological surgeons to perform more difficult surgeries using a minimally invasive method. Laparoscopic hysterectomy provides the benefits of vaginal hysterectomy to those women who would otherwise need an abdominal hysterectomy. TLH is preferable to total abdominal hysterectomy as patients experience reduced pain, rapid recovery, decreased blood loss, fewer wound infections and febrile episodes [14–16].

Laparoscopic hysterectomy needs greater surgical skills and experiences [15]. It also requires longer training times than abdominal and vaginal hysterectomies. The operation time is longer in laparoscopic hysterectomy than all other routes of hysterectomies [16]. Urinary tract injury such as bladder and ureter was more frequent in laparoscopic hysterectomy than in both abdominal and vaginal hysterectomy [6, 15–19].

Recognizing risk factors during laparoscopic hysterectomy is thus of paramount importance. Several studies have quantified these complications [9–12, 20–23].

Leonard et al. [24] reported that 29 of 416 (7%) TLH patients had to be converted to laparotomy and the major cause of conversion in these patients was extensive pelvic adhesions (55.2%).

Generally, surgeons encounter unexpected pelvic adhesions during TLH which may prohibit a safe dissection through laparoscopy. About 10% of patients without previous pelvic surgery have spontaneous adhesions of the omentum or bowel, whereas 31% of patients with previous pelvic surgery are free of adhesions [25].

Severe pelvic adhesions as a result of underlying pathology increase the rate of complication and conversion during laparoscopic hysterectomy [26].

Christopher et al. [27] reported that the risk factors of conversion to laparotomy are associated with dense pelvic adhesion secondary to previous pelvic surgery, large uterine size and excessive hemorrhage.

The rate of conversion to laparotomy in our study was 8%. The risk of conversion to laparotomy increased in patients with severe pelvic adhesions that were discovered during the operation and in patients with difficulties in exposure of uterine vessel due to large uterine size (heavy uterine weight). The most common cause of conversion to laparotomy was pelvic adhesions during the operation (17 cases; 73.9%). Five patients had to be converted to laparotomy because of difficulties in exposure of uterine vessel due to uterine size. In 1 case, the conversion to laparotomy was done because we had to suture injured bladder.

Although we may suspect severe pelvic adhesions preoperatively, we can only evaluate it during the initial phase of laparoscopy. When the patients have a history of previous pelvic laparotomy and have greater likelihood of adhesions, they must be informed of the risk for possible laparotomy and gynecological surgeons should consider other hysterectomy routes.

In our study, severe pelvic adhesions discovered during operation increased the risk of conversion to laparotomy. In several studies previous pelvic laparotomy was associated with pelvic adhesions. For example, prior vertical incision caused greater pelvic adhesion than prior Pfannenstiel incision [28]. Eventually, prior pelvic laparotomy increased the complications that require laparotomy [12].

Conversions to laparotomy were associated with significantly greater blood loss than successful TLH [23]. The estimated blood loss was greater in patients of conversion to laparotomy (455.6 ± 143.7 ml) than in patients of successful TLH (304.2 ± 45.8 ml) during operation in our study. Previous cesarean section, endometriosis and previous pelvic laparotomy have been considered as main causes of intra-operative and postoperative complications [29].

However, there were no differences in intra-operative and postoperative complications such as ureter injury, bowel injury, fever, hemoglobin change and hematoma formation between failed TLH patients and successful TLH patients in our study.

However, the incidence of bladder injury was greater in patients who were converted to laparotomy than in patients of successful TLH (p = 0.024). There was only 1 patient with bladder injury among the successful TLH patients. Bladder injuries occurred in 5 failed TLH patients. Four patients needed no conversion to laparotomy as bladder repairs were made by laparoscopic suture. Only 1 patient with bladder injury in the failed TLH group was converted to laparotomy to repair the injury.

This single case of bladder injury requiring conversion to laparotomy occurred during dissection of the uterovesical fold off the cervix in a patient with a previous cesarean section history and severe pelvic endometriotic adhesions. We had difficulty in suturing the bladder injury by laparoscopy due to dense adhesion and therefore laparotomy was done.

Several publications have reported that TLH can be performed in cases where patients have enlarged uteri [30, 31]. However, in our study, uterine weight is a significant risk factor of conversion to laparotomy. For 5 patients, we had to perform laparotomy because of heavy uterus (defined as more than 250 g uterus with difficulty in manipulation by uterine manipulator) with large myoma. A heavy uterus with large myoma hinders access to the uterine pedicle with rigid laparoscopic instruments and makes exposure of uterine vessels difficult. In this situation, a preoperative gonadotropin-releasing hormone cycle may help to perform TLH by decreasing size of myoma [32, 33].

In our study, BMI is not a risk factor in conversion to laparotomy. There is no significant difference of BMI between the 2 groups. This result agrees with those of previous studies that show that high BMI is not associated with risk of conversion to laparotomy during TLH [34].

Conclusion

Preoperative identification of the potential risk factors for conversion to laparotomy in patients who plan to undergo TLH is very important. The major risk factors are

pelvic adhesions during operation and uterine weight with large myoma. To know these risk factors will enable surgeons to minimize the conversion rate and to consider alternative hysterectomy routes. The surgical hysterectomy route should be selected only after careful comparison of the relevant risks and benefits. Patients should be informed of the risk of conversion to laparotomy before the operation. Because our study reviewed medical records, recall bias affecting the results could exist. Our study has a limitation of retrospective study. Prospective studies such as a scoring system of the risk factors of conversion to laparotomy will be needed to validate our results later.

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