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Original Article

Comparison of laparoscopic surgery and conventional laparotomy for surgical staging of patients with presumed low-risk endometrial cancer: The current state of Japan

Imari Deura [a, b], Muneaki Shimada [a, c, *], Yukihiro Azuma [a], Hiroaki Komatsu [a], Kei Nagira [a], Mayumi Sawada [a], Tasuku Harada [a]

[a] Department of Obstetrics and Gynecology, Tottori University Fucluty of Medicine, 36-1 Nishimachi, Yonago, 683-8504, Japan
[b] Department of Obstetrics and Gynecology, St. Marianna University School of Medicine, 2-16-1 Sugeo, Miyamae-ku, Kawasaki, 216-8511, Japan
[c] Department of Gynecology, Tohoku University Hospital, Seiryo-cho 1-1, Aoba-ku, Sendai, 980-8574, Japan

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ABSTRACT

Objective: National health insurance coverage for the laparoscopic staging surgery for patients with stage IA endometrial cancer started from April 2014 in Japan. We conducted this retrospective study to evaluate the surgical outcomes of the laparoscopic surgery for patients with low-risk endometrial cancer compared with those of the laparotomy.

Materials and methods: A total of 120 patients with presumed low-risk endometrial cancer, who were treated at Tottori University Hospital between 2005 and 2016, were eligible for this study. The laparoscopic staging surgery included only the pelvic lymphadenectomy and not the para-aortic lymphadenectomy. We evaluated the discrepancy between preoperative presumption and postoperative diagnosis of recurrent risk factors.

Results: Forty patients underwent the laparoscopic surgery and 80 patients received the laparotomy. The laparoscopic surgery resulted in less intraoperative blood loss and shorter hospital stay. The operative time was significantly longer for the laparoscopic surgery compared with the laparotomy, but this difference was not seen in obese patients with a body mass index $\geq$30 kg/m^2. The type of the surgical procedure did not affect the incidence of perioperative complications. Among 120 patients, 104 (86.6%) were diagnosed as FIGO stage IA, 118 (98.3%) with endometrioid adenocarcinoma grade 1 or 2, and 107 (89.1%) with myometrial invasion depth <50%.

Conclusion: The laparoscopic staging surgery is a feasible and safe alternative to the laparotomy for patients with presumed low-risk endometrial cancer, especially for obese patients. To perform the laparoscopic surgery for patients with stage IA endometrial cancer under the current national health insurance system, it is important to limit the candidates to low-risk disease based on a precise diagnosis before the surgery.

Introduction

Endometrial cancer is one of the most common gynecological malignancies among women in developed countries [1]. In Japan, the number of patients with endometrial cancer has been increased in recent years, and 9673 patients were reported in the 2014 annual report of the Japan Society of Obstetrics and Gynecology (JSGO). Over 50% of Japanese patients with endometrial cancer had International Federation of Gynecology and Obstetrics (FIGO) stage IA disease and were treated with surgery only [2].

The National Comprehensive Cancer Network clinical practice guidelines in oncology recommend the total hysterectomy, the bilateral salpingo-oophorectomy and the surgical staging as primary management of patients with endometrial cancer that is limited to the uterus [3]. The pelvic and/or para-aortic lymphadenectomy is also important for definite surgical staging and for judging the propriety of adjuvant treatment.

* Corresponding author. Department of Gynecology, Tohoku University Hospital, Seiryo-cho 1-1, Aoba-ku, Sendai, 980-8574, Japan. Fax: +81 717 7258.
E-mail address: muneaki.shimada.b7@tohoku.ac.jp (M. Shimada).

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Surgical staging of endometrial cancer has been conducted with the conventional laparotomy. The laparoscopic surgery for endometrial cancer was first reported in the 1990s [4]. The robotic surgery started to diffuse into clinical practice in the 2000s. Worldwide, the usage of minimally invasive surgery for endometrial cancer increased from 9.3% in 2006 to 61.7% in 2011 [5]. Several studies including randomized controlled trials have shown that the laparoscopic surgery is feasible as an alternative approach to the conventional laparotomy for treating patients with early endometrial cancer [6–13]. Compared with the conventional laparotomy, the laparoscopic surgery is reported to be associated with less blood loss, shorter hospitalization, and fewer postoperative complications, without affecting the oncologic outcomes of patients with early endometrial cancer [14].

In Japan, the laparoscopic surgery for gynecological diseases is mainly performed in the field of reproductive medicine and endocrinology. In contrast, the majority of gynecological oncologists have selected the conventional laparotomy for gynecologic malignancies. As a result, the laparoscopic surgery for gynecological malignancies is not common, unlike other developed countries. In April 2014, the laparoscopic surgery for stage IA patients with endometrial cancer was accepted as a medical treatment under the national health insurance system in Japan, and its popularity has gradually increased as an alternative to the conventional laparotomy. The current national health insurance system covers the use of the laparoscopic surgery for the pelvic lymphadenectomy only and not the para-aortic lymphadenectomy, although there is no difference of medical instrument and consumptive material between the two procedures. In Japan, it is common that the patients undertake the medical treatments covered by the national health insurance system. And then, Japanese gynecologic oncologists can perform the laparoscopic surgery for patients with presumed low-risk endometrial cancer only.

We conducted this retrospective study to elucidate the surgical outcomes of the laparoscopic surgery for patients with low-risk endometrial cancer compared with those of the conventional laparotomy. We also evaluated the precision of diagnosis of low-risk endometrial cancer before and after surgical treatment by postoperative pathological findings.

Patients and methods

A total of 120 patients who had low-risk endometrial cancer before the staging surgery were treated at Tottori University Hospital between 2005 and 2016. We retrospectively reviewed the medical data of 120 patients obtained from the medical records. The patients with low-risk endometrial cancer were defined as follows: endometrioid adenocarcinoma grade 1 or 2 that was histologically proven by endometrial biopsy or curettage; less than 50% myometrial invasion as assessed on contrast-enhanced magnetic resonance imaging (MRI); no cervical invasion on hysteroscopy and contrast-enhanced MRI; and no extra-uterine progression, including nodal and distant metastasis, on contrast-enhanced computed tomography.

In our institution, the standard procedure of the staging surgery for low-risk endometrial cancer includes peritoneal cytology, the extended hysterectomy, the bilateral salpingo-oophorectomy, and the pelvic lymphadenectomy. Since September 2014, we generally selected the laparoscopic surgery as the standard surgical procedure covered by the national health insurance for patients with low-risk endometrial cancer. The uterine manipulator was not used generally during the laparoscopic surgery, but we used the uterine manipulator for the patients with severe adhesion in the pelvis or the huge uterus. The fallopian tubes were clipped at commencement of the operation. The specimens were retrieved in a bag to prevent the scatter of tumor cells into the peritoneal cavity. The para-aortic lymphadenectomy was performed if the assessment of the surgical specimen during the surgery suggested FIGO stage IB or more, such as more than 50% myometrial invasion, as mentioned in our previous report [15]. Only one patient underwent the additional para-aortic lymphadenectomy based on the assessment of the surgical specimen during the conventional laparotomy. If the patients who underwent the laparoscopic surgery for low-risk endometrial cancer were eligible for the para-aortic lymphadenectomy, we decided to convert the laparoscopic surgery to the laparotomy to perform the para-aortic lymphadenectomy under the national health insurance system. In the present study, one patient who underwent the conventional laparotomy and the additional para-aortic lymphadenectomy was excluded. The laparoscopic surgery was performed by the same team including a gynecologic oncologist and a laparoscopic expert.

All subjects were staged by the 2008 FIGO staging systems. The postsurgical FIGO stage and identification of the pathological risk group were based on histopathological examination, including histological type, depth of myometrial invasion, lymph node involvement, and peritoneal cytology. Adjuvant chemotherapy was given to patients who had greater than 50% myometrial invasion and/or extra-uterine progression including lymph node involvement. The patients with only positive peritoneal cytology were also candidates for adjuvant chemotherapy.

We compared the surgical outcomes, including operative time, estimated blood loss, number of lymph nodes retrieved, hospital stay after surgery, and the incidence of perioperative complications, by the surgical procedure.

Based on Common Terminology Criteria for Adverse Events (CTCAE) version 4.0, intraoperative complications were assessed [16]. We evaluated postoperative complications which were defined as grade 2 or higher adverse event using the Clavien–Dindo classification [17]. Based on the histological findings after the surgery, we also evaluated the discrepancy between preoperative presumed FIGO stage and postsurgical FIGO stage.

Survival outcomes including the disease-free survival and the overall survival were compared using the Kaplan–Meier method, by the surgical procedure. The significance of the outcomes was tested by the log-rank test. Statistical analysis was performed using GraphPad Prism, version 5.0 for Windows (GraphPad Software, Inc., San Diego, CA, USA). Chi-square test and Mann–Whitney test were used to analyze the outcomes. All calculated p values were two-tailed. $P < 0.05$ was considered statistically significant.

Results

Out of 120 patients with low-risk endometrial cancer, 40 and 80 patients underwent the laparoscopic surgery and the laparotomy, respectively. The patient characteristics are shown in Table 1. Except for the follow-up duration, there were no significant differences in patient characteristics between the laparoscopic surgery and the laparotomy groups. The median follow-up duration of patients who underwent the laparoscopic surgery was shorter than the follow-up of patients who underwent the laparotomy (478 days vs. 2162 days, $P < 0.0001$). With a median follow-up duration of 2162 days, 6 patients with presumed low-risk endometrial cancer had recurrence, and 2 patients died of endometrial cancer out of 80 patients who underwent the conventional laparotomy. In contrast, no patients who underwent the laparoscopic surgery had recurrence, with a median follow-up duration of 478 days. Regarding the disease -free survival and overall survival, Kaplan–Meier analysis showed no significant difference between the two groups (Fig. 1).

The surgical outcomes by the surgical procedure are shown in Table 2. The median operative time of the laparoscopic surgery was

Table 1
Patient characteristics.

	Laparoscopy (n = 40)	Laparotomy (n = 80)	P value
Age (years)	57 (32–77)	57 (33–77)	0.5381
Height (cm)	154 (144–169)	154 (140–168)	0.9444
Weight (kg)	54 (35–133)	55 (36–110)	0.3509
BMI (kg/m^2)	23.6 (15.9–48.8)	23.5 (18.0–44.6)	0.5495
<25	26 (65.0)	49 (61.2)	
25 to <30	10 (25.0)	16 (20.0)	
≥30	4 (10.0)	15 (18.8)	
Parity	2 (0–3)	2 (0–4)	0.8646
0	9 (22.5)	15 (18.8)	
1	6 (15.0)	11 (13.7)	
≥2	25 (62.5)	54 (67.5)	
Previous laparotomy	0 (0–2)	0 (0–3)	0.6402
0	28 (70.0)	57 (71.3)	
1	10 (25.0)	13 (16.2)	
≥2	2 (5.0)	10 (12.5)	
Premenopause	12 (30.0)	22 (27.5)	0.8311
Diabetes mellitus	7 (17.5)	13 (16.3)	1.0000
Follow-up duration (days)	478 (134–1206)	2162 (107–4265)	<0.0001*

Data are presented as median (range) or n (%), *: Significant difference, BMI: body mass index.

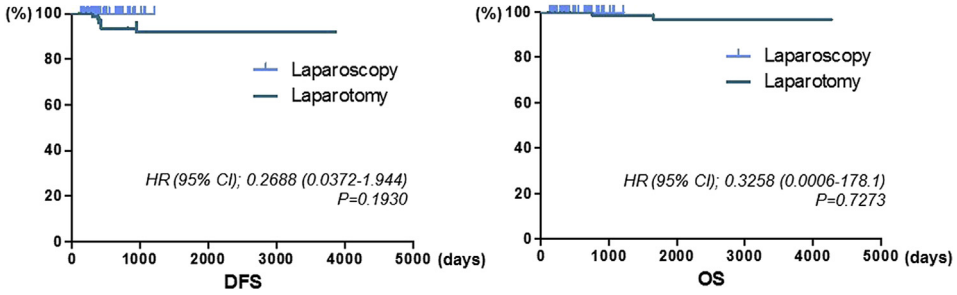

Fig. 1. Disease-free survival and Overall survival. No patients had recurrence after the laparoscopic surgery. Six patients had recurrence and two patients died of endometrial cancer out of 80 patients who underwent the conventional laparotomy. Kaplan–Meier analysis showed no significant difference between the two groups. DFS: Disease-free survival, OS: Overall survival, HR: Hazard ratio, 95% CI: 95% confidence interval.

Table 2
Operative outcomes.

	Laparoscopy (n = 40)	Laparotomy (n = 80)	P value
Operative time (min)	284 (155–497)	248 (110–404)	<0.0001*
BMI < 25	284 (155–497)	235 (110–327)	<0.0001*
BMI 25 to <30	290 (230–355)	257 (140–303)	0.0452*
BMI ≥ 30	287 (248–377)	281 (154–404)	0.8026
Estimated blood loss (ml)	40 (5–560)	370 (22–1170)	<0.0001*
Number of lymph node removed	29 (15–54)	23 (10–65)	0.0058*
Uterine weight (g)	135 (50–425)	145 (60–3400)	0.7066
Postoperative hospital stay (days)	7 (6–23)	11 (8–37)	<0.0001*

Data are presented as median (range) or n (%), *: significant difference, BMI: body mass index.

significantly longer than that of the laparotomy (284 min vs. 248 min, $p < 0.0001$). However, there was no significant difference in operative time (287 min vs. 281 min, $p = 0.8026$) between the procedures in obese patients with BMI more than 30 kg/m^2. Although the operative time of the laparotomy tended to be longer in obese patients ($p = 0.0019$), BMI was not correlated with operative time in those who underwent the laparoscopic surgery ($p = 0.9949$). The estimated blood loss with the laparoscopic surgery was significantly less than that with the laparotomy (40 ml vs. 370 ml, $p < 0.0001$). The number of pelvic lymph nodes retrieved in patients with the laparoscopic surgery was significantly higher than the number retrieved in those who underwent the laparotomy (29 vs. 23, $p = 0.0058$). The length of hospital stay after the laparoscopic surgery was significantly shorter than that after the laparotomy (7 days vs. 11 days, $p < 0.0001$).

Perioperative complications are shown in Table 3. The incidence of intraoperative complications was similar in both groups (10.0% [4/40] vs. 6.3% [5/80], $p = 0.6835$). Among patients who underwent the laparoscopic surgery, two patients had venous injuries and one had bowel or vaginal injury. No patient who underwent the laparoscopic surgery needed a blood transfusion or conversion to the conventional laparotomy. In contrast, among the patients who underwent the conventional laparotomy, two had urinary injuries, two required blood transfusions, and one had a venous injury. The incidence of postoperative complications of the laparoscopic surgery was also similar to the incidence of complications of the conventional laparotomy (12.5% [5/40] vs. 18.8% [15/80], $p = 0.4468$). One patient who underwent the repair of the rectal injury during the laparoscopic surgery had pelvic infection and lower limb venous thrombosis which treated using oral

Table 3
Perioperative complications.

	Laparoscopy (n = 40)	Laparotomy (n = 80)	P value
Intraoperative complications			
Urinary injury	0	2 (2.5)	
Bowel injury	1 (2.5)	0	
Venous injury	2 (5.0)	1 (1.3)	
Vaginal injury	1 (2.5)	0	
Blood transfusion	0	2 (2.5)	
Conversion to laparotomy	0	–	
Total	4 (10.0)	5 (6.3)	0.4791
Postoperative complications			
Wound complications	0	4 (5.0)	
Infection	2 (5.0)	3 (3.8)	
Venous thrombosis	2 (5.0)	4 (5.0)	
Ileus	0	3 (3.8)	
Neurogenic bladder	0	1 (1.3)	
Hematoma	0	1 (1.3)	
Lymphangitis	1 (2.5)	3 (3.8)	
Others	1 (2.5)	2 (2.5)	
Total	5 (12.5)	15 (18.8)	0.4468

Data are presented as n (%).

anticoagulant for three months after the surgery. Only one patient in each group suffered from a grade 3 postoperative complication as determined by the Clavien–Dindo classification. We treated the patient who underwent laparoscopic surgery for the extrapelvic vein thrombosis with temporary inferior vena cava filter for one month and oral anticoagulant for six months. The patient in the group of the laparotomy needed re-operation for wound infection. Among the patients who underwent the laparoscopic surgery, one patient suffered from lower limb neurological disturbance, but there was no wound dehiscence or ileus. Relatively common postoperative complications after the conventional laparotomy were the following: wound dehiscence (5.0% [4/80]), lower limb venous thrombosis (5.0% [4/80]), infections (3.8% [3/80]), ileus (3.8% [3/80]), and lymphangitis (3.8% [3/80]). Regarding lower limb venous thrombosis, all patients were treated with oral anticoagulants for six months after the surgery. There were many patients with lymphedema of the Clavien–Dindo classification grade 1, which was not suitable for the definition of postoperative complication. The specialists for lymphedema assessed 40 patients who underwent the laparoscopic surgery and 36 patients who received the laparotomy using the classification of International Society for Lymphedema. The incidence rate of lower limb lymphedema was 40% in the laparoscopic group and 65.7% in the laparotomy group, although about half of the patients were not aware of their lymphedema.

Out of 120 patients who were diagnosed with low-risk endometrial cancer before the staging surgery, the examination of postsurgical pathological findings revealed that 104 patients (86.6%) had low-risk endometrial cancer (Table 4). The remaining 16 patients were divided into the following postsurgical FIGO stages: 10 were stage IB, one was stage II, 4 were stage III, and one was stage IV. One hundred and eighteen patients (98.3%) had grade 1 or 2 endometrioid adenocarcinoma, and 107 (89.1%) showed myometrial invasion with depth < 50%. Out of 120 patients with presumed low-risk endometrial cancer, four patients (3.3%) had pelvic lymph node involvement. Based on the postsurgical examination of pathological findings, 18 patients received adjuvant chemotherapy because of intermediate or high risk factors. Three stage IA patients also underwent adjuvant chemotherapy because of positive peritoneal cytology.

Discussion

As shown by the results of several randomized controlled trials and the current study, the laparoscopic surgery was associated with longer operative time, less intraoperative blood loss, and shorter hospitalization compared with the conventional laparotomy [14,18]. In our study, the differences regarding variables of operative time, number of lymph node removed and postoperative hospital stay may seem to be small, but there were significant

Table 4
Pathological outcomes.

		Total (n = 120)	Laparoscopy (n = 40)	Laparotomy (n = 80)	P value
FIGO stage	IA	104 (86.6)	33 (82.5)	71 (88.7)	0.3970
	non IA	16 (13.4)	7 (17.5)	9 (11.3)	
	IB	10 (8.3)	5 (12.5)	5 (6.2)	
	II	1 (0.9)	0	1 (1.3)	
	III	4 (3.3)	2 (5.0)	2 (2.5)	
	IV	1 (0.9)	0	1 (1.3)	
Histological type	Endometrioid G1/G2	118 (98.3)	40 (100)	78 (97.5)	1.0000
	Others	2 (1.7)	0	2 (2.5)	
Myometrial invasion	<50%	107 (89.1)	34 (85.0)	73 (91.2)	0.3545
	≥50%	13 (10.9)	6 (15.0)	7 (8.8)	
Lymph node metastasis	+	4 (3.3)	1 (2.5)	3 (3.8)	1.0000
	–	116 (96.7)	39 (97.5)	77 (96.2)	
Peritoneal cytology	+	3 (1.5)	1 (2.5)	2 (2.5)	1.0000
	–	117 (98.5)	39 (97.5)	78 (97.5)	

Data are presented as n (%), FIGO: Federation International Gynecologic Oncology.

differences statistically. In general, longer operative time is a disadvantage of the laparoscopic surgery, but the type of the surgical procedure did not affect the operative time in obese patients whose BMI was more than 30 kg/m^2 in the present study. Obesity is one of the common risk factors for the development of endometrial cancer. Additionally, obese women have higher surgical risk in the staging surgery for early endometrial cancer [19]. Although obesity was considered to be a contraindication for the laparoscopic surgery, recent reports suggested that the laparoscopic surgery for patients with endometrial cancer has advantages over the conventional laparotomy, even in obese patients [20,21]. A Korean report, which showed that there was no difference in operative time between the laparoscopic surgery and the conventional laparotomy for obese patients, supports our result [21]. In obese women, the disadvantage of longer operative time in the laparoscopic surgery may be offset. As some previous reports showed, the laparoscopic surgery was associated with more lymph nodes number compared with the conventional laparotomy in our study. We tried to dissect the pelvic lymph nodes of the same boundary in the two procedures. It may be the reason of more lymph nodes number in the laparoscopic group that we could get a clear view of the pelvic deep site using the laparoscopy. The uterine size is also a key factor for the laparoscopic procedure. The huge uterus is associated with the space constraint and the difficulty of transvaginal retrieval of the specimen. In our study, the heaviest weight of the uterus was 425g in the laparoscopic group. The uterine manipulator was used to make the space in the pelvis. The uterus with adenomyosis was bisected in the bag and retrieved trans-vaginally. At the end of the surgery, the massive bleeding of vaginal laceration was detected. It is important to recognize that the huge uterus may obstacle the laparoscopic surgery.

According to meta-analysis data, patients who underwent the laparoscopic surgery had a similar incidence of intraoperative complications compared with those who underwent the conventional laparotomy [18]. Our study also showed no difference in the incidence of intraoperative complications between the laparoscopic surgery and the conventional laparotomy. The rate of conversion from the laparoscopic surgery to the laparotomy was reported to range from 0% to 25.8% [7,11]. No conversion to the laparotomy occurred in the present study. The LAP 2 study showed that the conversion rate was 25.8% and the risk of conversion rose with the increase in BMI [11]. The median BMI of our patients of 23.6 kg/m^2 was lower than the BMI of 28.0 kg/m^2 of patients in the LAP2 study. Severe adhesion sometimes causes the conversion of the laparoscopy to the laparotomy. In our study, the rectal injury occurred in a patient with the obliteration of the cul-de-sac during the laparoscopic surgery. However, the conversion to the laparotomy was not needed by using the uterine manipulator to perform the lysis of the adhesion.

The laparoscopic surgery resulted in fewer postoperative complications in comparison with the conventional laparotomy [18]. The LAP2 study also showed that there were fewer postoperative complications with the laparoscopic surgery [11]. However, the current study showed similar incidence of postoperative complications with either surgical approach. A possible reason is that the definition of postoperative complication was defined as grade 2 or higher adverse event using the Clavien–Dindo classification in this study, whereas the LAP2 study used CTCAE. The laparoscopic surgery was associated with lower incidence of wound complications and ileus after the surgery compared with the conventional laparotomy [1,11,20,22–24]. In the present study, there were no wound complications or ileus, but one case of obturator nerve injury occurred, which was caused by placement of the patient in the lithotomy position in the laparoscopic surgery.

The Japanese treatment guidelines for uterine body neoplasm, which was updated by JSGO in 2013, recommend both pelvic and para-aortic lymphadenectomy for patients with intermediate/high-risk endometrial cancer. Mariani et al. reported that 16% of 281 patients with high-risk endometrial cancer had isolated para-aortic nodal involvement [25]. In Japan, the national health insurance covers the laparoscopic surgery for patients with presumed stage IA endometrial cancer only, and it does not cover the laparoscopic para-aortic lymphadenectomy for patients with endometrial cancer. Therefore, we limited the candidates for the laparoscopic surgery to those with presumed low-risk tumor and omitted the para-aortic lymphadenectomy. In order to omit the para-aortic lymphadenectomy and avoid the conversion to the laparotomy from the laparoscopic surgery, we should carefully perform the preoperative examination to identify patients with a low-risk tumor.

Regarding histological type, only 2 cases had inconsistent results among the 120 cases of the present study, which were serous and adenosquamous carcinoma. All patients who underwent the laparoscopic surgery had the same histological results before and after the surgery. In the laparoscopic group, all preoperative histological specimens were obtained using the total endometrial curettage. On the other hand, among 80 patients who underwent the laparotomy, the total endometrial curettage was performed in only 23 patients (28.8%). Out of 120 cases, only two (1.7%) had discordance between the pre- and post-laparotomy diagnoses of histological type, and both patients did not undergo the total endometrial curettage. According to the Japanese treatment guidelines for uterine body neoplasm, which was updated by JSGO in 2013, the rate of agreement between preoperative total endometrial curettage and postoperative pathological examination ranges from 35% to 96%. Therefore, accurate histological diagnosis before the surgery should be obtained in order to select the appropriate candidates for the laparoscopic surgery.

In this study, out of 120 patients, 13 (10.9%) had greater than 50% myometrial invasion on postoperative histological evaluation. Before the surgery, the depth of myometrial invasion was evaluated using contrasted-enhanced MRI as we previously reported [15]. A meta-analysis showed the efficacy of contrasted-enhanced MRI for preoperative assessment of myometrial invasion [26]. However, the accuracy of determining the depth of myometrial invasion is limited by polypoid tumor, distension of the endometrial cavity by pyometra, and the presence of leiomyoma [27,28]. We reported that MRI assessment tended to underestimate the depth of myometrial invasion, particularly in the patients with a grade 3 tumor [15]. Additionally, it may be difficult to evaluate myometrial invasion at tubal corneal sites of the uterus by MRI. In our series, out of 13 patients with greater than 50% myometrial invasion, 11 patients had factors that made it difficult to evaluate myometrial invasion before the surgery: one had type II endometrial cancer of serous adenocarcinoma, one had leiomyoma, 4 had adenomyosis, and 5 had invasive tumor at tubal corneal sites.

The GOG 33 study reported that pelvic nodal involvement was detected in less than 5% of patients with low-risk endometrial cancer [29], which was similar to the incidence of pelvic lymph node involvement in the current study (3.3% [4/120]). Regarding four patients with pelvic lymph node involvement, the histological type of all patients was endometrioid adenocarcinoma grade 1, but 2 patients had deep myometrial invasion. Therefore, the physician should assess myometrial invasion precisely to identify low-risk endometrial cancer before the laparoscopic surgery. We are unable to use the laparoscopic surgery for para-aortic lymphadenectomy, and a method to identify the patients without lymph node metastasis is highly required. Recently, Yoshida et al. reported the biomarkers associated with lymph node metastasis [30]. It may raise the possibility of pre-operative diagnosis to select the appropriate candidates for the laparoscopic surgery in Japan.

There are several limitations to our study. First, the current study was a retrospective analysis. The number of patients was too

small to compare the surgical outcome between the laparoscopic surgery and the laparotomy, although this study included patients who underwent the surgical treatment for the same disease at the same institution. Second, the follow-up duration of the laparoscopic group was too short to evaluate the oncologic outcomes in comparison with those of the conventional laparotomy. There was no patient with recurrence after the laparoscopic surgery although the median follow-up duration was 478 days. It is difficult to compare the recurrence rate between the two groups because the median follow-up durations were totally different (134–1206 days vs. 107–4265 days). Additionally, the median disease-free survival of 6 patients with recurrence after laparotomy was 414 days. Many authors already reported the advantages and oncologic outcome of patients with gynecologic malignancies [14,31]. Unfortunately, Japanese women had never received the benefit of minimum invasive surgery for gynecologic malignancies until health insurance covered the laparoscopic surgery for patients with stage IA endometrial cancer. Although there is a lot of research about the feasibility and safety of the laparoscopic surgery for the patients with endometrial cancer, few studies regarding to Japanese patients have been reported. It is true that our study has the limitations. In Japan, the national circumstance of the laparoscopic surgery for gynecological malignancies is different from another country. It must be significant to report the assessment of endometrial cancer patients who underwent laparoscopic surgery at an institute in Japan. In conclusion, the laparoscopic staging surgery is feasible and a safe alternative to the laparotomy for presumed low-risk endometrial cancer. The laparoscopic surgery may have advantages over the laparotomy, especially in obese patients. To perform the laparoscopic surgery for patients with stage IA endometrial cancer under the current national health insurance system, it is important to limit the candidates to low-risk disease based on a precise diagnosis before the surgery, especially in Japanese institutions that will adopt the laparoscopic surgery in the future.

Conflict of interest

The authors have no conflicts of interest relevant to this article.

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