Original Research

A 15-year Experience With Total Laparoscopic Hysterectomy at a Regional Core Hospital and an Analysis of Risk Factors for Major Intraoperative Complications: A Retrospective Study

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Abstract

Background: The number of laparoscopic surgeries has been increasing in regional core hospitals, and procedures involving total laparoscopic hysterectomy (TLH) are being performed more frequently. Therefore, the importance of data acquisition and analysis of TLH procedures has increased. In particular, examining the risks of complications for improving surgical procedures and patient selection is considered especially crucial in regional healthcare settings, where medical resources are relatively limited. To determine the prevalence of and risk factors associated with the occurrence of the major intraoperative complications of TLH, we performed a multivariate analysis using records from our hospital. **Methods**: We retrospectively reviewed the medical records of 548 patients who underwent TLH to treat uterine diseases from 1 January 2010 to 31 December 2024. Among these patients, 27 patients were identified with major intraoperative complications, such as organ injury and massive blood loss. First, we conducted simple comparisons using Fisher's exact test (two-tailed) for 22 representative factors related to patient characteristics. Then, we performed a multivariate logistic regression analysis to assess the effects of nine representative factors, including both preoperative and intraoperative/postoperative factors. **Results**: According to the results of the Fisher's exact test (two-tailed) and multivariate analysis, we detected significant impacts of (1) high body mass index (BMI) (defined as 30 kg/m^2 or greater), (2) hypermenorrhea, and (3) coexistent ovarian endometriotic cysts among the preoperative factors and (1) high BMI (defined as 30 kg/m^2 or greater), (2) hypermenorrhea, (3) intraoperative findings of adhesions, and (4) heavy uterine weight (500 g or greater) among the intraoperative/postoperative factors. **Conclusions**: This study identified certain trends in risk factors associated with major intraoperative complications of TLH, using a relatively simple analysis. These findings may provide important information when TLH is considered a surgical option. Based on these findings, future studies with more sophisticated methodologies will be necessary to provide additional insights.

Keywords: total laparoscopic hysterectomy; intraoperative major complication; multivariate analysis; retrospective study

1. Introduction

As total laparoscopic hysterectomy (TLH), defined as a procedure in which all steps from uterine dissection to suturing are performed laparoscopically, with the uterus primarily retrieved through the vagina, has become more widely adopted in Japan, the number of indications beyond leiomyoma and adenomyoma has increased. TLH has become a primary surgical alternative to abdominal hysterectomy, even in regional core hospitals such as ours [1–4]. This shift is largely attributed to the association of TLH with relatively less pain and shorter recovery times than for conventional abdominal hysterectomies. However, in addition to the longer operation time [5,6], a relatively high level of surgical skill is required for TLH [7], and it is crucial to perform the surgical procedure safely without causing complications such as bleeding or organ injury. Notably, in regional hospitals such as ours, where medical resources are limited and healthcare services rely heavily on

limited human resources across all departments and various medical staff, the safe execution of TLH may become particularly important. Therefore, it is considered meaningful to collect and analyse data from each hospital, particularly those focused on major intraoperative complications such as massive bleeding or organ injury, which often require unexpected human resources. From this perspective, we reviewed our experience with TLH over the past ten years to examine whether the risk of such complications could ultimately be predicted in advance.

2. Materials and Methods

2.1 Data Collection

This retrospective study was reviewed and approved by the Human Ethics Committee of Kinan Hospital (Approval number: 283, Clinical outcomes of endoscopic surgery: retrospective analyses). The deidentified medical records of 548 patients who underwent TLH between 1 July

2010 and 31 December 2024 for uterine diseases were retrospectively reviewed, and data regarding TLH indications and histopathological diagnoses of uterine lesions were collected. In terms of major intraoperative complications, according to past reports [4], we focused mainly on organ injuries that were considered to have occurred as a result of surgical manipulation, particularly due to instrument handling within the pelvic cavity during TLH. Among the 25 cases reported by our hospital to the Japan Society of Gynaecologic and Obstetric Endoscopy and Minimally Invasive Therapy, we excluded the following 10 cases: 4 cases involving instrument breakage; 1 case involving an abdominal wall haematoma; 2 cases involving subcutaneous emphysema; 2 cases involving skin burns, which were presumably caused by the light source cable; and 1 case involving vaginal wall laceration, all of which were identified after the completion of TLH. Consequently, we included 15 cases in the analysis. With respect to the amount of blood loss, although we considered setting the threshold at 500 mL, which is generally regarded as a significant amount of blood loss in gynaecological surgery, TLH tends to result in less blood loss than conventional abdominal hysterectomies do. At that threshold (500 mL), only two patients met the criteria. Therefore, by considering the mean and standard deviation of the blood loss amount for our institution, we set the threshold at 300 mL (± 2.5 SD), which corresponded to 20 cases, or approximately 3.6% of all cases. In combination with the aforementioned organ injuries as major intraoperative complications, the total number of cases was 27, representing just under 5% of all 548 cases. This proportion could be considered a reasonable figure in comparison with those of previous reports, especially in comparison with some reports in Japan [4,8,9] and was therefore used in our analysis [10]. For the 548 TLH patients, data on the following variables were extracted: (1) basic patient characteristics, primarily obtained from medical questionnaires documented in the medical records, such as age; body mass index (BMI), defined as body weight (kg) divided by the square of height (m); parity; history of gynaecological surgery; irregular menstruation; hypermenorrhoea; and dysmenorrhoea; (2) data related to preoperative conditions, such as the leiomyoma size (defined as the maximal diameter measured by magnetic resonance imaging (MRI)), the uterine size (defined as the average of the long and short diameters measured by MRI), the presence of ovarian endometriotic cysts or adenomyoma, and carbohydrate antigen 19-9 (CA19-9), carbohydrate antigen 125 (CA125), and lactate dehydrogenase (LDH) positivity; and (3) intraoperative/postoperative findings, such as the operation time, blood loss amount, intraoperative adhesion findings, pathological diagnoses of endometriosis, pathological diagnoses of adenomyosis, and resected uterine weight. Although this is a limitation of the study, owing to the retrospective nature of data collection, which focused on patients visiting the gynaecology department, information on comorbidities from other specialties, such as internal medicine and psychiatry, could not be obtained.

2.2 Analysis Methods

First, we compared basic information such as age, BMI, parity, leiomyoma diameter, uterine size, operation time, blood loss amount, and resected uterine weight between patients with and without major intraoperative complications. For each factor, the median, as well as the 25th percentile and 75th percentile values, are compared. The p values were obtained with the Wilcoxon rank-sum test, and $p < 0.05$ was considered to indicate statistical significance. Next, from the available medical records, 22 representative factors were selected. The 548 patients were divided into two groups on the basis of the presence or absence of each factor. The proportions of patients with major intraoperative complications between these two groups were subsequently compared. Among these factors, advanced age was defined as 50 years or older as a substitute for menopausal status, and high BMI was defined as 30 kg/m^2 or greater. On the basis of previous reports [4,8,11], a large leiomyoma was defined as a lesion with a diameter of 8 cm or more, a large uterus was defined as a uterus with a diameter of 10 cm or more, and heavy uterine weight was defined as 500 g or more. Given the relatively small number of patients with major intraoperative complications (n = 27), and the possibility of low expected cell counts in the 2×2 contingency tables, Fisher's exact test (two-tailed) was used as an appropriate statistical method for between-group comparisons.

Finally, candidates for multivariate analysis were selected on the basis of a p value of 0.30 or less in the aforementioned simple comparisons. We then extracted data on the following 9 representative factors: (1) high BMI (defined as 30 kg/m^2 or more), (2) hypermenorrhoea, (3) history of gynaecological surgery, (4) large leiomyoma (8 cm or more), (5) large uterus (10 cm or more), (6) coexistent ovarian endometriotic cyst, (7) intraoperative findings of adhesions, (8) pathological diagnosis of endometriosis, and (9) heavy uterine weight (500 g or more). The patients were then divided into two groups, and multivariate analysis was performed twice as follows: first, seven preoperative factors (1 through 6) were used; second, nine factors that included both preoperative and intraoperative/postoperative findings (1 through 5 and 7 through 9) were used.

Statistical analyses were performed with Microsoft Excel 365 (Microsoft Corporation, Redmond, WA, USA) and JMP version 18 for Windows (SAS Institute, Inc., Tokyo, Japan). The associations between patient characteristics and the likelihood of major intraoperative complications were assessed with the Wilcoxon rank-sum test, Fisher's exact test (two-tailed) and multivariable logistic regression analysis. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to determine the strengths of the associations. A value of $p < 0.05$ indicated statistical significance.

3. Results

3.1 Details of the 548 Cases

At our institution, TLH is performed primarily for uterine lesions, the distribution of which is shown in Table 1A. Similarly, the postoperative pathological findings around the uterine lesions were also recorded, as shown in Table 1B. As expected, approximately 85% of the patients in both Table 1A and Table 1B were diagnosed with leiomyoma or adenomyoma. Among the total cases, 73 involved adnexal tumour lesions, which were preoperatively identified and presumed to be benign. As shown in Table 2, 27 patients experienced major intraoperative complications, 8 of whom experienced multiple complications. Among these cases, 11 involved organ injury in addition to massive blood loss. However, in all of these cases, intraoperative repair was successfully performed, and no postoperative sequelae occurred.

Table 1A. Surgical indications of the 548 cases.

Surgical indication	Cases (%)
Leiomyoma	393 (71.7%)
Adenomyoma	73 (13.3%)
Stage IA endometrial cancer	20 (3.6%)
Endometrial hyperplasia (with or without atypia) (*1)	17 (3.1%)
Stage IA squamous cell carcinoma	2 (0.4%)
Precancerous cervical lesions (*2)	23 (4.2%)
Endometrial polyp	8 (1.5%)
Lobular endocervical glandular hyperplasia	5 (0.9%)
Others (*3)	7 (1.3%)
Total	548

*1: Atypical endometrial hyperplasia (11 patients) and endometrial hyperplasia without atypia (6 patients); *2: Carcinoma in situ (CIS) (9 patients), adenocarcinoma in situ (AIS) (4 patients), cervical intraepithelial neoplasia 2 (CIN2) (6 patients) and CIN3 (4 patients); *3: Uterine perforation (2 patients), additional surgery for borderline ovarian tumour (2 patients), smooth muscle tumour of uncertain malignant potential (STUMP) (1 patient), pelvic organ prolapse (1 patient) and haematometra (1 patient).

The indications for TLH and the pathological diagnoses of the 548 patients were documented. The uterine diseases were classified accordingly. TLH, total laparoscopic hysterectomy.

3.2 Simple Evaluation of the Influence of Patient Characteristics on the Occurrence of Major Intraoperative Complications

In a simple comparison of patient characteristics between those with and without major intraoperative complications, significant differences were observed in uterine size, operation time, blood loss amount, and resected uterine weight (Table 3). Furthermore, as shown in Table 4, a simple analysis of the associations between individual factors and the likelihood of major intraoperative complica-

Table 1B. Postoperative diagnoses of the 548 cases.

Postoperative diagnosis	Cases
Leiomyoma	386 (70.4%)
Adenomyoma (*1)	78 (14.2%)
Endometrioid adenocarcinoma	22 (4.0%)
Endometrial hyperplasia (with or without atypia) (*2)	14 (2.6%)
Precancerous cervical lesions (*3)	21 (3.8%)
No residual disease (*4)	6 (1.1%)
Endometrial polyps	11 (2.0%)
STUMP	3 (0.5%)
Others (*5)	7 (1.3%)
Total	548

*1: Including suspected lesions (3 cases); *2: Atypical endometrial hyperplasia (12 cases) and endometrial hyperplasia without atypia (2 cases); *3: CIS (7 cases), AIS (2 cases), CIN1 (5 cases), CIN2 (2 cases) and CIN3 (5 cases); *4: Including AIS (1 case), CIS (2 cases), STUMP (1 case) and borderline ovarian tumour (2 cases) as preoperative diagnoses; and *5: Lobular endocervical glandular hyperplasia, suspected (2 cases), adenosquamous carcinoma of the uterine cervix (1 case), uterine adenosarcoma (1 case), nabothian cyst (1 case), cervical endometriotic cyst (1 case) and adnexal serositis (1 case).

Table 2. Details of major intraoperative complications.

No	Complication	Number
A	Massive blood loss (300 mL or more)	20
B	Conversion to laparotomy (due to severe adhesions)	6
C	Bladder injury	5
D	Vaginal wall injury	1
E	Ureteral injury	1
F	Intestinal injury	3
G	Omental injury	1

The types and numbers of major intraoperative complications in the 548 TLH patients were documented. Among these, the following were included as combinations of major intraoperative complications: AB (4 cases), ABC (2 cases), AC (1 case), and AD (1 case).

tions revealed 3 significant factors, namely, hypermenorrhoea, intraoperative findings of adhesions, and heavy uterine weight (500 g or more). In addition, the following 6 factors had p values of 0.30 or less when the proportions of patients with major intraoperative complications were compared between the groups: (1) coexistent ovarian endometriotic cyst, (2) large leiomyoma (8 cm or more), (3) high BMI (defined as 30 kg/m^2 or more), (4) history of gynaecological surgery, (5) large uterus (10 cm or more), and (6) pathological diagnosis of endometriosis. On the basis of these results, a total of 9 factors were included in the subsequent multivariate analysis.

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Table 3. Basic patient characteristics.

Index	Complication present (n = 27)	No complication (n = 521)	p value
Age (years old)	47.0 (44.0–49.0)	46.0 (43.0–49.0)	0.562
BMI (kg/m^2)	22.9 (20.6–25.2)	21.8 (19.8–24.8)	0.249
Parity	2.0 (0.0–4.0)	2.0 (0.0–6.0)	0.367
Leiomyoma diameter (cm)	76.5 (52.3–93.3)	61.0 (40.0–80.0)	0.094
Uterine size (cm)	95.5 (83.0–114.8)	88.0 (71.8–102.5)	0.039
Operation time (minutes)	209.0 (186.5–267.5)	141.0 (122.0–167.0)	<0.001
Blood loss amount (mL)	360.0 (294.5–428.0)	11.0 (0.0–54.0)	<0.001
Resected uterine weight (g)	350.0 (205.5–513.5)	220.0 (147.0–331.0)	0.002

The basic characteristics obtained from the patients' medical records are summarized. For each factor, the median, as well as the 25th percentile and 75th percentile values, are shown for both patients with major intraoperative complications and those without complications. The p values were obtained with the Wilcoxon rank-sum test, and $p < 0.05$ was considered to indicate statistical significance. BMI, body mass index.

Table 4. Simple comparison of patient information.

Factor	Positive vs. Negative	p value
Advanced age (50 years old or older)	n = 6/111 vs. n = 21/437	0.806
Preoperative hormone treatment	n = 23/429 vs. n = 4/119	0.477
High BMI (30 kg/m^2 or more)	n = 4/35 vs. n = 23/513	0.085
Nulliparity	n = 4/110 vs. n = 23/438	0.626
Irregular menstruation	n = 4/116 vs. n = 23/432	0.628
Hypermenorrhoea	n = 24/352 vs. n = 3/196	0.006
Dysmenorrhoea	n = 16/292 vs. n = 11/256	0.559
Gynaecological surgical history	n = 4/139 vs. n = 23/409	0.258
Adenomyoma	n = 4/79 vs. n = 23/469	1.000
Coexistent ovarian endometriotic cyst	n = 6/57 vs. n = 21/491	0.050
Nonendometriotic ovarian cysts	n = 1/16 vs. n = 26/532	0.560
Multiple leiomyomas	n = 15/290 vs. n = 12/258	0.845
Large leiomyoma (8 cm or more)	n = 10/117 vs. n = 17/431	0.053
Submucosal leiomyoma	n = 6/108 vs. n = 21/440	0.804
Large uterus (10 cm or more)	n = 12/166 vs. n = 15/382	0.131
LDH positivity (>222 U/L)	n = 0/21 vs. n = 27/527	0.616
CA19-9 positivity (>37 U/mL)	n = 1/23 vs. n = 26/525	1.000
CA125 positivity (>35 U/mL)	n = 5/71 vs. n = 22/477	0.376
Intraoperative findings of adhesions	n = 17/230 vs. n = 10/318	0.028
Pathological diagnosis of endometriosis	n = 6/62 vs. n = 21/486	0.108
Pathological diagnosis of adenomyosis	n = 3/90 vs. n = 24/458	0.598
Heavy uterine weight (500 g or more)	n = 7/45 vs. n = 20/503	0.004

On the basis of the presence or absence of 22 factors that were extracted from the patient medical records, the 548 patients were divided into two groups, with 27 patients with major intraoperative complications and 521 patients without complications, and between-group comparisons were performed. For each of the two groups, the number of patients with major intraoperative complications (a) and the total number of patients (b) are presented as n = a/b. The p values were calculated with Fisher's exact test (two-tailed), and $p < 0.05$ indicated statistical significance. LDH, lactate dehydrogenase; CA19-9, carbohydrate antigen 19-9; CA125, carbohydrate antigen 125.

3.3 Influential Factors Predicting Major Intraoperative Complications

Among the candidate factors that were selected on the basis of the results of the simple analyses, namely, p values of 0.30 or less according to Fisher's exact test (two-tailed), significant differences were detected for (1) high BMI (defined as 30 kg/m^2 or greater), with an OR of 3.9 (95% CI: 1.0–11.9); (2) hypermenorrhoea, with an OR of 5.9 (95% CI: 2.0–25.9); and (3) coexistent ovarian endometriotic cysts, with an OR of 4.3 (95% CI: 1.4–11.5) among

Table 5A. Identification of factors influencing major intraoperative complications based on preoperative information.

Factor	OR (95% CI)	p value
High BMI (30 kg/m^2 or more)	3.9 (1.0–11.9)	0.044
Hypermenorrhoea	5.9 (2.0–25.9)	<0.001
Gynaecological surgical history	0.6 (0.2–1.8)	0.423
Large leiomyoma (8 cm or more)	2.4 (0.8–6.7)	0.109
Large uterus (10 cm or more)	1.3 (0.5–3.6)	0.566
Coexistent ovarian endometriotic cyst	4.3 (1.4–11.5)	0.012

ORs, Odds ratios.

Table 5B. Identification of factors influencing major intraoperative complications based on intraoperative and postoperative information.

Factor	OR (95% CI)	p value
High BMI (30 kg/m^2 or more)	3.5 (0.9–11.2)	0.069
Hypermenorrhoea	7.0 (2.2–30.9)	<0.001
Gynaecological surgical history	0.5 (0.1–1.5)	0.223
Large leiomyoma (8 cm or more)	2.5 (0.8–7.7)	0.117
Large uterus (10 cm or more)	0.9 (0.3–2.7)	0.920
Intraoperative findings of adhesions	3.2 (1.2–8.5)	0.018
Pathological diagnosis of endometriosis	3.0 (0.9–9.1)	0.066
Heavy uterine weight (500 g or more)	4.6 (1.3–15.9)	0.017

Multivariate analyses of the preoperative information (6 factors) and intraoperative/postoperative information (8 factors) of the 548 patients were performed separately to examine the effects of each factor for which data were collected from the medical records. The ORs and 95% CIs for the incidence of these factors and the p values are shown in this table. $p < 0.05$ indicated statistical significance.

the preoperative factors; and (1) hypermenorrhoea, with an OR of 7.0 (95% CI: 2.2–30.9); (2) intraoperative findings of adhesions, with an OR of 3.2 (95% CI: 1.2–8.5); and (3) heavy uterine weight (500 g or greater), with an OR of 4.6 (95% CI: 1.3–15.9) among the intraoperative/postoperative factors (Table 5A and Table 5B). Additionally, a significant trend and a p value of less than 0.1 were detected for the pathological diagnosis of endometriosis.

4. Discussion

With the increasing adoption of TLH, its indications are expanding, even in regional healthcare settings where medical resources are relatively limited. Therefore, we must analyse the results of various cases to validate the safety of the procedure for these indications. At our institution, approximately 50 TLH procedures have been performed annually since 2017, and the proportion of laparoscopic surgeries among all surgical procedures is expected to continue to increase. Given that TLH generally requires a longer operation time than abdominal total hysterectomy does and involves the use of laparoscopic equipment, it is

becoming increasingly important to anticipate and appropriately manage intraoperative complications. Among the 27 patients who experienced major intraoperative complications in this study, although no patients required blood transfusions, the operation times were approximately 1.5 times longer, resulting in increased strain on the limited resources of the operating theatre (Table 3).

Therefore, in this study, we aimed to identify, in a relatively simple and practical manner, the factors that may significantly increase the risk of major intraoperative complications, even at a core clinical hospital like ours. We used a stepwise approach involving comparisons of medians, Fisher's exact test (two-tailed), and multivariate analysis, focusing on patient-related factors that can realistically be extracted from medical records. As a result, in addition to hypermenorrhoea, significant associations were found for high BMI (defined as 30 kg/m^2 or more) and coexistent ovarian endometriotic cysts among the preoperative factors (Table 5A) and for intraoperative findings of adhesions and heavy uterine weight (500 g or more) among the intraoperative/postoperative factors (Table 5B). Previous reports have rarely indicated that hypermenorrhoea directly increases the risk of major intraoperative complications, and information about hypermenorrhoea was retrospectively collected from medical questionnaires and was not based on clearly defined variables. However, as shown in Table 5B, considering that heavy uterine weights (500 g or more) were found to be significant, this suggests that underlying uterine structural abnormalities causing hypermenorrhoea, such as leiomyoma or adenomyoma, might contribute to increased surgical difficulty. Further investigations may be needed to clarify this potential association. Except for hypermenorrhoea, all of these factors are considered to intuitively complicate the surgical procedure, which is consistent with findings from previous reports [8,9,12–20]. In regional medical settings such as at our institution, the factors previously identified in past studies as contributing to the difficulty of TLH are largely consistent [4,8]. Therefore, although differences in case volumes and institutional capabilities may exist, the accumulation and reporting of data appear to be important. In addition, as our institution is a regional medical centre, there is a unique circumstance in that TLH procedures are performed primarily by a single lead surgeon (S.H.). Therefore, this study has the limitations of not being able to evaluate changes in surgical skill or the complexity of cases over a period of approximately 15 years.

In addition, this study represents the first attempt to divide the factors into preoperative and intraoperative/postoperative categories and perform a multivariate analysis separately for each category. Interestingly, among the intraoperative/postoperative factors, the p value for intraoperative findings of adhesions was lower than that for the pathological diagnosis of endometriosis, suggesting that the presence of adhesions may be more important than endometriosis itself. Together with a large leiomyoma (8 cm

or more), which had a *p* value of approximately 0.1 among the preoperative factors, these findings indicate that both the size of the target uterus and the presence of adhesions may play critical roles in safely performing TLH. Even in hospitals with limited medical resources, such as ours, these findings may allow proactive measures, such as requesting extended operating room time in advance or considering the placement of ureteral stents when necessary. As demonstrated above, even in a regional medical setting, it is possible to detect risk factors for major intraoperative complications through collection of case information and analysis of TLH procedures. Given the high likelihood that laparoscopic surgery will increasingly become the standard approach for treating gynaecological diseases even in regional healthcare systems, publishing similar reports may be valuable for various medical institutions. However, there were several limitations in the present study: its retrospective design, potential inconsistencies in record-keeping due to changes in personnel and documentation methods over time, and the fact that the data were derived from a single institution. Furthermore, as this study focused on patients visiting the gynaecology department, information on comorbidities from other medical specialties, such as internal medicine and psychiatry, could not be obtained, which is an additional limitation. As a result, only broad classifications can be made for surgical indications, postoperative diagnoses, major intraoperative complications, and influencing factors. Since the definition of major intraoperative complications may have been somewhat subjective, caution is warranted, although we managed to focus mainly on blood loss and organ injury. In particular, the threshold for blood loss was set at 300 mL instead of the commonly used 500-mL threshold, and there may have been a technical issue in how blood loss was measured at our institution; however, only two patients had blood losses exceeding 500 mL. Therefore, larger-scale analyses with more sophisticated methodologies will be necessary in the future to produce more refined and generalizable results.

5. Conclusions

This study identified the risk factors for major intraoperative complications of TLH, including high BMI (defined as 30 kg/m^2 or more), hypermenorrhoea, coexistent ovarian endometriotic cysts, intraoperative findings of adhesions, and heavy uterine weight (500 g or more). On the basis of these findings, further large-scale studies using more sophisticated statistical methods will be necessary in the future.

Abbreviations

AIS, adenocarcinoma in situ; BMI, body mass index; CA125, carbohydrate antigen 125; CA19-9, carbohydrate antigen 19-9; CI, confidence interval; CIN, cervical intraepithelial neoplasia; CIS, carcinoma in situ; LDH, lactate de-

hydrogenase; MRI, magnetic resonance imaging; OR, odds ratio; STUMP, smooth muscle tumour of uncertain malignant potential; TLH, total laparoscopic hysterectomy.

Availability of Data and Materials

The datasets analysed in this study are not publicly available because of privacy concerns. However, anonymized and processed data are available from the corresponding author upon reasonable request.

Author Contributions

YM and WI designed the research study, collected and processed the clinical data in detail. SH supervised the overall study. SH, SM, RA, WI, KT, YM, JT, and MN were all involved in the initial data collection from patient records and contributed substantially to discussions throughout multiple departmental conferences, where the study design, data interpretation. SH and RA determined the surgical methods and supervised all medical procedures. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The study was conducted in accordance with the Declaration of Helsinki. This study was reviewed and approved by the Human Ethical Committee of Kinan Hospital (trial registration number 283). Informed consent was obtained from all patients.

Conflict of Interest

The authors declare no conflict of interest.

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