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Long-term follow-up after laparoscopic management of endometrial cancer: a 15-year cohort study

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Abstract The objective of this study was to evaluate long-term oncological outcomes of laparoscopic management of endometrial carcinoma (EC) in a large series of consecutive patients from two referral cancer centres. The study is a large retrospective study with 15-year follow-up. The clinical records of 207 consecutive women with clinical stage I EC managed by laparoscopy between 1990 and 2005 were reviewed. Laparoscopy included peritoneal washing, inspection of abdominal cavity, total laparoscopic hysterectomy + bilateral salpingo-oophorectomy and pelvic/para-aortic lymphadenectomy depending on the preoperative histology or frozen section results. Data collected included conversion rate, operative time, hospital stay, surgical complications, FIGO 1988 stage and 5-year survival. Laparoscopic procedures were converted to laparotomy in nine (4.3%) cases. Mean operative time was 173.2 min (70–300 min). Mean hospital stay was 5 days. The mean number of lymph nodes removed was 10 (2–25). Lymphadenectomy was considered not feasible in 20 cases (12.9%) due to technical difficulties. Intraoperative and postoperative complications were seen in 11 (5.6%) and 13 (6.6%) women, respectively. Histopathological results led to upstaging in 11.6% of cases. After a mean follow-up of 74.8 months (14–204 months), 5-year cause-specific and disease-free survival rates were 93.2% and 89.3%, respectively. Twenty-one (10.6%) patients developed recurrences. No port site metastases were identified. Laparoscopic management of EC is feasible, reproducible and does not worsen patient prognosis. It allows comprehensive surgical staging and the option of lymphadenectomy in a single surgical procedure without compromising the oncological radicality required. Our results show minimal morbidity and similar long-term outcomes than those obtained by laparotomy in the literature.

Keywords Endometrial cancer · Laparoscopy · Long-term follow-up · Survival

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Background

Endometrial cancer (EC) is the most common gynaecological malignancy in developed countries, with more than 40,000 cases estimated to be diagnosed in 2009 in the USA [1] and 5,800 new cases diagnosed in 2005 in France [2].

Most women with EC develop postmenopausal bleeding, facilitating early diagnosis. Currently, more than 70% of cases are diagnosed whilst the tumour is confined to the uterus (clinical stage I) [3]. In such cases, surgery is the primary treatment.

According to the International Federation of Gynecology and Obstetrics (FIGO) [4], the staging surgery includes

peritoneal washings, total hysterectomy and bilateral salpingo-oophorectomy. Although pelvic and para-aortic lymphadenectomy are recommended [5], they remain controversial.

In most centres worldwide, this surgical staging is more commonly performed via a midline vertical infraumbilical incision. Since the early 1990s, all the steps required for a comprehensive surgical staging are feasible by laparoscopy [6–10].

After these earliest reports [11–13], several retrospective studies [14–25] and recent trials [26–33] have demonstrated that laparoscopic staging of EC is feasible and safe, and results in shorter hospital stays and improved quality of life. Despite these established short-term advantages, there is no agreement about the survival benefit of laparoscopic staging procedures. The main reason for this is that survival data from well-designed prospective studies remain insufficient due to short-term follow-up [34]. Therefore, even if long-term outcomes after laparoscopic staging seem to be comparable to abdominal staging [18–22], they are not well documented yet.

The purpose of this study was to present our experience and both surgical and oncological outcomes for a large series of patients with early-stage EC managed completely via laparoscopy with a long-term follow-up.

Patients and methods

The medical records of 207 consecutive patients with early-stage (clinical stage I) EC who underwent laparoscopic staging at Clermont-Ferrand University Hospital and Jean Perrin Cancer Centre between February 1990 and December 2005 were retrospectively reviewed. Cases were identified from databases of both centres. Institutional Review Board exemption was granted by both centres because of the retrospective nature of this study.

Data collected included patient age, parity, menopausal status, body mass index (BMI), operating time, conversion to laparotomy, blood transfusion, intraoperative and postoperative complications, hospital stay, histological grade, number of lymph nodes yielded, surgical stage (FIGO 1988), adjuvant therapy, duration of follow-up and development of disease recurrence, site of recurrence or death.

It should be noted that although the FIGO staging was changed in 2009 [35], this change occurred after the creation of our database. Therefore, all our patients were staged and managed according to the old system. Moreover, most studies of laparoscopic management of EC, including the most recent trials [32–34], are based on the old system. Additionally, since no prognostic difference between the two systems for stage I EC has been noted [36], the old system is used in this report, unless otherwise stated.

Preoperative workup included pelvic examination, chest X-ray, standard preoperative blood analysis and abdomino-pelvic MRI in most of the cases.

We offered laparoscopy as first-line treatment to all patients, and during the study period, we performed primary laparotomy only in patients for whom laparoscopic approach was contraindicated.

Contraindications for laparoscopy included: severe cardiopulmonary disease precluding the Trendelenburg position, anaesthetic contraindication for pneumoperitoneum, limited vaginal access and/or a bulky uterus where vaginal removal might require morcellation, presence of gross adenopathies at MRI (more advanced disease is suspected) and severe obesity (BMI≥40) in the first 4 years of the study period. Previous laparotomy was not considered a contraindication for laparoscopy.

In all cases, laparoscopy started with a meticulous inspection of all pelvic and abdominal structures. In the event of evidence of peritoneal spread, we converted to laparotomy for completion of debulking and staging. The laparoscopic procedure included: peritoneal washing, total laparoscopic hysterectomy with bilateral salpingo-oophorectomy (TLH/BSO) and pelvic ± para-aortic lymphadenectomy according to the results of frozen section or preoperative histology. Operating times were recorded from the creation of the pneumoperitoneum to skin closure.
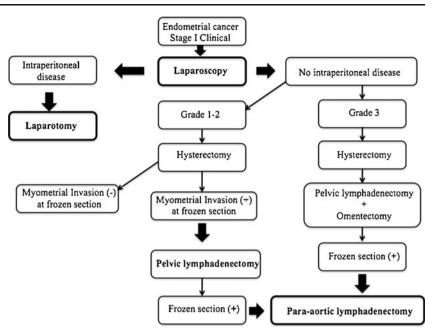
Pelvic lymphadenectomy was performed for all women with myometrial invasion, grade 3 tumours and those with high-risk histology (e.g. papillary serous or clear cell adenocarcinoma; Fig. 1).

Our technique of TLH/BSO was described previously [37]. To display vaginal fornices and uterine vessels, we routinely used a uterine manipulator (Clermont-Ferrand, Karl Storz, Tuttlingen, Germany) with a smooth tip (no screw thread) specially designed for oncological purposes. Although the coagulation of the tubes before uterine cannulation is not a systematic practice in our department, it was made in some cases according to surgeon preference.

Briefly, pelvic lymphadenectomy consisted of complete skeletonization of common, internal and external iliac vessels and harvesting of all fatty and lymphatic tissue above and below the obturator nerve. Nodes yielded were routinely retrieved in an endoscopic bag and sent to the pathologist for frozen section. Para-aortic lymphadenectomy extended to the renal vessels was performed only if the pelvic nodes were shown to be involved at frozen section (Fig. 1).

All surgeries were performed by 11 surgeons who were assisted by residents or fellows.

Adjuvant treatment was discussed together with radiotherapists, pathologists, and medical oncologists in a multidisciplinary meeting according to the protocol shown in Fig. 2. Adjuvant whole pelvic radiation ± brachytherapy

Fig. 1 Management protocol followed during the whole study period

was recommended for all patients with grade 3 tumours and for those with surgical stage Ic or IIIa (positive cytology). Vaginal cuff brachytherapy was prescribed for patients with stage Ib grade 1/2. Patients with IIIa (adnexal involvement) and those with more advanced disease received extended field pelvic radiation and, in some cases, chemotherapy.

Follow-up visits were scheduled 1 month after surgery and then every 3 months for the first 2 years, and every 6 months thereafter. Recurrence-free and overall survival were estimated using Kaplan–Meier analysis, considering relapse or death as censoring events, respectively.

Data processing and statistical analysis were performed with SAS statistical software V8.02 (SAS Institute, Cary, NC, USA). Statistical significance was established at $p<0.05$.
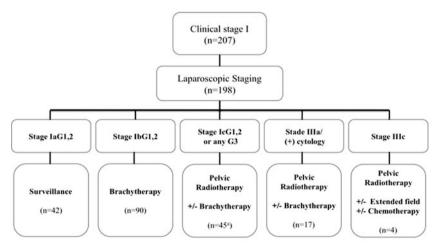
Results and findings

Among 207 patients with clinical stage I EC managed by laparoscopy, 52 (25.1%) were obese (BMI≥30 kg/m^2), 36 (17.3%) were nulliparous, and 56 (27%) were ≥70 years old. Patient characteristics and clinical data are summarised in Table 1.

The laparoscopic procedure could successfully be completed in 198 (95.6%) patients, but it was converted to laparotomy in nine (4.3%) patients.

Reasons for conversion were the following: extrauterine/ intraperitoneal disease ($n=4$), several pelvic and intraperitoneal adhesions precluding pelvic visualisation ($n=2$), severe subcutaneous emphysema and uncontrollable hypercapnia after hysterectomy (converted for lymphadenectomy, $n=1$),

Fig. 2 Postoperative management and different adjuvant therapies administered during the study period according to surgical stage and grade

^{a} Included 1 patient with stage IIaG1, and one with stage IIbG1

Table 1 Clinical characteristics (n=207)

Mean age (range)	63 years (36–88)
Age≥70 years	56 (27%)
Mean BMI (kg/m^2, range)	26.2 (16–56)
Obesity (BMI≥30)	52 (25.1%)
Nulliparity	36 (17.3%)
Postmenopausal status	184 (88.8%)

failure of pneumoperitoneum creation (BMI=32 kg/m^2, previous bowel resection, n=1) and difficult exposure due to morbid obesity (BMI=56 kg/m^2, n=1). These patients were excluded from the analysis.

Pelvic node dissection was performed according to our protocol in 87.1% of cases. The procedure was deemed not feasible in 20 (12.9%) cases because of morbid obesity (n=7), inadequate ventilation due to pneumoperitoneum and Trendelenburg position (n=7), several adhesions attributed to previous surgery (n=2), and gas embolism (n=1).

Three patients underwent para-aortic lymphadenectomy. For the first case, this was because of positive pelvic nodes at frozen section. The final histology reported three of ten metastatic para-aortic nodes. The second case was a patient with a clear cell tumour in which para-aortic lymphadenectomy was decided by the surgeon and eight negative para-aortic nodes were identified. The third case of lymph node dissection extended to the para-aortic chains was due to a false positive result of frozen section (endosalpingiosis).

Operative and postoperative complications occurred in 11 (5.6%) and 13 (6.6%) patients, respectively.

The mean operative time was 173.2 min (range 70–300 min) for TLH and pelvic lymphadenectomy, including the time waiting for frozen section evaluation. The mean length of hospital stay was 5 days (range 2–16 days). Surgical outcomes and complications are shown in Table 2.

Definitive surgical stage and grade are shown in Table 3. As a result of surgical staging, 23 patients (11.6%) were upstaged. Interestingly, there were two patients with stage IIIc tumours and positive pelvic lymph nodes for whom para-aortic lymphadenectomy was not performed because pelvic lymph nodes were negative at frozen section.

Reasons for upstaging were as follows: pelvic and/or para-aortic nodal metastases (n=3), positive cytology (n=13), adnexal metastases (n=3) or both (n=2). Two patients were upstaged due to cervical involvement. Adjuvant therapy was administered to 156 patients (Fig. 2). The mean follow-up was 74.8 months (range 14–204 months). At the last follow-up (March 2010), 21 (10.6%) women had recurrences, with a median recurrence interval of 35 months (range 6–143 months). No port site recurrences occurred in this series. Unexpectedly, one patient presented a delayed recurrence at 143 months after surgery. The sites of recurrence are summarised in Table 4. In order to be honest, we included among the recurrences two patients who probably had metastatic disease at the time of primary surgery. In these cases, preoperative evaluation could have led to understaging the disease (stage >I), given recurrence site and time since surgery (Table 4). Thirteen patients died from recurrent disease. Among patients with surgical stage I, one patient who had stage Ib clear cell carcinoma developed an early peritoneal recurrence 7 months after surgery. She died 24 months later from peritoneal carcinomatosis.

Overall and cause-specific survival rates were 88.9% and 93.2%, respectively (p=0.07, NS; Fig. 3a). The disease-free 5-year survival rate was 89.3% (Fig. 3b).

Discussion

Despite its retrospective design, this study remains an interesting data source. With its large series of consecutive patients with early-stage EC treated by laparoscopy over a long period of 15 years, this study in fact provides significant information about long-term survival and complications for these patients.

Surgical approach of endometrial cancer: the feasibility of laparoscopy

In agreement with several previous studies [14–33], our data support the statement that laparoscopic approach is feasible, safe and reproducible, offering patients all the advantages of a minimally invasive technique. Therefore, it seems that the only weakness in laparoscopic staging of EC is the increased operative time [22, 26, 30, 32]. We think that this is a reasonable concession given the lower morbidity, shorter hospital stay and improvement in quality of life [31–33]. These are major issues in EC patients who are frequently elderly, obese and with comorbid conditions. It should be noted that even if the mean hospital stay in our series was longer than previous reports [14–17], this can be explained by the fact that during the first 4 years of the study, patients stayed in the hospital for longer because we were more apprehensive about this "new" procedure. Nowadays, most patients are discharged on the second day after TLH, or even earlier in selected cases [38].

Vaginal hysterectomy has been reported as a safe, simpler and faster technique with low morbidity for the treatment of stage I EC in obese and elderly patients and those with significant coexisting medical conditions for whom total abdominal hysterectomy might be difficult or risky [39, 40]. However, the major objection to this approach is that it does not allow performing the complete

Table 2 Summary of surgical outcomes and complications

Mean operative time (TLH + pelvic lymphadenectomy)	173.2 min (70–300)	Intraoperative complications		11 (5.6%)
Conversion rate	9 (4.3%)	Haemorrhage	1	Controlled vaginally
Mean hospital stay (days)	5 (2–16)	Bladder injury	1	Treated laparoscopically during operation
Mean return bowel activity (days)	1.4 (1–3)	Subcutaneous emphysema	5	One case required late conversion to perform lymphadenectomy
Recurrence rate	21 (10.6%)	Gas embolism	1	Operative time 70 min. Favourable outcome
Para-aortic lymphadenectomy	3 (1.5%)	Blood transfusion	3	
Mean no. of pelvic nodes	10 (2–25)	Postoperative complications		13 (6.6%)
Lymphadenectomies indicated and not performed	20 (12.9%)	Hemoperitoneum	1	Required laparotomy and blood transfusion 48 h after surgery
Positive cytology	15 (7.6%)	Pulmonary embolism	1	Discharged in good conditions
Upstaged patients	23 (11.6%)	Vesicovaginal fistula	1	3 months after surgery. Managed laparoscopically
Cause-specific survival	93.2%	Intestinal sub-oclussion	1	Requiring readmission and medical treatment 3 weeks after surgery
Median recurrence-free interval	35 months	Phlebitis	2	
Mean follow-up	74.8 months	Port site hernia	1	
Overall survival	88.9%	Obturator neuropathy	3	Resolved spontaneously.
Disease-free survival	89.3%	Lymphedema/Lymphocyst	2	Resolved spontaneously.
Adjuvant therapy	156 (78.8%)	Vaginal cuff dehiscence	1	Previous radiotherapy. Cuff dehiscence 6 years after surgery. Re-closure without complications

surgical staging recommended by FIGO [4] to be carried out. Moreover, inspection of the abdominal cavity and peritoneal washings are not possible and, frequently, the ovaries cannot be removed [39].

In this study, more than 50% of the women were elderly or obese. We have shown that laparoscopy is an adequate approach for these patients since all FIGO guidelines with regard to surgical staging can be met by laparoscopy.

During the study period, our surgical technique underwent no major changes and the complication rate remained lower than reported in previous studies [41] despite the higher number of surgeons. This is very important since it

Table 3 Distribution of patients according to stage and histological grade

FIGO 1988 surgical stage	No. of patients (%)	Detail (%)	FIGO 2009 surgical stage
Ia	43 (21.7)		Stage Ia: 164 (82.8%)
Ib	96 (48.5)		Stage Ib: 36 (18.1%)
Ic	36 (18.2)		
IIa	1 (0.5)		Stage II: 1 (0.5%)
IIb	1 (0.5)		
IIIa	18 (9.1)	Positive cytology: 13 (6.6) Adnexal invasion: 3 (1.5) Both: 2 (1)	Stage IIIa: 5 (2.5%)
IIIc	3 (1.5)		Stage IIIc1: 2 (1%) Stage IIIc2: 1 (0.5%)
Grade			
1	154 (77.3)		
2	24 (12.1)		
3	21 (10.6)		

Table 4 Recurrence site and time to recurrence among 21 patients who relapsed

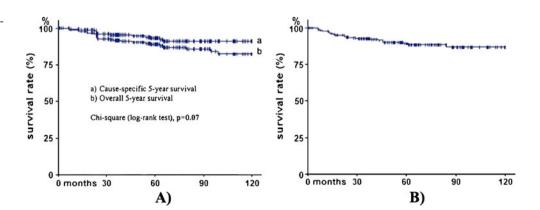| Case	1988 FIGO stage/grade	Recurrence site(s)	Time to recurrence (months)	Status
1	IbG3 (clear cell)	Peritoneal carcinomatosis	7	Deceased
2	IIIaG3, (+) cytology, (+) adnexa	Vagina	143	Alive
3	IIaG1	Vagina + central pelvis	58	Alive
4	IcG1	Aortic lymph nodes + liver + lungs	61	Alive
5	IIIaG1, (+) cytology	Central pelvis + bone	12	Deceased
6	IIIaG1, (+) cytology	Vagina + lungs	9	Deceased
7	IcG1	Liver + lungs	84	Alive
8	IbG1	Lungs	45	Deceased
9	IIIaG1, (+) cytology	Peritoneum	24	Deceased
10	IbG1	Central pelvis	42	Deceased
11	IaG1	Vagina	22	Alive
12	IbG2	Lungs	37	Deceased
13	IIIaG1, (+) cytology	Bone	15	Alive
14	IIIaG3, (+) cytology	Liver + lungs	13	Deceased
15[a]	IIIaG3 (clear cells), (+) adnexa	Aortic lymph nodes + liver	6	Deceased
16[a,b]	IIIcG1	Aortic lymph nodes	6	Alive
17	IaG1	Vagina + peritoneum	13	Deceased
18	IcG1	Central pelvis + aortic lymph nodes + lungs	29	Deceased
19	IbG3	Central pelvis	45	Alive
20	IcG3	Peritoneum	22	Deceased
21	IIIaG3, (+) cytology	Peritoneum + liver + lungs	16	Deceased

[a] Probably presence of metastatic disease at time of surgery. Clinically understaged

[b] Para-aortic lymphadenectomy not performed. False (−) frozen section of pelvic nodes

underlines the importance of using a standardised surgical technique in order to reduce complications and achieve procedure reproducibility [42].

Despite the claim that use of uterine cannulation is not necessary [30] and that it may led to dissemination of tumoral cells [43, 44], there is no evidence that uterine manipulation during laparoscopy increases the risk of cell spillage in the pelvic cavity [27, 28, 45]. To date, the prognostic importance of isolated positive cytology remains uncertain [46]. In fact, the new FIGO staging system

deleted cytology as a variable dictating more advanced disease [35]. In this study, the rate of positive cytology and vaginal recurrence was comparable with those reported in previous studies in which patients were treated by laparotomy [47] or those in which TLH was performed without uterine cannulation [48]. Moreover, several studies comparing laparotomy with laparoscopy have shown that the rate of positive cytology was identical between the groups [41] even if the uterus was cannulated [24, 27]. Furthermore, in our experience, the uterine manipulator is essential

Fig. 3 a Overall and cause-specific 5-year survival rates projected by Kaplan–Meier curves (log-rank test, $p=0.07$, NS). **b** Disease-free 5-year survival curve

to improve exposure and prevent ureteral complications [37]. This is important since impaired exposure is a major reason for conversion [32], especially in obese women [49].

The rate of conversion to laparotomy was 4.3% in this series. It compares favourably with previous reports [24, 31, 32] and is consistent with the conversion rates reported for single-centre studies (<10%) [15, 20, 23] Unexpectedly, the recently published LAP-2 multicentric randomised controlled trial (RCT) [32] reported a conversion rate of 26%. This surprisingly high rate of conversion is probably more representative of the reality, without the bias of a specialised centre. However, it may be influenced by the higher prevalence of obesity among women in the USA compared with Europe [50] and the need for comprehensive surgical staging (including pelvic and para-aortic lympha-denectomy) to meet the study protocol [32].

These features make the LAP-2 protocol not fully applicable in many centres around the world where systematic pelvic and para-aortic lymphadenectomy is not the standard treatment for early-stage EC [22, 24, 27, 28, 41, 51].

Lymphadenectomy and endometrial cancer: the controversy

Despite the fact that lymphadenectomy is recommended as a standard component of surgical staging of EC [4, 5] and that there is agreement about its prognostic value, it remains a variable practice from institution to institution. Surveys of major gynaecological cancer centres demonstrate these differing approaches to management, with 54% of American centres [52] and 24% of centres in Western Europe [53] performing systematic lymphadenectomy for all women. Therefore, the reality is that about 50% of women still do not undergo lymphadenectomy at the time of their primary surgery [54].

The therapeutic benefit of lymphadenectomy is based on several retrospective studies that reported a significant survival advantage for patients undergoing lymph node dissection [54–58]. Conversely, and according to recent data, the surgical strategy for management of EC could undergo major changes. Two randomised trials have concluded that there is no benefit in performing systematic lymphadenectomy for clinical stage I EC in terms of overall, disease-specific and recurrence-free survival [59, 60]. In this context, older studies [61, 62] have demon-strated that in low-risk patients (endometrioid histology, grade 1 or 2, and without or with tumours invading <50% of the myometrium), the risk of nodal metastases is negligible. Furthermore, in the absence of positive pelvic lymph nodes or other risk factors associated with a poor prognosis, the probability of para-aortic lymph node metastases is extremely low [62, 63]. In this study, the number of patients with positive pelvic nodes was lower than in previous reports [23, 26, 59, 60, 64], but this could be explained by the fact that most of the patients in our series had low-risk tumours.

Recently, Mariani et al. [65] analysed the extension of lymphatic spread among 422 patients with clinical stage I EC. The authors reported that in patients with high-risk disease, the rate of lymphatic metastases above the inferior mesenteric artery was 16%, even with negative pelvic nodes. On the contrary, a recent paper including 1,942 patients showed that the risk of isolated para-aortic metastases was 1%, even with high-risk tumours, continu-ing the controversy concerning this issue [66]. In this study, most patients had low-risk tumours, and only three women underwent para-aortic lymphadenectomy. Therefore, the numbers are insufficient to draw any conclusion on the risk of isolated para-aortic metastases.

Based on the growing evidence suggesting that lympha-denectomies are not appropriate for low-risk patients [67] and the fact that the procedure is not totally free of complications [67, 68], the most rational approach is to adapt the indication of lymphadenectomy according to the patient's characteristics (age, performance status, comorbid conditions) and the histological characteristics of the tumour at preoperative biopsy or frozen section.

In our experience, as in others [69, 70], frozen section is a reliable method for triage of patients for lymphadenec-tomy, with a low rate of false-negative results.

Today, the therapeutic benefits of lymphadenectomy are still matter of debate, especially in early-stage disease [71]. In addition, there are still many questions to be answered about the role and extension of lymphadenectomy in EC. In this setting, the sentinel lymph node technique seems promising since it could clarify the current controversies regarding lymphatic dissemination of EC in the future [72, 73], although further studies are needed before it is put into clinical practice.

Although in our series only three of the patients with higher risk of recurrence underwent complete surgical staging including para-aortic lymphadenectomy, several randomised trials [74, 75] have demonstrated the safety of adjuvant radiotherapy in these patients despite the lack of comprehensive staging.

To date, with or without lymphadenectomy, the role of laparoscopy in the management of EC is established and the advantages of minimally invasive techniques are well known. Therefore, if lymphadenectomy proves to be necessary it should be attempted using a minimally invasive approach. This is very interesting since in our experience, and in agreement with several reports [32, 49], lymphade-nectomy is the limiting step when performing laparoscopic staging due to impaired exposure.

This apparent "conflict" between a minimally invasive procedure and a comprehensive staging including complete lymphadenectomy could be resolved with the use of other

techniques, such as the extraperitoneal laparoscopic approach [76] or robotic-assisted laparoscopy [77], in order to overcome the limitations of conventional laparoscopy.

Long-term results of laparoscopy in endometrial cancer patients

To be accepted as the gold standard, a surgical procedure must be feasible, effective, reproducible and safe. In addition, when treating cancer patients, it is mandatory to not compromise standard survival outcomes.

Several retrospective studies have shown no difference in survival and recurrence rates between laparotomy and laparoscopy; however, these studies are limited by their sample size and short-term follow-up [21–25]. To date, three RCTs have included survival data [26–28]. None of these studies have demonstrated any significant difference between laparoscopy or laparotomy with respect to recurrence, disease-free and overall survival. These trials lacked the power to prove this hypothesis, however, and only one of them has a mean follow-up >4 years [28].

Recently, Walker et al. [34] released initial survival data from the LAP-2 study conducted by the GOG at the 41st Annual Meeting of the Society of Gynecologic Oncologists. As expected, the authors showed that the 3-year overall survival was 89.8% in the laparoscopy group and 89.9% in the laparotomy group. They concluded that laparoscopy should be considered the standard for treatment for EC. We agree with these conclusions, but it is important to note that even if the sample size of the study was appropriate to address this issue, the follow-up is still too short. In this context, we think that there is still place for large retrospective series such as this one to support these conclusions. Although it is a retrospective study, its major strength is the long-term follow-up. Interestingly, in this and other studies with a longer follow-up, more than 30% of the recurrences reported occurred after 36 months [28].

In our study, the recurrence rate and disease-free 5-year survival were 10.6% and 89.3%, respectively, and are comparable with survival and recurrence data obtained by laparotomy [5]. Our results support the oncological safety of the laparoscopic approach. Therefore, to draw definitive conclusions from RCT, all that is needed is time. If the good results already published are confirmed in a few years, laparoscopy will become the gold standard technique for the management of early-stage EC.

Conclusion

Although long-term results of recent RCTs are still immature, available data demonstrate that the results of laparoscopy are equivalent or better than those achieved with laparotomy. From the data presented, we think that equivalent rates for both disease-free and overall survival can be expected. Therefore, after adequate training, laparoscopy should be preferred over laparotomy for the management of early-stage EC.

Declaration of interest The authors have no conflicts of interest to declare.

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