

# Role of Minimally Invasive Surgery in Gynecological Cancers

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## ABSTRACT

**Background:** Presently due to technological advances, operative laparoscopy now plays a crucial role in the management of pelvic malignancies. With newly developed techniques to complete both pelvic and para-aortic lymph node dissection, the use of the laparoscope has increased in patients with pelvic malignancies. Gynecological oncologists are currently incorporating the techniques of operative laparoscopy in the management of patients with cervical, endometrial, and ovarian cancer.

**Aim:** To review literature on the role of minimal invasive surgery in various gynecological cancers.

**Materials and methods:** These were drawn from previous research materials online in PubMed, Cochrane library, Wikipedia.

**Conclusion:** Minimal invasive surgical approaches to the management of gynecologic malignancies are feasible and provide exciting alternatives. However, the safety and efficacy of these techniques compared to laparotomy in this setting has not been carefully studied. Potential advantages include shorter operative time for some procedures, shorter recovery times, and less adhesion formation. These new surgical techniques need to be evaluated critically and compared to more traditional approaches.

**Keywords:** Gynecological cancers, Laparoscopy, Lymphadenectomy, Minimally invasive surgery.

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## INTRODUCTION

In the past, the laparoscope has been used for few procedures like diagnostic and sterilization procedures. Due to technologic advances, operative laparoscopy and other minimal invasive surgical techniques now play an important role in the management of a wide variety of benign gynecological conditions including ectopic pregnancy,

endometriosis, pelvic pain, leiomyomata and adnexal masses. Similarly, the role of minimal invasive surgery in the management of malignant disease has expanded. With newly developed techniques to complete both pelvic and para-aortic lymph node dissection, the use of minimal invasive surgical techniques has increased in patients with pelvic malignancies. Gynecologic oncologists are currently incorporating the techniques of minimal invasive surgery in the management of patients with cervical, endometrial and ovarian cancer.

Radical vaginal trachelectomy with laparoscopic pelvic lymphadenectomy has emerged as a safe, reasonable option for women with early-stage cervical cancer desiring fertility preservation. Similarly, laparoscopic radical hysterectomy with pelvic lymphadenectomy has been systematically described, is feasible, and can be offered to women with early-stage cervical cancer who do not desire future childbearing. In the treatment of early stage endometrial cancer, the surgical approach of laparoscopic hysterectomy, peritoneal washings, and pelvic and para-aortic lymph node dissection, with or without an omentectomy, is being compared with the same surgery performed via laparotomy in the cooperative gynecologic oncology group (GOG) LAP 2 study, which has completed accrual, and appears to be a reasonable surgical option. In ovarian cancer, minimally invasive surgery has been incorporated to manage early-stage, advanced-stage, and recurrent disease, as well as second-look procedures. Hand-assisted laparoscopy has also recently been described in managing larger volume primary and recurrent gynecologic cancers.

## AIMS AND OBJECTIVES

To review literature on the role of minimal invasive surgery in various gynecological cancers.

## MATERIALS AND METHODS

An extensive literature search online was done through PubMed, Wikipedia, Cochrane and videos via YouTube.

## REVIEW OF ARTICLES

### Cervical Cancer

The issue of laparoscopy in the management of locally advanced cervical cancer has been addressed by several authors. In particular, researchers from Korea, Chung et al,<sup>1</sup>

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evaluated the feasibility and safety of pretreatment laparoscopic surgical staging in the treatment of locally advanced cervical cancer. The authors contended that pretreatment laparoscopy is the best guideline for individualized concurrent chemoradiation. When compared with magnetic resonance imaging, laparoscopic surgical staging was superior in detecting microscopic lymph node metastases.

Various studies summarized in Tables 1 to 3 respectively at various places.

Thus, while abdominal radical hysterectomy remains the standard of care for early-stage cervical cancer, laparoscopic radical hysterectomy appears to be a safe, reasonable alternative. Operative laparoscopy has also been used as a means of determining a patient's eligibility for pelvic exenteration for recurrent cervical cancer, removal of diseased adnexae, and ovarian transposition. It has been proven to be a valuable step in the workup and management of patients with locally recurrent cervical cancer.

### Endometrial Cancer

Operative laparoscopy is also useful in the management of patients with malignancies of the uterine corpus. In 1988, endometrial cancer became a surgically staged

malignancy according to FIGO. The importance of pelvic and para-aortic lymph node status documented by a large GOG study was instrumental in motivating the change to surgical staging.

Various studies are summarized in Table 2:

Patients managed with a laparoscopic approach had the same number of lymph nodes removed, but had less complications, a shorter hospital stay and quicker recovery than the laparotomy group. In addition to surgical staging in the primary management of endometrial carcinoma patients, the technique can be utilized in patients with incomplete staging of disease at their primary surgery.

### Ovarian Cancers

Epithelial ovarian cancer is one of the leading causes of death in gynecological malignancies and the seventh most common cancer in the world among women. Minimally invasive surgery for patients with ovarian cancer can be incorporated in different ways depending on the stage of disease and surgical goals of the procedure. In advanced stage disease, laparoscopy in general can be used to confirm diagnosis and determine resectability. In early-stage disease, patients can be comprehensively staged via the laparoscopic approach. The laparoscopic

**Table 1:** Various studies comparing laparoscopic approach vs conventional approach for management of cervical cancer

Sl. no.	Name	Type of study	Intervention	Participants	Result
1	Roy et al <sup>2</sup>	Retrospective	Laparoscopic pelvic lymphadenectomy and radical vaginal hysterectomy with abdominal radical hysterectomy	52	Both procedures were equally safe and efficacious
2	Spirtos et al <sup>3</sup>	Prospective	Laparoscopic radical hysterectomy	78	94% of the procedures were completed laparoscopically. The average operative time was 205 minutes. The average EBL was 225 ml, with only one patient requiring a blood transfusion. There were three cystotomies and one ureterovaginal fistula noted. The average lymph node count was 34, with 11.5% of patients having positive nodes. Three patients had close or positive surgical margins, and 5.1% of patients recurred with at least a 3-year follow-up <sup>3</sup>
3	Abu-Rustum et al <sup>4</sup>	Prospective	Compared patients undergoing laparoscopic radical hysterectomy with pelvic lymphadenectomy with patients with abdominal radical hysterectomy with pelvic lymph node dissection	Not available	The laparoscopic approach for radical hysterectomy was safe, feasible, and associated with low morbidity. The median operative time was longer for the laparoscopic approach, while the hospital stay and EBL were significantly less in the laparoscopic group.
4	Marnitz et al <sup>5</sup>	Prospective	Patients with locally advanced cervical cancer who were selected for laparoscopic staging for primary chemoradiation.	84	They found that removal of more than five pelvic and/or more than five para-aortic lymph nodes was associated with significantly longer overall survival. The authors concluded that debulking of tumor-involved lymph nodes should be performed prior to primary chemoradiation in patients with locally advanced cervical cancer.
5	Kohler et al <sup>6</sup>	Prospective	Patients undergoing explorative laparoscopy to determine eligibility for exenteration	41	Almost half (48.7%) of the patients avoided unnecessary exenteration for unresectable disease or intra-abdominal spread of disease.

**Table 2:** Various studies comparing laparoscopic approach vs conventional approach for management of endometrial cancer

Sl. no.	Name	Type of study	Intervention	Participants	Results
1	Gemignani et al <sup>7</sup>	Prospective	Laparoscopically assisted vaginal hysterectomy with pelvic and para-aortic lymph node dissection, peritoneal washings, and an omentectomy in patients with serious malignancies of the endometrium with total abdominal hysterectomy (TAH)/BSO with surgical staging	Not available	LAVH was associated with a shorter hospital stay, fewer complications, and lower overall hospital charges
2	Tozzi et al <sup>8</sup>	Randomized controlled trial	Laparoscopy vs laparotomy in endometrial cancer	122	The overall survival rate was 86.3 vs 89.7%, respectively. The authors recommend that laparoscopic procedures be included in the routine treatment options for patients with endometrial cancer
3	Janda 2010 <sup>9</sup>	Multicenter randomized controlled trials	Total laparoscopic hysterectomy, bilateral salpingo-oophorectomy, peritoneal washings, +/- pelvic lymph node dissection +/-para-aortic lymph node dissection vs conventional laparotomy approach	332	Laparoscopic approach is associated with equivalent disease free survival rate when compared with the standard laparotomy approach for women with Stage I endometrial cancer
4	Mourits 2010 <sup>10</sup>	Multicenter randomized controlled trial conventional laparotomy approach	Total laparoscopic hysterectomy, bilateral salpingo-oophorectomy, peritoneal washings, +/- pelvic lymph node dissection +/-para-aortic lymph node dissection vs laparotomy approach	283	TLH was associated with significantly less blood loss ( $p < 0.0001$ ), less use of pain medication ( $p < 0.0001$ ), a shorter hospital stay ( $p < 0.0001$ ), and a faster recovery ( $p = 0.002$ ), but the procedure took longer than TAH ( $p < 0.0001$ ).
5	Walker 2012 <sup>11</sup>	Multicenter randomized controlled trial	Laparoscopic hysterectomy included laparoscopic assisted techniques, total laparoscopic approaches, and rarely robotics." Washings, extrafascial hysterectomy and bilateral salpingo-oophorectomy, + pelvic lymph node sampling + para-aortic lymph node sampling vs Laparotomy, washings, extrafascial hysterectomy and bilateral salpingo-oophorectomy, + pelvic lymph node sampling + para-aortic lymph node sampling	2616	Laparoscopy had fewer moderate to severe postoperative adverse events than laparotomy (14 vs 21%, respectively; $p < 0.0001$ ) but similar rates of intraoperative complications, despite having a significantly longer operative time (median, 204 vs 130 minutes, respectively; $p < 0.001$ ).

second-look procedure is a reasonable approach to assessing disease status at completion of adjuvant chemotherapy in selected patients.

Various studies are summarized in Table 3.

The rates of negative evaluations and recurrence rates were comparable between patients undergoing laparoscopy and those undergoing laparotomy for ovarian cancers.

## DISCUSSION

It is clear that minimally invasive surgery approaches to the management of gynecologic malignancies are feasible and provide exciting alternatives. Operating times intuitively have improved with greater surgical experi-

ence. In addition, adequacy of the procedure being performed needs to be assured. Comparison of recurrence rates and survival provide some insight. Schlaerth et al<sup>16</sup> evaluated women with cervical cancer undergoing laparoscopic retroperitoneal lymphadenectomy followed-by immediate laparotomy to assess the adequacy of lymph node removal. In that study, the investigators reported that laparoscopic aortic lymph node sampling could be performed safely and adequately. Laparoscopic pelvic lymphadenectomy was noted at the time of laparotomy to have residual tissue lateral to the common iliac vessel and distal external iliac vessels in 15% of patients. Because none of the laparoscopic surgeons were aware of the pre-

**Table 3:** Various studies comparing laparoscopic approach vs conventional approach for management of ovarian cancer

Sl. no.	Name	Type of study	Intervention	Participants	Results
1	Chi et al <sup>12</sup>	Prospective	Laparoscopic staging vs staging via laparotomy for apparent stage I ovarian or fallopian tube cancers	50	The authors concluded that patients with apparent stage I ovarian and fallopian tube cancers can safely and adequately undergo laparoscopic surgical staging
2	Leblanc et al <sup>13</sup>	Prospective	Laparoscopic staging of incompletely staged invasive adnexal tumors	42	They found it to be safe, accurate, and with a low incidence of complications, particularly in the group of patients who had already undergone prior abdominal surgery. They found that the rates of negative evaluations and recurrence rates were comparable between patients undergoing laparoscopy and those undergoing laparotomy.
3	Hua 2005 <sup>14</sup>	Prospective case-control	Laparoscopic surgical staging vs open surgical staging of early ovarian cancer	21	Significantly fewer postoperative complications with laparoscopy compared with laparotomy
4	Angioli 2005 <sup>15</sup>	Retro- or prospective enrolment not known	Open diagnostic laparoscopy; examination of the whole abdominal cavity, biopsies for frozen section, performed by gynecological oncologist. If judged resectable direct cytoreduction was done	87	53 were indicated to be operable. Of these 51 had operable disease at laparotomy and 2 not. The other 34 patients were treated with NACT and 25 received an interval debulking surgery after 3 courses of chemotherapy

sence of this residual tissue, awareness should allow for correction of this potential surgical shortcoming. Also, there was concern that tumor implantation might be more commonly associated with laparoscopy. Abu-Rustum et al<sup>17</sup> noted that subcutaneous tumor implantation is not limited to laparoscopy. In a 12-year period, 1,288 patients had 1,335 transperitoneal laparoscopies. Laparoscopy-related subcutaneous tumor implantation was noted to be rare (0.97%) in women undergoing transperitoneal laparoscopy with malignant disease. Patients with advanced intra-abdominal or pelvic metastatic disease and progressive carcinomatosis appeared at greatest risk. Abu-Rustum et al<sup>17</sup> concluded that the risk for subcutaneous tumor implantation should not preclude laparoscopy in women with gynecologic malignancies managed by gynecologic oncologists. Frequently, obesity can present a challenge in managing early endometrial cancer via a minimally invasive approach. Eltabbakh et al<sup>18</sup> prospectively studied 42 obese women with clinical stage I endometrial cancer over a 2-year period. Forty patients were offered laparoscopic surgery. The procedure was converted to open laparotomy in three (7.5%) of the patients. Holub et al also reported on peri- and postoperative outcomes in obese *vs* nonobese patients using a minimally invasive surgical approach. They reported no statistical difference in operating time, lymph node counts, blood loss, or hospital stay. However, in a group of 33 obese and 32 nonobese patients, there was a higher number of major complications in obese patients than in nonobese patients (eight *vs* five). In the obese subgroup, complications included pulmonary micro-embolism, injury to the epigastric artery, injury to

the bladder, uncontrolled bleeding, and conversion to laparotomy. Holub et al<sup>19</sup> concluded that the expected outcome should be balanced with risks, but emphasized that laparoscopic surgery in obese women, much like in nonobese women, is safe, feasible, and should be considered in patients with endometrial cancer. Injuries to the bladder and epigastric artery, as reported by Holub et al,<sup>19</sup> highlight the difficulties of trocar placement in patients who are morbidly obese. Childers et al<sup>20</sup> also found that, in patients with endometrial cancer, obesity was the limiting factor in performing lymphadenectomies. Eltabbakh et al were unable to perform para-aortic lymph node samplings in two patients because of poor visualization secondary to obesity. However, they did report higher pelvic lymph node yields laparoscopically when compared with laparotomy. Finally, assessment of complications and conversion rate need to be addressed as the role of minimally invasive surgery increases in the management of gynecologic cancers. In evaluating their initial 10-year experience with laparoscopy, Chi et al<sup>21</sup> noted a low complication rate (2.5% grade 3–5) and a low conversion rate of 7%. They identified older age, malignancy, previous radiation, and previous abdominal surgery as significant risk factors for complications or conversion to laparotomy, which should help guide patient selection and surgical planning.

## CONCLUSION

After a literature search, it seems that minimal invasive surgical staging operation is a safe and effective therapeutic procedure for management of gynecological cancers, with an acceptable morbidity compared to the

laparotomic approach, and is characterized by far less blood loss and shorter postoperative hospitalization time. Recently, some reports demonstrated that robotic surgery is superior to laparoscopy in surgical staging of endometrial cancer.<sup>22,23</sup> However, the high cost limits universal use. Further multicenter randomized trials with longer follow-up should be necessary to evaluate the overall oncologic outcomes of this procedure.

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