

ORIGINAL RESEARCH ARTICLE

Revisiting the role of the Pfannenstiel incision in early-stage endometrial cancer

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Abstract

Introduction: Endometrial cancer is the most common gynecologic malignancy in developed countries, and the optimal surgical approach in early-stage cases remains a subject of ongoing clinical debate.

Objective: This study aims to compare laparoscopy and Pfannenstiel incision in early-stage, low-grade endometrial cancer (EC) surgery.

Methods: A retrospective study was conducted on the records of 224 patients diagnosed with EC between April 2010 and April 2024. Only patients with stage I and grade I-II endometrioid type EC were included in the study. After excluding 94 patients with non-endometrioid histology, stage II-IV disease, grade 3 tumors, and synchronous tumors, 130 patients were included in the final analysis. Participants were categorized into two groups: Group 1 (63 patients who underwent surgery through Pfannenstiel incision) and Group 2 (67 patients who underwent laparoscopic surgery).

Results: The median overall survival (OS) was 48 months (range: 12 – 168) and the median disease-free survival (DFS) was 47 months (range: 8 – 168). During the follow-up period, 20 patients died and 8 patients experienced disease recurrence. The overall OS rate was 84.6%, and the DFS was 93.8%. When comparing groups, the OS was 85.7% in Group 1 and 83.6% in Group 2 ($p=0.12$). The DFS rate was significantly higher in Group 1 compared to Group 2 (96.8% vs. 91%; $p=0.037$).

Conclusion: This study highlights the continued relevance of staging surgery with the Pfannenstiel incision in early-stage EC patients with vaginal stenosis, morbid obesity unsuitable for trocar insertion, a history of multiple abdominal surgeries, inability to insert a manipulator, an enlarged normal uterus, or suspected pelvic adhesions.

Keywords: Endometrial cancer; Laparoscopy; Pfannenstiel incision

1. Introduction

Endometrial cancer (EC) is the most common gynecological cancer in middle- and high-income countries, and its prevalence is increasing worldwide.¹ While surgical staging is the cornerstone of EC management, hysterectomy is considered one of the best treatment options for patients with nonmetastatic disease.^{2,3} Hysterectomy is often

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performed in conjunction with other surgical procedures, particularly oophorectomy. These surgeries can be performed using laparoscopy, laparotomy, or robotic-assisted methods.⁴⁻⁶ Several studies have compared midline and Pfannenstiel incisions for laparotomy in early-stage EC.⁷⁻¹⁰ Although laparoscopy offers greater comfort for patients, each surgical method has distinct advantages and disadvantages. Laparoscopic surgery may pose challenges, especially in patients with a history of pelvic surgery or those who are superobese.¹¹ In such cases, although the midline incision used in laparotomy provides a broader operative field, it is associated with higher complication rates compared to the Pfannenstiel incisions.¹² Staging with a Pfannenstiel incision may be a surgical option in patients with vaginal stenosis, morbid obesity that precludes trocar insertion, unsuitability for a manipulator, history of multiple abdominal surgeries, enlarged uteri, or suspected pelvic adhesions. In such complex scenarios, the choice of incision in laparotomy becomes critical. Although a midline incision can provide extensive exposure and easier access to pelvic organs, it is associated with higher postoperative pain, increased wound infection rates, and longer recovery times compared to the Pfannenstiel incision.¹³

The Pfannenstiel incision, characterized by its transverse suprapubic placement, generally offers superior cosmetic outcomes, less postoperative pain, and reduced wound-related complications. Previous studies comparing midline and Pfannenstiel incisions in early-stage EC surgery have reported lower complication rates, including wound infections and incisional hernias, with Pfannenstiel incisions.^{14,15} Recent data suggest that in patients unsuitable for minimally invasive techniques, the Pfannenstiel incision serves as a valuable alternative, offering some of the benefits of minimally invasive surgery while retaining the advantages of an open approach.^{16,17} Moreover, patient satisfaction related to postoperative pain management, hospital stay duration, and cosmetic outcomes is notably higher among those undergoing surgery through the Pfannenstiel incision compared to midline laparotomy.¹⁸

Taken together, the Pfannenstiel incision represents a viable alternative to laparoscopy in patients for whom minimally invasive surgery is contraindicated or not feasible. It also offers a compromise between the benefits of open and minimally invasive surgery. Some reports have shown that adequate lymph node retrieval can be achieved through the Pfannenstiel incision without compromising oncologic safety. In this study, we aimed to compare laparoscopy and Pfannenstiel incision in early-stage, low-grade EC surgery.

2. Materials and methods

2.1. Patients

A retrospective study was conducted on the records of 224 patients diagnosed with EC between April 2010 and April 2024. The staging was performed according to revised the International Federation of Gynecology and Obstetrics (FIGO) 2009 criteria.¹⁹ Serous and clear cell carcinomas were classified as grade 3.²⁰ Only stage I and grade I – II endometrioid-type EC were included in the study. Women aged 18 and older, who were postmenopausal or perimenopausal and had complete preoperative and postoperative data, were eligible for inclusion. After excluding 94 patients with non-endometrioid histology, stage II – IV disease, grade 3 tumors, and synchronous tumors, a total of 130 patients were included in the final analysis. Data related to age, body mass index (BMI), stage, grade, and survival were extracted from medical records. BMI was calculated as weight in kilograms (kg) divided by height in meters squared (m²). Participants were categorized into two groups: Group 1 (63 patients who underwent surgery through Pfannenstiel incision) and Group 2 (67 patients who underwent laparoscopic surgery). All patients underwent preoperative magnetic resonance imaging (MRI) to assess myometrial invasion, cervical involvement, and pelvic/para-aortic lymph node metastasis. Patients with suspicious findings for stage II – IV on preoperative MRI were excluded, as they underwent complete lymph node dissection. Patients were followed until April 2024 or their date of death. All patients completed appropriate adjuvant therapy in the postoperative period.

2.2. Sample evaluation

The surgical procedure using the Pfannenstiel incision included total hysterectomy, bilateral salpingo-oophorectomy, omental biopsy, and pelvic lymph node sampling. Pelvic lymph nodes were removed starting from the distal part of the common iliac artery to the circumflex iliac vein and anterior to the obturator nerve. In our clinic, para-aortic lymph node sampling is not performed in patients with low-grade, early-stage EC as assessed by preoperative MRI. Sentinel lymph node (SLN) mapping is also not performed due to the lack of equipment. Instead, pelvic lymph node sampling, cytology collection, and omental sampling are performed for staging purposes. For laparoscopic surgery, a 10 mm, 0° laparoscope was routinely used. We opted for umbilical access using the open entry (Hasson) technique under direct vision,²¹ with a small transverse or longitudinal incision made at the umbilicus. A uterine manipulator was routinely used, and the fallopian tubes were sealed with bipolar energy before

hysterectomy. After the removal of the uterus through the vagina, a powder-free surgical glove was inserted into the abdominal cavity. The glove was filled with the retrieved lymph nodes, the open end was clipped, and the glove was extracted through the vagina. The procedure was completed following hemostasis.

2.3. Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences statistics (Version 22.0., IBM, USA) for Windows. For continuous variables, mean, median, and standard deviation were calculated. The Student's *t*-test, Mann–Whitney U-test, and Kruskal–Wallis tests were used for comparisons between continuous variables, whereas the Fisher's exact test was conducted for categorical variables. Kaplan–Meier curves were constructed to assess overall survival (OS) and disease-free survival (DFS) in both groups. Statistical significance was defined as $p < 0.05$.

3. Results

3.1. Patient demographics and baseline characteristics

A total of 130 patients with early-stage, low-grade EC treated between April 2010 and April 2024 were included in the study. Of these, 63 patients underwent surgery through Pfannenstiel incision (Group 1) and 67 patients underwent laparoscopic surgery (Group 2). The mean age of the cohort was 60.7 ± 7.9 years. The mean BMI was 33.6 ± 5.5 kg/m². Postoperative pathological analysis revealed a median tumor size of 3 cm (range: 1 – 8 cm). Patient characteristics and pathological findings are summarized in [Table 1](#).

3.2. Surgical and pathological outcomes

Lymphovascular space invasion (LVSI) was present in 12.7% of patients in Group 1 and 7.5% in Group 2 ($p=0.322$). Peritoneal cytology was positive in two patients (3.2%) in Group 1 and three patients (4.5%) in Group 2 ($p=0.701$), with no statistically significant difference. The mean number of pelvic lymph nodes retrieved was 10.6 ± 7.8 in Group 1 and 9.45 ± 5.1 in Group 2 ($p=0.318$), indicating similar surgical adequacy in nodal assessment between the groups.

3.3. Recurrence patterns

During the follow-up period, a total of eight patients experienced disease recurrence. Recurrence was observed in two patients in Group 1—one with pelvic lymph node recurrence and the other with peritoneal recurrence. In contrast, six patients in Group 2 experienced recurrence: One with port-site metastasis, two with vaginal cuff recurrence,

Table 1. Comparison of demographic and clinicopathological characteristics of study participants (n=130)

Characteristics	Group 1 (Pfannenstiel incision)	Group 2 (laparoscopy)	p
Number of patients (n)	63	67	-
Mean age (years)	60.65±9.5	60.75±9.2	0.96
Mean BMI (kg/m ²)	33.1±5.5	34.2±4.7	0.225
Surgical stage (n)			
IA	54	49	0.078
IB	9	18	
Grade (n)			
1	40	47	0.702
2	23	20	
LVSI (n)			
Negative	55	62	0.322
Positive	8	5	
Cytology (n)			
Negative	61	64	0.701
Positive	2	3	
Mean number of pelvic lymph nodes removed	10.6±7.8	9.45±5.1	0.318
Recurrence (n)	2	6	0.172
OS (%)	85.7	83.6	0.12
DFS (%)	96.8	91	0.037*

Note: * $p < 0.05$.

Abbreviations: BMI: Body mass index; DFS: Disease-free survival; LVSI: Lymphovascular space invasion; OS: Overall survival.

one with pulmonary metastasis, one with pelvic lymph node recurrence, and one with colon metastasis. Although the number of recurrences was numerically higher in Group 2, the difference was not statistically significant ($p=0.172$).

3.4. Survival outcomes

The median OS for the entire cohort was 48 months (range: 12 – 168 months), and the median DFS was 47 months (range: 8 – 168 months). The OS and DFS rates were 84.6% and 93.8%, respectively. OS was 85.7% in Group 1 and 83.6% in Group 2, with no statistically significant difference ($p=0.12$). However, DFS was significantly higher in Group 1 (96.8%) compared to Group 2 (91%) ($p=0.037$). Kaplan–Meier survival curves are shown in [Figures 1 and 2](#).

4. Discussion

In the management of early-stage EC, the choice of surgical approach is a critical determinant of both oncologic

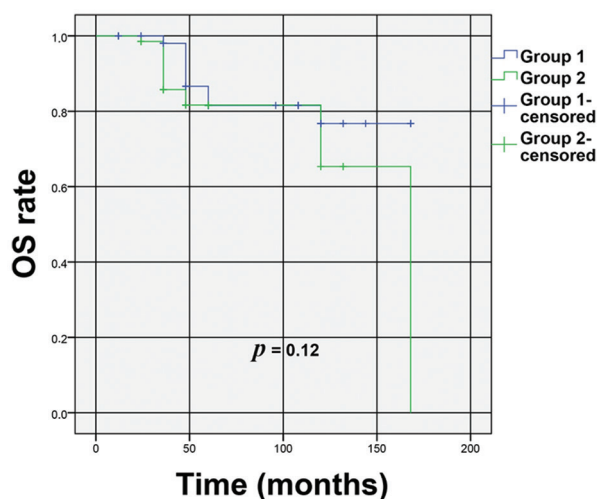


Figure 1. Kaplan–Meier curves for overall survival in Group 1 (Pfannenstiel incision) and Group 2 (Laparoscopy) patients with early-stage, low-grade endometrial cancer

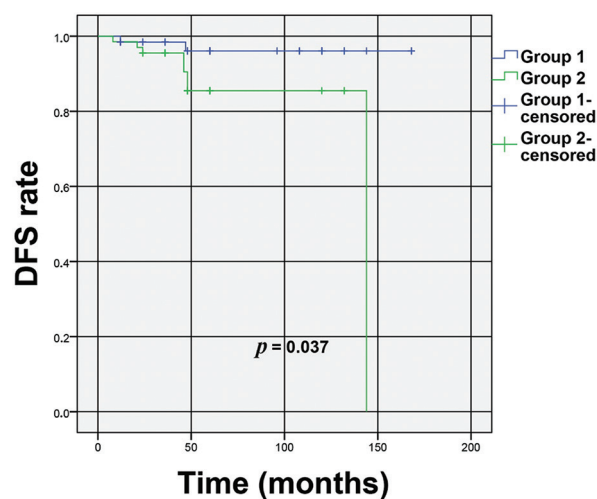


Figure 2. Kaplan–Meier curves for disease-free survival in Group 1 (Pfannenstiel incision) and Group 2 (Laparoscopy) patients with early-stage, low-grade endometrial cancer

outcomes and postoperative quality of life. Traditionally, total abdominal hysterectomy with bilateral salpingo-oophorectomy and when indicated, pelvic and para-aortic lymphadenectomy have constituted the standard surgical treatment. While these procedures were historically performed through midline laparotomy, the evolution of minimally invasive surgery has led to the widespread adoption of laparoscopy and more recently, robotic-assisted techniques. Nevertheless, the potential benefits of low transverse abdominal incisions—particularly the Pfannenstiel approach—should not be overlooked, especially in selected patient populations. The Pfannenstiel

incision is well-established in gynecologic surgery, offering favorable cosmetic outcomes, reduced postoperative pain, and a lower risk of wound complications when compared to vertical midline incisions. Several studies have highlighted that this approach can provide sufficient access to the pelvic cavity while minimizing trauma to the abdominal wall, potentially resulting in decreased rates of surgical site infection and incisional hernia, particularly in obese patients. Furthermore, the incision’s location along natural skin folds contributes to improved patient satisfaction and faster return to daily activities.^{22,23} Laparoscopy plays an important role in the surgical treatment of EC.²⁴ However, it may not be suitable for every patient. In some cases, laparotomy may be more advantageous than laparoscopy. We prefer laparotomy over laparoscopy in patients with vaginal stenosis, morbid obesity that precludes safe trocar placement, inability to insert a manipulator, a history of multiple abdominal surgeries, a larger-than-normal uterus, or suspicious adhesions on pelvic examination. We believe that the Pfannenstiel incision is a safer alternative for these patients, especially to avoid the complications associated with midline incision.

In 2009, peritoneal cytology was removed from the FIGO staging system.²⁵ While LVSI was added to the FIGO staging system in 2023, cytology remains excluded from staging.²⁶ A recent meta-analysis on the significance of positive peritoneal cytology in early-stage EC showed that it was associated with inferior DFS and OS.²⁷ On the contrary, Takenaka *et al.*²⁸ stated that peritoneal cytology status was not a prognostic factor in the low-risk early-stage ECs. In addition, during the insertion and use of the manipulator in laparoscopic surgery, there are hypotheses that the manipulator may weaken the myometrium, lead to uterine rupture, and facilitate tumor cell dissemination into the peritoneal cavity.²⁹ A secondary hypothesis suggests that the uterine manipulator may create significant tension within the endometrial cavity, increasing intrauterine pressure and promoting tumor cell translocation through the fallopian tubes into the peritoneal cavity.³⁰ To mitigate this risk in laparoscopic EC surgeries, we routinely seal the fallopian tubes with bipolar energy before hysterectomy. In our study, we found no difference in peritoneal cytology positivity between the two groups.

Currently, the landscape of surgical nodule evaluation for EC is shifting from lymphadenectomy to SLN biopsy, with no evidence of a negative impact on cancer-specific survival.³¹ In EC patients, SLN bilateral mapping fails in 20 – 25% of cases.³² The assessment of lymph node status remains a critical component in the surgical staging of EC, significantly influencing prognosis and adjuvant treatment decisions. Traditionally, systematic pelvic and para-aortic

lymphadenectomy have been employed for this purpose. However, this approach is associated with considerable morbidity, including prolonged operative time, increased blood loss, lymphocele formation, and lower extremity lymphedema. In recent years, SLN biopsy has emerged as a less invasive alternative that offers accurate staging with reduced surgical risk. Several studies have demonstrated that SLN mapping in EC provides high sensitivity and negative predictive value for the detection of nodal metastasis.³³ Cervical injection of indocyanine green followed by near-infrared fluorescence imaging has become the preferred technique due to its superior detection capabilities and safety profile. One of the key advantages of the SLN approach is the opportunity for ultrastaging, which enhances the detection of micrometastases and isolated tumor cells that might be missed by routine pathological evaluation. This is particularly important in patients with clinically early-stage disease, where even low-volume nodal metastasis may alter the risk stratification and subsequent treatment plan. Moreover, in patients with negative SLNs, systematic lymphadenectomy can often be safely omitted, thereby minimizing surgical complications without compromising oncologic outcomes. Despite its advantages, SLN mapping is not without limitations. Its success is highly dependent on surgeon expertise, institutional experience, and patient factors such as obesity or prior pelvic surgeries, which can interfere with lymphatic drainage and reduce mapping efficacy. In addition, the reliability of SLN biopsy in high-risk histologic subtypes (e.g., serous or clear cell carcinoma) or in cases with grossly enlarged lymph nodes remains controversial. Some guidelines still recommend comprehensive lymphadenectomy in these populations due to a higher prevalence of nodal metastasis.

SLN biopsy represents a significant advancement in the surgical management of EC.³⁴ It offers an accurate, minimally invasive alternative to full lymphadenectomy, particularly in patients with low to intermediate risk disease. When performed in accordance with validated protocols and applied to appropriately selected patients, it provides accurate staging and minimizes surgical morbidity. However, the availability of technology and expertise remains a barrier in some institutions. In our center, due to the lack of equipment for SLN sampling, we performed selective lymph node removal of bulky nodes during surgery to achieve surgical staging while minimizing the risk of lymphedema. In our study, we did not observe any significant difference in the number of resected lymph nodes between patients undergoing surgery via Pfannenstiel incision versus laparoscopy.

Although the number of patients with recurrence was higher in the laparoscopy group, no significant difference

was found between the two groups. In our study, port site metastasis was detected in only one patient after laparoscopic surgery. These metastases are rare, with an estimated incidence of <1% in cases of early-stage EC.³⁵ While no vaginal cuff recurrence was observed in patients who underwent surgery with a Pfannenstiel incision, it was observed in a patient who underwent laparoscopic surgery. This may be attributable to the use of a uterine manipulator in laparoscopic procedures. Similar concerns were raised in the phase III LACC trial, where minimally invasive radical hysterectomy in cervical cancer was associated with significantly lower OS and DFS compared to open abdominal surgery.³⁶ In our study, while no significant difference in OS was detected between the two groups, DFS was significantly better in patients treated with Pfannenstiel incision.

The OS rate for patients with EC is reported at approximately 85%.³⁷ The 5-year DFS and OS rates have been reported as 95.2% and 96.4%, respectively.³⁸ For stage I and stage II tumors, the 5-year survival rate is between 74% and 91%.³⁸ Stuart *et al.*³⁹ suggest that pelvic lymphadenectomy improves overall or recurrence-free survival in women with early EC. Furthermore, Alouini and Bakri⁴⁰ showed in their review that systematic para-aortic lymphadenectomy may not be necessary in early-stage genital malignancies. In our study, we found that performing only pelvic lymph node sampling—without para-aortic lymphadenectomy—yielded the OS and DFS consistent with the literature.

Recent studies also suggest that systemic inflammatory markers may serve as useful diagnostic and prognostic biomarkers. For example, Ronsini *et al.*⁴¹ demonstrated how endometrial thickness, when combined with systemic inflammatory response (SIR) indices, may help distinguish between endometrial dysplasia and carcinoma in patients with postmenopausal bleeding. However, our study did not incorporate SIR data, which represents a limitation.

There is also a biological perspective on how systemic or metabolic factors may influence cancer progression and surgical outcomes. A recent systematic review highlights the role of trace elements such as selenium, zinc, copper, and cadmium in the pathogenesis and progression of various malignancies. The review suggests that imbalances in essential and toxic elements may contribute to oxidative stress, inflammation, and altered immune responses, potentially affecting both tumor biology and post-operative recovery.⁴² Unfortunately, our study did not evaluate these parameters, which may also be considered a limitation.

This study has several additional limitations. First, due to its retrospective design, the selection of surgical approach was based on clinical judgment and individual patient characteristics rather than a standardized

protocol, introducing potential selection bias. Second, it was conducted at a single institution, which may limit the generalizability of the findings. Third, while the sample size was reasonable for an observational study, it may not be sufficient to detect subtle differences in long-term outcomes such as recurrence and survival. In addition, data regarding inflammatory markers, postoperative complications, and quality-of-life measures were not available, which restricted a more comprehensive assessment of patient outcomes. Finally, variations in surgical technique over the extended study period may have affected outcome consistency.

Nonetheless, our study has notable strengths. It brings renewed attention to the Pfannenstiel incision—a technique often overlooked in recent discussions dominated by minimally invasive methods. Our findings suggest that this approach remains clinically relevant, particularly for patients who are not ideal candidates for laparoscopy. In terms of recurrence and survival outcomes, the Pfannenstiel incision offers a viable, and in some cases, superior alternative. Taken together, we emphasize the underappreciated value of the Pfannenstiel incision in the surgical treatment of early-stage EC.

We hope our findings contribute meaningfully to the literature and encourage further research into this surgical approach, particularly for patient populations in whom laparoscopy is not feasible or safe.

5. Conclusion

The Pfannenstiel incision is an important surgical approach used in gynecology. We aimed to emphasize the importance of staging surgery with the Pfannenstiel incision in early-stage EC patients with vaginal stenosis, morbid obesity not suitable for trocar insertion, a history of multiple abdominal surgeries, inability to insert a manipulator, an enlarged uterus, or suspected adhesions on pelvic examination. It has been used in surgeries for many years, and its importance has recently been overshadowed by the rise of laparoscopy. However, our study highlights that it remains a valuable option and should not be overlooked.

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Conflict of interest

The authors declare no competing interests.

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Ethics approval and consent to participate

The present study was approved by the Ethical Committee of Afyonkarahisar Health Sciences University Hospital (approval no: 13.12.2024 – 2024/11) and conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from all patients during their hospitalization.

Consent for publication

Informed consent was obtained from all individual participants included in the study.

Availability of data

Data are available from the corresponding author upon reasonable request.

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