LAPAROSCOPY VERSUS LAPAROTOMY IN TREATMENT OF STAGE I, II ENDOMETRIAL CANCER, SURGICAL AND ONCOLOGICAL OUTCOME

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ABSTRACT

Objective: Our study involved a comparison of the laparoscopic-vaginal approach and the traditional abdominal approach for the treatment of patients diagnosed with endometrial cancer regarding pathological, operative, post-operative and oncological outcomes. **Methods:** This study is an RCT, fifty-six candidates with endometrial cancer were recruited and allocated to two groups, twenty-three patients each, laparoscopic group and laparotomy group. In this study, patients diagnosed with stage I, II endometrial cancer were randomly assigned to either Total laparoscopic hysterectomy (TLH); the intervention arm or Total abdominal hysterectomy (TAH) the standard arm in a 1:1 ratio. The randomization was performed using sequential number generation. Following the assignment, the intervention was not concealed from the study coordinators, patients, surgeons, and nursing team. The study's main outcomes were measured by the time taken to resume a regular oral diet, length of hospital stay after surgery, pain levels assessed after surgery, ability to move from the bed after surgery, occurrence of early or delayed complications after surgery, as well as the rate of recurrence. The data were analyzed using as treated principle, as two patients from laparoscopy group were excluded from the primary analysis as they converted to laparotomy. **Results:** The study found that none of patients in TLH group experienced postoperative complications and (5 out of 28 patients/17.9%) in TAH group, with $p<0.001$). There was no significant difference between groups in intraoperative complications. On the other hand, compared to TAH, TLH was linked to lower blood loss, shorter hospitalization periods, earlier resumption of regular oral diet, and quicker recovery, despite the fact that the TLH procedure took longer to perform than TAH. **Conclusions:** The laparoscopic surgical staging procedure is a safe and effective method for managing endometrial cancer. It is associated with an earlier resumption of regular oral diet and shorter hospitalization periods. In addition, the rates of complications during and after the surgery are comparable to laparotomy. However, the laparoscopic approach typically requires a longer operative time.

Key words: Endometrial cancer, Laparoscopy, Laparotomy, Pelvic Lymphadenectomy.

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1.Introduction

Endometrial cancer, the most prevalent gynecologic cancer in the developed countries It occurs most often in older women, with the average age at diagnosis being around 68 years. Given the increasing number of older individuals within the population, it is expected that the incidence of endometrial carcinoma will also increase in this population. [1]

Genetic, environmental, and lifestyle risk factors collectively contribute to endometrial cancer (EC) becoming one of the most rapidly rising women's cancers worldwide and the most prevalent female genital tract malignancy in middle and high income countries.[2]

Approximately 80% of endometrial cancer cases are diagnosed at an early stage, leading to a good prognosis. [3]

In addition, the prognosis of endometrial cancer depends on several factors such as histological grading, depth of myometrial invasion, lymph node involvement, tumor size, lymph vascular space invasion (LVSI), stage of disease, and the type of treatment received which may include chemotherapy and radiotherapy.[4]

The International Federation of Gynecology and Obstetrics (FIGO) staging and treatment protocol recommends total abdominal hysterectomy with

bilateral salpingo-oophorectomy (TAH/BSO) as the standard therapy for the treatment of endometrial cancer, followed by staging and tailored adjuvant treatments based on individual patient and tumor characteristics represents the current optimal multimodality management strategy for endometrial cancer. [5,6]

The surgical procedure is still associated with morbidity and the risk of intraoperative and postoperative adverse events. [7]

Recently, many surgeons have opted for a minimally invasive laparoscopic approach for surgical staging of early-stage endometrial cancer, primarily FIGO stages I and II disease that is confined to the uterus and cervix. [8]

Various studies have found that the laparoscopic approach leads to superior short-term outcomes compared to open abdominal surgery for the treatment of endometrial cancer, including; Shorter hospital stay, lower need for blood transfusions, faster postoperative recovery times, improved quality of life in the early postoperative period, lower rates of surgical complications. recent research also indicates that laparoscopy is comparable to laparotomy in terms of oncologic outcomes like survival, while being associated with reduced healthcare costs. As such, emerging evidence suggests that minimally invasive staging and lymphadenectomy using laparoscopy is a technically feasible option for surgically managing endometrial carcinoma. However, more high-quality studies are still needed to definitively validate the long-term oncologic noninferiority of laparoscopy for endometrial cancer. [6,9]

Over the past two decades, numerous randomized controlled trials comparing laparoscopic and laparotomy staging for endometrial cancer have been conducted. These studies demonstrate that laparoscopy confers significant advantages in terms of reducing perioperative morbidity**.** [10]

However, despite the potential benefits, the laparoscopic approach remains underutilized worldwide, especially in obese patients with endometrial cancer due to technical difficulties related to limited exposure of anatomical structures due to excess abdominal fat, Higher risk of cardiopulmonary compromise from toxic carbon dioxide absorption and hemodynamic changes while in steep Trendelenburg positioning. [11]

The aim of the current study was to assess the intraoperative and postoperative complications, treatment-related outcomes, time taken to resume a regular oral diet, length of hospital stay after surgery and pain levels assessed after surgery in patients diagnosed with early stage endometrial cancer who underwent either total laparoscopic hysterectomy (TLH) or total abdominal hysterectomy (TAH). To minimize potential bias resulting from comparing an established procedure (TAH) with an experimental one (TLH), only surgeons who had demonstrated their proficiency in performing TLH through an independent assessment were selected to conduct the TLH surgeries.

2.Methods

2.1. Study setting: The study was conducted between January 2020 and December 2021 at the Gynecology Unit of the Department of Surgical Oncology at the National Cancer Institute, Cairo University in Egypt.

2.2. Study Design: This study was a non-blinded Randomized controlled trial (RCT).

2.3. Randomization and masking

Fifty-six eligible patients were allocated randomly to either the intervention group (TLH) or the control group (TAH). The randomization process was carried out using a computerized method with the PASS 2008 program. A randomization list was created and allocation was done using sealed envelopes by an independent biostatistician. However, after the assignment, the study surgeon, patients, and members of the operation team were not blinded to the intervention.

2.4. Sample size estimation

Based on a previous study by **Terao et al**. in 2016 [12] the sample size was estimated for this study. The previous study reported a difference in the duration of operation between the two groups (laparoscopic and laparotomy) of 73 ± 67 minutes. Using a power of 95% and a significance level of 5%, it was calculated that 23 patients in each group would be required. However, to compensate for any potential losses during follow-up, the sample size was increased to 28 in each group (20% more than the calculated size). The sample size was determined using the Power and Sample Size Calculation software Version 3.1.2 (Vanderbilt University, Nashville, Tennessee, USA).

2.5. Ethical standards: The study was performed according to the World Medical Association Declaration of Helsinki and the ethical standard of the National Cancer Institute, Cairo University. Institutional Review Board (IRB) full approval was obtained prior to the initiation of the study **(Study ID: SO2000-31014)**, Prior to the operation, written informed consent explaining all study details was obtained from all individuals involved in the study.

2.6. Inclusion and exclusion criteria

We recruited patients with histo-pathological confirmed diagnosis of EC Stage I, II. Exclusion criteria were women with medical problems that contraindicate surgery, Patients lost adjuvant therapy and patients refusing the procedure.

2.7. Data management &Statistical analysis

Data were collected from: outpatient medical records, inpatient gynecology department records and pathology department records. Excel was used for data entry, coding and data cleaning.

The statistical analysis was performed based on the "as-treated" principle, which means that it was based

on the intervention that each participant actually received during the study.

Patients who were initially allocated to receive laparoscopy but were ultimately converted to laparotomy and did not receive the laparoscopic procedure were excluded from the analysis. (Figure 1).

Statistical Package for Social Sciences (SPSS) version 27 were used in data analysis. The numerical data was summarized using means and standard deviations or medians and ranges, while categorical data was summarized as percentages. Independent t-tests and Mann-Whitney tests were used to compare numerical variables between the studied groups for normally distributed and non-normally distributed variables, respectively. For categorical variables, differences were analyzed with the chi-square test, and Fisher's exact test was used when appropriate. All p-values were two-sided, and a significance level of <0.05 was considered statistically significant.

2.8. End points were; Total operative time was defined as the duration from skin incision or creation of pneumoperitoneum to skin closure. This was calculated in minutes to assess the procedural efficiency of laparoscopic versus open surgery. Length of hospital stay was determined as the period between the date of the surgery and the date of the patient's discharge from the hospital. Postoperative pain levels were assessed on Day 0 and Day 1 after surgery using a 10-point numeric rating scale from 0 to 10, with 10 indicating the worst possible pain and 0 indicating no pain. This served as a patient-reported outcome to evaluate differences in postoperative pain between the TLH and TAH groups.

Intraoperative complications, blood loss, need for blood transfusion, rate of conversion to open technique, time to return to oral feeding, postoperative ambulation from the bed, postoperative complications as bleeding, wound infection and delayed complications as incisional and port site hernia were also recorded.

We evaluated postoperative complications which were defined as grade 2 or higher adverse event using the Claviene Dindo classification.[13]

2.9. Procedure: All TLH and TAH procedures were performed by experienced and established gynecological surgeons. All patients underwent pre-operative assessments, which included a medical history review, clinical examination, laboratory tests, radiological assessments (such as trans-vaginal ultrasound), metastatic workup, and dilatation and curettage.

All patients had been operated under general anesthesia with endotracheal intubation. Staging laparotomy was done with low midline abdominal incision.

All of the cases included in the study underwent surgical staging, which consisted of total abdominal hysterectomy and bilateral salpingo-oophorectomy (TAH & BSO), peritoneal cytology, and pelvic lymphadenectomy. The latter was performed for patients who met one or more of the following criteria: Grade 1 or 2 endometrioid carcinoma with myometrial invasion greater than 50%, grade 3 tumors, tumors with cervical extension, lower uterine tumors, clear cell or serous carcinoma, and tumors larger than 2 cm in size.

Laparoscopic approach was done through trans peritoneal approach with standard 4 port technique. Specimen was retrieved through the vagina. All patients had received injection paracetamol three times a day for 24 h or longer depending on the case and any extra needs was recorded.

Tumor histology, tumor grade, number of dissected nodes, lympho-vascular invasion, tumor diameter, cervical involvement, lower uterine segment, myometrial invasion, adnexal metastases, positive cytology, serosal involvement, other pelvic metastases was detected by examinations of the postoperative excised samples in pathology department and surgical stage of cancer (as defined by FIGO, 2009).

2.9.1 Post operative follow up

On first follow up, patients had complete physical examination and assessment of any abnormality or complication. Further follow up was done every 3 months along 3 years and the patients was assessed clinically, laboratory and radiologically.

2.9.2 Operative details

- Antibiotic prophylaxis included a single dose of intravenous broad-spectrum antibiotic delivered prior to the skin incision.
- Post-operative venous thromboembolic prophylaxis included elastic stockings, and low molecular weight heparin until the patient is ambulant. pneumatic cuff compression devices and elastic stockings were used for intra-operative thrombo-embolism prophylaxis.
- Examination under anesthesia was performed, followed by preparing the operative field, draping under sterile conditions.
- General anesthesia using isoflurane, and muscle relaxation.

2.9.2.1A.Laparotomy group

- The patient was positioned in the supine position with approximately 10–15-degree head down.
- A midline abdominal incision for the required length according to the size of the uterus
- Peritoneal cytology was done.
- Next the intestinal tract was pushed into the upper abdomen with two towels moistened with physiological normal saline, and a retractor is applied to expand the visual field.
- The round ligament was ligated and divided.
- The ovarian ligament and ovarian vessels were clamped, cut, and ligated after visualization of the ureter.

- These Procedures were also performed on the other side.
- Mobilizing the bladder was done.
- The uterine artery and vein/ cardinal ligament were clamped, cut, and ligated.
- The utero-sacral ligament and posterior half of the cardinal ligament were clamped, cut, and ligated **.**
- The vaginal wall was clamped at the cervicovaginal junction.
- The uterine cervix was palpated again from the front and back to identify the boundary, the vaginal wall was clamped with right-angle forceps.
- If the rectum was adherent to the posterior wall of the cervix, the adhesion was incised with an electric knife and push down slightly, then the vaginal wall was clamped.
- Once the vaginal opening was partially made, the vaginal wall was held with a long, straight Kocher's forceps.
- We used another long, straight Kocher's forceps to grip and retract the uterine cervix, incised the vaginal wall around the entire circumference, to remove the uterus.
- The vaginal wall was held with long, straight Kocher's forceps at three to four points, and vaginal secretions was removed and disinfected.
- The vaginal vault was closed at bilateral ends of the vaginal stump at first were sutured with 1–0 absorbable suture, and the remaining part was sutured continuously.
- Hemostasis and closing the retroperitoneum, checking the surgical field, and stop bleeding. Suture the pelvic peritoneum with 3–0 synthetic absorbable suture.

2.9.2.1B.Laparoscopy group

- After inducing anesthesia, Trendelenburg position, legs were placed in low lithotomy.
- Insertion of a Uterine Manipulator.
- CO2 insufflation and And placing four ports.
- The round ligament was transected and the anterior and posterior leaves of the broad ligament were separated with the Harmonic scalpel.
- The infundibulopelvic (IP) ligament or the utero-ovarian ligament was initially desiccated with a bipolar grasper.
- Mobilization of the bladder
- Secure the Uterine Vessels
- Separate the Uterus and Cervix using The Harmonic scalpel
- Removal of the Uterus through the vagina
- Vaginal Cuff Closure
- Port Site Closure

2.9.2.2. Ureteral identification and dissection:
Ureters were identified at the level of the common iliac artery (CIA). using great care to preserve vascular tissue around the ureter as much as possible.

2.9.2.3. Pelvic Lymph node dissection (PLND):
The study involved performing pelvic lymph node dissection (PLND), which is the removal of lymphatic tissue up to the common iliac bifurcation, including the internal iliac, obturator, and external iliac lymph nodes. During PLND, all nodal tissue is removed from the genitofemoral nerve laterally to the bladder wall medially, and from the distal common iliac artery superiorly to the lateral circumflex iliac vein and the node of Cloquet inferiorly. The obturator fossa is also cleared of nodal tissue, while preserving the obturator nerve. Additionally, the nodal tissue is cleared around the iliac vessels.

3. Results

3.1. Patients' characteristics

Of the 56 randomized patients, 28 were assigned to each group; 2 patients only were converted to laparotomy due to bladder injury and excluded from analysis as shown in Figure 1. No patients were lost during follow-up, and pelvic lymphadenectomy was performed for all included patients. However, para-aortic lymphadenectomy was not performed for any patient. The patients' characteristics did not differ between the two groups, as shown in Table 1.

Mean age was 60.0±7.1 for TLH and was 64.5±10.1 for TAH, obesity was comparable between groups. Comorbidity was reported in nearly 77.8% (42 of 54) of included patients; 12 patients (46.2%) in TLH and 21 patients (70.0%) with p value =0.070. Postoperative radiotherapy was given to 61.5% (16 of 26) of patients in TLH and given to 60.7% (17 of 28) of patients in TAH.

3.2. Intra- post operative Complications

Both groups were comparable in terms of intraoperative complications. Postoperative blood transfusion was significantly lower in the TLH versus TAH group (2 vs 18 patients, $p < 0.001$). The TLH group had a significantly longer operative time. More patients in the TLH group started oral intake on postoperative day 0 (22 vs 0 patients, $p < 0.001$) and had lower pain scores (median 2 vs 5, $p < 0.001$). The TLH group was able to ambulate earlier (20 vs 0 on day 0, $p < 0.001$) and had a shorter hospital stay (mean 2 vs 4 days, $p < 0.001$). The TLH group had less intraoperative blood loss (mean 231 vs 632 ml, $p < 0.001$) and fewer postoperative complications (0% vs 17.9%, $p=0.002$) but more port site hernias (2 vs 0 patients, $p=0.002$) as shown in Table 2.

The number of dissected lymph nodes was comparable between groups. Oncologic outcomes in terms of recurrence rates at 1 and 2 years were similar between groups with two patients in each group experiencing recurrence (un-tabulated results).

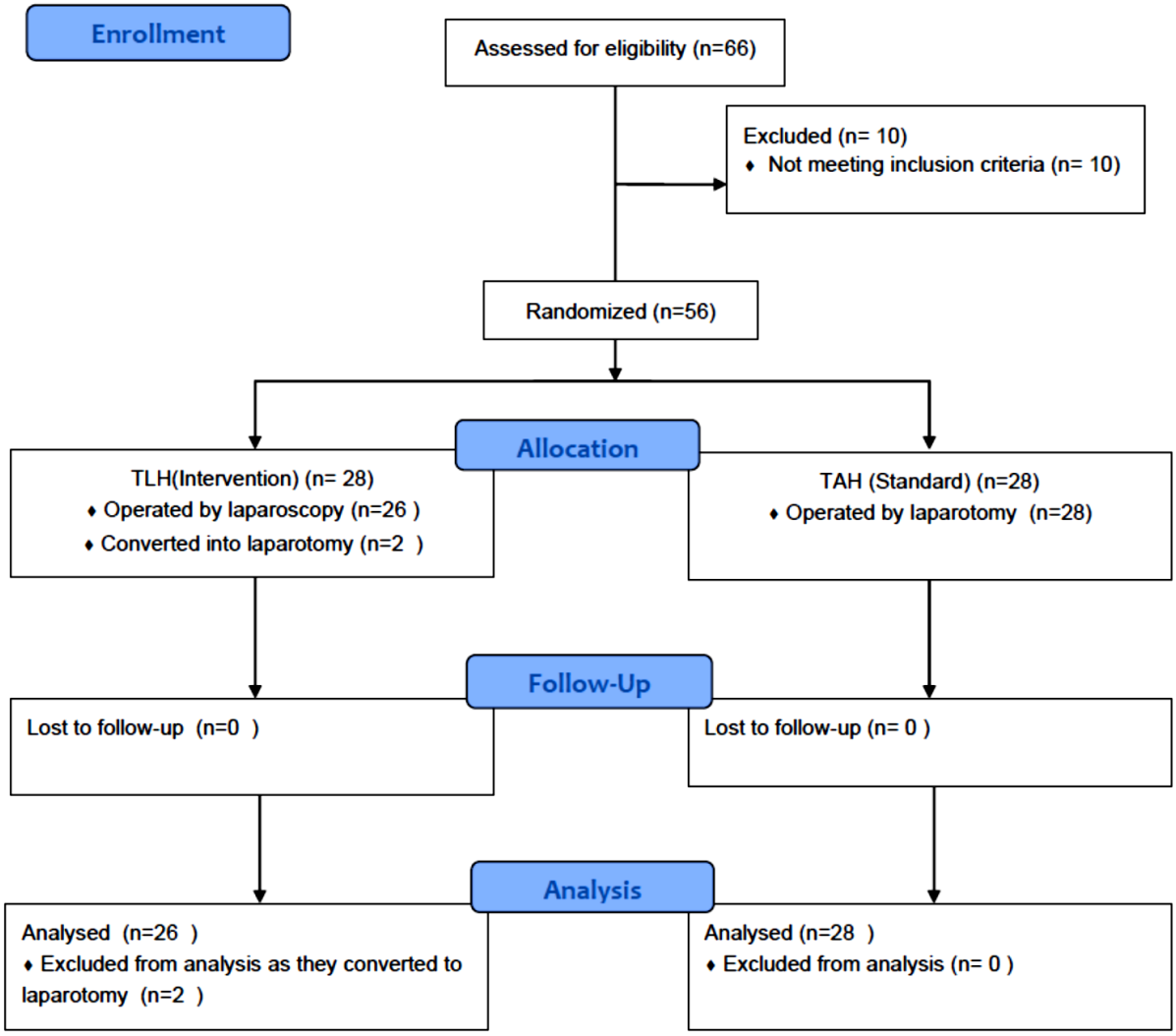

Figure (1): Consort diagram for the patients recruitments and follow up

Table 1: Patients' and tumor characteristics in the studied groups

	TLH(n=26) n (%)	TAH(n=28) n (%)	P value
Age(yrs.)			
Mean ±SD	60.0±7.1	64.5±10.1	0.065
Range	45-77	42-76	
BMI (kg/m^2)			
Normal (18.5-24.9)	2(8.0)	2(7.4)	0.920
Over weight (25-29.9)	9(36.0)	11(40.7)	
Obese class I (30-34.9)	12(48.0)	13(48.1)	
Obese class II (35-39.9)	2(8.0)	1(3.7)	
Menstrual History			
Premenopausal	5(19.2)	4(14.3)	0.724 [a]
Postmenopausal	21(80.8)	24(85.7)	
Family History of Cancers	17(65.7)	21(75.0)	0.435
Family history of uterine cancers	10(38.5)	10(35.7)	0.835
who (in +ve only)			
1st degree	9(90)	9(90)	1.000 [a]
2nd degree	1(10)	1(10)	
Parity			
Nullipara	3(11.5)	5(17.9)	0.706[a]
Multipara	23(88.5)	23(82.1)	
Comorbidity	12(46.2)	21(70.0)	0.070
Type of comorbidity			
DM	9/12(75.0)	11/22(52.4)	0.201
HTN	3/12(25.0)	10/22(47.6)	
Tumour grade			
I	5(19.2)	6(22.2)	0.861
II	18(69.2)	19(70.4)	
III	3(11.5)	2(7.4)	
Tumour diameter(cm)			
Mean ±SD	5.3±1.8	5.6±1.3	0.483
Myometrial invasion			
≤1/2myometrial thickness	12(46.2)	10(35.7)	0.435
>1/2myometrial thickness	14(53.8)	18(64.3)	
Cervical involvement	1(3.8)	2(7.1)	1.000[a]
Lower uterine	1(3.8)	2(7.1)	1.000[a]
Serosal involvement	1(3.8)	0	0.481[a]
Dissected Nodes			
None	21(83)	26(91)	0.243
One- two nodes	4(13)	2(4)	
Post op RTH	16(61.5)	17(60.7)	0.951

P<0.05 is statistically significant, SD: standard deviation, a: analysis done by fisher exact test, TLH: Total laparoscopic hysterectomy, TAH: total abdominal hysterectomy

Table 2: Intra/ post operative complications in the studied groups

	TLH(n=26) n (%)	TAH(n=28) n (%)	P value
Intra-operative complications	2(7.7)	1(3.6)	0.604 [a]
Need of blood transfusion	2(7.7)	18(64.3)	**<0.001**
Amount of blood loss			
Mean ± SD	231.3±96.3	632.6±143.5	**<0.001**
Start of Post-operative oral feeding			
Day 0	22(84.6)	0(0)	**<0.001**
Day1	2(7.7)	2(7.1)	
Day2 -Day3	2(7.7)	26(92.9)	
Postoperative ambulation			
Day 0	20(76.9)	0(0)	**<0.001**
Day1	6(23.1)	11(39.3)	
Day2	0(0)	17(60.7)	
Postoperative Complication	0(0)	5(17.9)	**<0.001**
Delayed complications	2(7.7)	10(35.7)	**0.013**
Hospital stays(days)			
Mean ± SD	2.0±1.0	4.0±1.0	**<0.001**
Operation Time(minutes)			
Mean ± SD	129.8±17.1	88.3±7.8	**<0.001**
Post-operative pain score			
Median (Range)	2(1-3)	5(4-7)	**<0.001**

P<0.05 is statistically significant, SD: standard deviation, analysis done by independent t test, a: analysis done by fisher exact test, TLH: Total laparoscopic hysterectomy, TAH: total abdominal hysterectomy

4.Discussion

According to the National Comprehensive Cancer Network clinical practice guidelines in oncology, the recommended primary management for patients with endometrial cancer that is confined to the uterus is the total abdominal hysterectomy, bilateral salpingo-oophorectomy, and surgical staging. [14]

Numerous studies, including randomized controlled trials, have demonstrated that laparoscopic surgery is a viable and effective alternative to conventional laparotomy for treating patients with early endometrial cancer. [5]

A study conducted in Japan by Deura et al on the staging of endometrial cancer reported results similar to ours, demonstrating that laparoscopic surgery is associated with less blood loss, shorter hospitalization, and fewer postoperative complications, while maintaining comparable oncologic outcomes for patients with early endometrial cancer when compared to conventional laparotomy.[15]

Our current study has provided evidence that laparoscopic surgical management, staging, and lymphadenectomy for endometrial cancer are safe, effective, and feasible, which is consistent with the findings of Chu et al. [5]

Ghazali's study demonstrated the efficacy of laparoscopic excision in stage I endometrial cancer, with histopathological results showing that the laparoscopic approach did not compromise the completeness of tumor excision or the adequacy of surgical margins. The study also showed that full hysterectomy could be performed using laparoscopic techniques in a manner similar to laparotomy. These findings suggest that laparoscopic excision is a viable option for the surgical management of stage I endometrial cancer, with outcomes comparable to those of traditional laparotomy. [8]

Ghazali and his colleagues demonstrated in their study that laparoscopic lymphadenectomy can be performed safely and completely, with the number of lymph nodes harvested being similar to that of laparotomy, which is consistent with our study's findings. Additionally, they showed that laparoscopic surgery is a safe approach for patients of all age groups, including those with comorbid conditions such as obesity, hypertension, or diabetes. In the surgical management of any

malignancy, the primary goal is to minimize patient morbidity and optimize their overall health. Therefore, any surgical procedure should aim to decrease the patient's morbidity and improve their postoperative outcomes.[8]

Api's comparison study between laparoscopy and laparotomy also favored the laparoscopic technique, as it demonstrated that laparoscopy resulted in less blood loss and shorter post-operative hospital stays when compared to laparotomy. These findings further support the use of laparoscopic surgery as a safe and effective alternative to traditional laparotomy for the management of endometrial cancer. [16]

Our study's findings are consistent with previous reports that laparoscopy is a safe and effective method for the surgical management and staging of endometrial cancer. We also demonstrated that laparoscopic surgery resulted in less intraoperative blood loss compared to laparotomy, and none of the patients in the laparoscopy group required blood transfusion either intra- or post-operatively. These results suggest that laparoscopy is a viable and advantageous approach for the management of endometrial cancer, with potential benefits in terms of reducing blood loss and the need for transfusion. In Our study also found that the operative time was longer in the laparoscopy group compared to the laparotomy group, which is consistent with previous studies. Although the longer operative time may be a disadvantage of laparoscopy, it is important to note that the potential benefits of laparoscopy, such as reduced blood loss, shorter hospital stay, and fewer postoperative complications, may outweigh this disadvantage. Additionally, with increasing experience and improvement in technology, the operative time for laparoscopy may be reduced in the future. Our study found that only two patients in the laparoscopy group required conversion to laparotomy, which is consistent with previous reports. Our study suggests that laparoscopic surgery is particularly beneficial for obese patients or those at high risk of developing deep vein thrombosis or pulmonary embolism due to the smaller incision size and less painful technique, which allows for rapid post-operative movement.

However, caution must be taken in patients with certain medical conditions, such as chronic lung disease or obstructive sleep apnea, which may affect their ability to tolerate laparoscopic surgery. In such cases, a medical physician or ENT specialist evaluation may be required before deciding on the type of surgery. It is important to minimize patient morbidity during surgery, as excessive intra- or post-operative bleeding, wound infection, or difficult post-operative movement can weaken the patient's body and hinder their ability to fight cancer. The use of laparoscopic surgery can facilitate rapid wound healing and the initiation of further therapies, such as chemotherapy or radiotherapy, which can improve patient outcomes and survival. [8]

Studies comparing laparoscopic and open abdominal approaches for the surgical staging of endometrial cancer have consistently found that patients undergoing a laparoscopic hysterectomy have a significantly shorter post-operative hospital stay. In our study, the mean length of hospital stay was approximately 2 days shorter in the laparoscopic group compared to the open surgery group. Other studies have reported similar reductions in hospital stay of 1 to 4 days with laparoscopy. The proportion of patients requiring more than 2 days of hospitalization after surgery was also significantly lower in the laparoscopic group in our study. [9]

Malur and his colleagues in 2001[(17)] conducted a study in which they compared 37 endometrial cancer patients who underwent laparoscopic surgery to 33 patients who had laparotomy. They found that patients in the laparoscopic group had shorter hospital stays, less blood loss, and a lower rate of blood transfusion when compared to the laparotomy group. These findings are consistent with other studies that have demonstrated the advantages of laparoscopic surgery for the management of endometrial cancer, including reduced morbidity, faster recovery, and improved quality of life for patients. [9]

While our study found higher rate for blood transfusion in Laparotomy group than laparoscopy group , other studies have reported conflicting results. For instance, **Scribner et al**[(18)] reported that patients in the laparoscopy group received more blood transfusions than those in the laparotomy group. However, it is important to note that this study had a small sample size and may not be representative of the overall population. On the other hand, **Bogani et al** [(19)] studied the differences between laparoscopy and laparotomy in women over 75 years and found no significant difference in the blood transfusion rate between the two groups. It is important to consider the specific patient population, surgical technique, and other factors that may influence blood transfusion rates when interpreting these results, as such factors may vary between studies

In a study on the same subject, Ghezzi and his colleagues reported a higher rate of blood transfusions among patients who underwent laparotomy compared to laparoscopy. This finding is consistent with other studies that have reported lesser blood loss and transfusion rates in laparoscopic surgery compared to laparotomy for the management of endometrial cancer. [(20)]

Studies have shown that laparoscopic surgery for the management of endometrial cancer may require a longer operative time compared to laparotomy. This is because laparoscopic surgery requires more

technical expertise and set-up time for equipment and instruments**.** [9]

Our study found that the mean operative time was 129 minutes for laparoscopy and 88 minutes for laparotomy. The surgeon's experience and learning curve are crucial factors in achieving a shorter operative time.

Palomba et al. conducted a study on endometrial cancer patients and reported that the probability of conversion to laparotomy was associated with the stage of the endometrial carcinoma. Specifically, the more advanced the stage of the carcinoma, the higher the risk of conversion to laparotomy. Their study also found an overall conversion rate of 13.2% for laparoscopy. These findings suggest that the stage of the endometrial carcinoma should be considered when deciding on the surgical approach for endometrial cancer patients, as more advanced stages may require a higher likelihood of conversion to laparotomy. [(21)] In our study we had two cases converted from laparoscopy to laparotomy, both were due to bladder injury.

Lymphadenectomy is an important part of the surgical management of endometrial cancer, and it is performed in both laparoscopic and laparotomy approaches. Studies comparing the two methods have reported conflicting results regarding the number of lymph nodes obtained. Some studies have found comparable results in the number of lymph nodes obtained in both techniques , while others have reported a higher number of lymph nodes obtained in laparotomy, which may be due to the ability to access more para-aortic lymph nodes in the laparotomy group. The optimal surgical approach for lymphadenectomy in endometrial cancer may depend on various factors, including tumor stage, patient characteristics, and surgeon experience and preference. [(9)]

Kohler and his colleagues conducted a study to assess the feasibility of laparoscopic lymphadenectomy in 650 patients with gynecologic cancers. Among the 66 patients who underwent the lymphadenectomy procedure, on average, 26.7 lymph nodes were retrieved (15.4 pelvic and 9.6 para-aortic). The total time for obtaining pelvic and para-aortic lymph nodes was 56 and 63 minutes, respectively. [(22)]

While some studies have reported a higher number of lymph nodes obtained in laparotomy, other studies have found the opposite, with laparoscopy yielding a higher number of lymph nodes. One possible explanation for this is that the pneumoperitoneum in laparoscopy creates a positive pressure that may facilitate the dissection and removal of lymph nodes, particularly in the pelvic region. This may result in a higher number of lymph nodes obtained in laparoscopy compared to laparotomy. However, the optimal surgical approach for lymphadenectomy in endometrial cancer may depend on various factors, including individual patient characteristics and surgeon experience and preference. [(23)] In our study the number of dissected LN was nearly equal in both groups with average number twelve LN.

Gemignani et al. [(24)] conducted a study to compare the survival rates of 69 endometrial cancer patients who underwent laparoscopic surgery and 251 patients who underwent open surgery. They found no significant difference in survival rates between the two groups. Similarly, **Obermair et al**.[(25)] and **Malur et al**.[(17)] also reported similar results in their studies, which suggest that the choice of surgical approach (laparoscopy vs. open surgery) does not significantly impact survival outcomes for endometrial cancer patients. [*(9)*]

The LAP2 trial is a well-known randomized controlled trial that compared the outcomes of laparoscopic surgery and open surgery (laparotomy) for the management of endometrial cancer. The trial found that laparoscopic surgery had longer operative times compared to laparotomy, but it was associated with lower rates of complications and shorter hospital stays. Importantly, the trial also found no significant difference in survival or recurrence rates between the two groups, suggesting that laparoscopic surgery is a safe and effective alternative to laparotomy for the management of endometrial cancer. [(26)]

5. Limitations

Strengths of our study include randomized design and all patients adhered to their follow up schedule with no dropout. The laparotomy arm was performed by well-trained surgeons, the laparoscopic arm was performed by the same team. Throughout the study with two cases converted to open technique due to bladder injury

Our study is not devoid of limitations; our study was conducted upon a relatively small sample size due to epidemic of (COVID-19) and it was a single-institution study.

At first laparoscopic surgery was lengthy operation with long operative time, but with time and gaining experience and increasing learning curve it became easier and less operative time.

Follow up of the patients was not long enough (1-3 years) to be able to comment on 5-years disease free survival and over all survival.

6. Recommendation

We recommend continuing follow up of the patients for longer time. We recommend a large multicenter RCTs with longer follow-up are needed to provide more convincing survival outcomes, with special attention to the postoperative quality of life measures and cost analysis for different surgical services.

Author contributions

HR, AT, AK, ZG, MS: contributed to the design, surgical procedure, data collection and implementation of the research

ShZ: contributed to the pathological examination

ED : contributed to Randomization and all data analysis aspects

All authors discussed the results and contributed to the final manuscript

Conflicts of interests

The authors declared no conflicts of interest.

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