

# THE RISK OF LAPAROSCOPY IN OVARIAN SURGERY

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## **Abstract**

### **Objective**

The objective of this literature review is to highlight the risk of laparoscopy in ovarian surgery, encompassing from the benign, borderline or low malignant potential ovarian mass and also important details on specific ovarian mass like dermoid cyst and the risk of rupturing and performing detorsion on an ovarian cyst during laparoscopy.

### **Material and Methods**

This article was enabled by doing literatures review using search engines such as Google, HighWire Press, Blackwell Synergy on keywords such as laparoscopy, ovarian neoplasm, , ovarian cyst, benign ovarian mass, ovarian LMPs (low malignancy potentials) , borderline ovarian mass, dermoid cyst, endometrioma, ovarian torsion, complication of laparoscopic, spillage of ovarian content, chemical peritonitis.

### **Results**

Laparoscopy is the method of choice in operating benign masses of the ovary, while the risk and benefits on borderline or low malignant potential ovarian masses remains inconclusive. Dermoid cyst can be safely operated by laparoscopy, preferably by preventing cyst ruptured. The risk of rupturing an ovarian cyst during laparoscopy will depends on its potential malignancy, making preoperative assessment prudent.

### **Conclusion**

Laparoscopy will undoubtedly become one of the most important methods in performing ovarian surgery. Meticulous preoperative assessment will reduce the risk of laparoscopy surgery on ovarian masses.

### **Keywords:**

Laparoscopy, ovarian neoplasm, , ovarian cyst, benign ovarian mass, ovarian LMPs (low malignancy potentials) , borderline ovarian mass, dermoid cyst, endometrioma, ovarian torsion, complication of laparoscopic, spillage of ovarian content, chemical peritonitis.

### **Introduction**

Ovarian tumours can occur in all stages of a woman's life. At early age, dysgerminomas are the most common ovarian tumor, while at the childbearing or reproductive age, functional cysts, endometriotic cysts, dermoids and benign epithelial tumours

predominate. Up to 30% of ovarian lesions are borderline or malignant in perimenopause women (1,2,3,4,5).

Nowadays, laparoscopy is gaining more popularity in surgical exploration and management of adnexal masses. **Medeiros et al** have done a systematic review over six RCTs and found out that laparoscopic surgery was associated with significantly less postoperative pain, fewer adverse effects (surgical injury or postoperative complications), and a shorter length of stay in hospital, although the operative time was slightly longer by average 11 minutes in the laparoscopy group compared to open laparotomy. (1)

Nonetheless, laparoscopy approach still has controversies regarding some issues. This literature review is intended to highlight and answer questions regarding what ovarian pathology would be best treated by laparoscopy, whether spillage of ovarian cyst would affect patients future outcome. This literature review will also cover the effect of laparoscopic detorsion of ovarian mass.

### **Material and Methods**

This literature review is made by doing research on various recent literatures in advance of laparoscopic approach on ovarian pathology. Search engine like Highwire press, Blackwell synergy, google were the most used search engine. Keywords used were laparoscopy, ovarian neoplasm, ovarian cyst, benign ovarian mass, ovarian LMPs (low malignancy potentials), borderline ovarian mass, dermoid cyst, endometrioma, ovarian torsion, complication of laparoscopic, spillage of ovarian content, chemical peritonitis.

### **Preoperative assessment: A necessity**

Whenever an ovarian tumor is detected, it is of utmost importance to establish whether the tumor is likely to be malignant or benign as decision making about the surgical approach will be based upon this. Other reason beside this is benign, borderline, and malignant lesions have been identified in the same surgical specimen. (1,2,3,4,5,6)

**Medeiros et al** suggested preoperative assessment for ovarian tumor : (1) transvaginal ultrasonography for morphologic scoring (internal borders, septations, papillary projections, echogenicity, and volume) and presence of ascites ; (2) color Doppler transvaginal ultrasonography: vascular quality is assessed by vascular resistance index and pulsatility index, cutoff of pulsatility index less than 1 or/and resistance index less than 0.4 define criterion for discriminating from malignant tumor; and (3) serum levels of CA125 with cutoff value of 35 U/mL. (1)

In general, all ovarian masses will fall into three categories ; masses that are clearly benign, masses that are clearly malignant and the borderline masses which often create confusion in diagnosis and treatment.

Large (above umbilicus), solid, fixed or irregular adnexal masses along with ascites or matted bowel and with malignant morphologic scoring in ultrasound (which arise suspicion of malignancy) were generally treated by laparotomy. On the other hand masses that after passing all the necessary preoperative workup and still turn out to

have a tendency to be benign are candidate for laparoscopy. Borderline tumor, which fall inbetween these two categories mentioned above, still raised some debatable issues.

Even after all these preoperative assessment been done , it is still not possible to have 100% certainty. Only inspection of the abdominal cavity, cytologic examination of the peritoneal liquid during operation and histologic examination of the surgical specimens will clarify this issue.

### **Ovarian tumors: benign , borderline (LMPs tumor) and malignant ovarian tumors**

**Duggal et al** reported laparoscopy management of benign ovarian mass. They extracted adnexal masses without endobags and inspite of spillage of contents post operative outcome was not affected. (2)

**'Borderline tumours' or tumours of low malignant potential (LMP)** of the ovary were first described in 1929. It is characterised by cellular features of malignancy (mitotic activity, cellular atypia) without stromal invasion and, thus, does not fulfill the criteria for invasive cancer. Some authors debated that these tumors are precursor lesions of invasive ovarian cancer while else considered it as a sole entity. (4,5,6,7)

Ovarian LMPs are epithelial tumours where serous ovarian tumor (65%) and mucinous ovarian tumor are the most common histologic types (32%). Serous LMP tumours are mostly confined to ovaries (stage 1) and bilateral tumours are common. Almost 30% of patients with serous LMP tumours will have extraovarian disease (upstaging), and a third of these tumours with an LMP diagnosis on frozen section will be upgraded to invasive cancer on final histopathology.(4,5)

Mucinous tumours are more often unilateral and confined to the ovary than serous LMP tumours. Rare histological types of ovarian LMP tumours include endometrioid, clear cell or Brenner (transitional cell). While a formal grading is not established, the presence of micropapillary features is accepted to increase the risk of invasive implants and recurrence. (4)

**Obermair et al** in their report described some specific concerns about laparoscopic approach for ovarian LMP tumours. These concerns include: (1) inadvertent cyst rupture: While cyst rupture does not matter for benign tumours, it is a matter of debate if it translates into impaired outcomes of patients with ovarian LMP tumours. (2) Lack of tactile sense: Despite excellent vision, laparoscopy has a drawback in tactile senses . This disadvantage may result in missing plaques and nodules on the peritoneum or the omentum which would have been palpated at laparotomy. (3) Surgical skills: Advanced laparoscopic skills are required to perform a surgical staging procedure if required. (4) Besides concerns mentioned above, **Fauvet et al** also stressed the risk of inadequate initial staging, tumor cell dissemination and wound metastasis.(5)

The management guidelines of borderline **ovarian** tumor are similar to the management of invasive **ovarian** cancer, which often require laparotomy. Peritoneal washing,

random or targeted multiple biopsies, omentectomy and tumor debulking are recommended, together with appendectomy for mucinous borderline tumors. (4,5,6,7)

As with invasive ovarian cancer, the standard treatment for LMP or borderline ovarian tumors is surgical excision. Spreading of LMP tumours within the peritoneal cavity may create deposits. These deposits may be non-invasive or invasive. Invasive implants require treatment similar to early stage epithelial ovarian cancer, including complete surgical staging and postoperative chemotherapy. **Desfeux's et al** mentioned suggested cyst rupture does not seem to translate into poorer outcome for the patient. Nonetheless, ovarian LMPs have a significantly less aggressive behaviour than classical epithelial ovarian carcinomas. Overall recurrence rates are of 5–7% and five-year overall survival is > 97% for early stage disease. The majority of patients with recurrence can also be cured by surgical excision.(4)

The problem with borderline ovarian tumors is despite the use of imaging techniques, including transvaginal sonography and color Doppler, and serum tumor markers, it sometimes remains difficult to distinguish borderline with the benign or malignant ovarian tumor. The sonographic of the borderline **ovarian** tumors exhibited features of benign tumors, with infrequent multilocular cysts and endophytic growth. Therefore, it is not uncommon that preoperative assessment fails to diagnose this borderline entity. Surgical staging for ovarian LMP tumours is better done and follow exactly the same staging as invasive ovarian cancer. Serous tumours are known to spread similar to invasive ovarian cancer and has similar pattern of invasiveness as epithelial ovarian cancer. Mucinous tumours are less likely to do so. Surgical staging includes peritoneal washings for cytology, biopsies of adhesions and peritoneal lesions, omentectomy, as well as pelvic and aortic lymph node dissection.

McGowan et al reasoned that inadequate initial staging in borderline ovarian tumor can be caused by the difficulties in performing surgical staging. Therefore, borderline tumor suspicious for malignancy has to be treated in specialized units with available intra-operative histology, and by surgeons with high experience in **laparoscopy**. Another potential explanation is that **ovarian** borderline tumors has a benign behavior and that comprehensive laparotomic staging remains controversial, owing to its low impact on clinical management and outcome. However, Trope et al in meta analysis found that the main independent prognostic factor for disease-free and long-term survival was the FIGO stage. (4)

**Fauvet et al** reported that laparoconversion was necessary during 42 out of 149 initial laparoscopies. The main indication for laparoconversion was signs of malignancy that were based on macroscopic aspect of adnexa or features suggesting an intra-abdominal dissemination. **Fauvet et al** in their report showed that dissemination of tumor cell and the occurrence of parietal metastasis along with wound metastases were not found in their patient's series. These might be explained by the short follow up periode, the large proportion of women having early stage of disease and also the biologic nature of borderline ovarian tumor which is unlikely to influence patient prognosis. (5)

Port-site metastases are another issue that rose in laparoscopy management of borderline ovarian tumor. Tumour recurrence to a surgical wound has been reported in all gynaecological cancer types in both open and laparoscopic surgery. Port-site

metastasis after laparoscopic surgery seems to be most common in patients with advanced intraperitoneal cancer. Port-site metastasis in other than advanced ovarian cancer is rare. Despite this rarity, port-site metastasis after laparoscopic treatment of ovarian LMP has been reported. Hsiu et al reported two cases of tumour implants occurred after diagnostic laparoscopic biopsies of serous LMP. **Morice et al** reported three cases of port metastases and all of these metastases were treated by surgical resection. (6,7)

On summary, the good biological behaviour and favorable outcome of LMP tumors suggested that patient's life expectancy is hardly altered by the diagnosis of an ovarian LMP tumor.

Although like previously mentioned that laparoscopy tends to increase the risk of cyst rupture, the risk of recurrence is similar when laparoscopic and open surgeries are compared. Nonetheless, prospective randomized trials are still needed to clarify the role of **laparoscopy** in women with borderline **ovarian** tumors.

### **Ovarian Cyst ruptured during laparoscopy operation**

Laparoscopy has higher tendency in rupturing the cyst and therefore spillage of its content, compared to open laparotomy. **Fanfani, Fagotti, et al** reported, excluding endometrioma, the overall frequency of inadvertent rupture of cysts during operation was 6% in the **laparoscopy** and 2% in the minilaparotomy group.(8)

Ovarian cyst rupture during laparoscopy surgery is believed to have unfavorable clinical impact to the patient. Laparoscopic management of ovarian cysts with suspicious features for malignancy remains controversial due to potential spillage of ovarian cyst contents, delayed staging and the possibility of accelerating the spread of malignant cells if the cyst ruptured during laparoscopic operation, either intentionally or not. Larger ovarian cyst is particularly of concern because of the higher incidence of rupture during laparoscopy and because larger ovarian cyst also has the tendency to be more malignant in nature.

Dermoid cyst is a benign ovarian mass which has specific feature. Unlike most other ovarian benign cyst, spillage of dermoid cyst material can result in an extensive inflammatory reaction, resulting in peritoneal adhesion formation. But some recent reports denied this issue. **Shawki O., Ramadan A., Askalany A.** (2007) reported removal of thirty-one dermoid cysts with a mean diameter of 7.5 cm in 26 patients. From those cases they encountered 14 spillages during the procedures: in ten cases (71%) of trocar removal without the use of endobag, one case (10%) of removal within an impermeable endobag, and three cases (42%) of colpotomy removal. This study, along with a review of 14 studies in the literature, concluded that only 0.2% incidence of chemical peritonitis following laparoscopic removal of dermoid cysts. Compared to management of dermoid cyst by open laparotomy, laparoscopic approach allows proper exposure of the cul-de-sac and forceful jet lavage aspiration, ensuring pelvic clean out from any microscopic material of the dermoid cyst. **Benezra, Victor; Verma, Usha; Whitted, R Wayne** reported 108 women with a preoperative diagnosis of suspected

ovarian dermoid cyst. Fifty-three patients underwent laparoscopic cystectomy (n = 32, 61%) or laparoscopic oophorectomy (n = 21, 39%) and another 55 patients had laparotomy for ovarian cystectomy or oophorectomy. *Regarding spillage of dermoid cyst content during laparoscopy*, compared with those who had laparotomy (4.1%), spillage of the cyst contents was much more frequent in women who underwent laparoscopy (31.4%) (P = 0.0004). After statistical analysis, they found out that laparoscopy was significantly more commonly associated with dermoid cyst spillage, even when adjustments were made for cyst size, oophorectomy, and cystectomy. But then, no patient in this series developed peritonitis. (9,10)

Spillage from a mucinous cyst can result in pseudomyxoma peritonei while spillage of malignant cystic contents can result in intra-peritoneal dissemination of malignant cells and can advance the stage of the disease.

Carbon dioxide (CO<sub>2</sub>) which is frequently used in laparoscopy, despite many of its advantages, possesses possible potential in activating cell enzymes, which in turn may lead to mitosis and an increase in the production of tumor growth factor in animal model. Therefore, regarding this issue, a surgeon should therefore run an adequate preoperative evaluation to exclude possible malignancy by taking careful history, examination, ultrasonography assessment and measurement of **ovarian** tumour markers. Around 10% of adnexal masses were extremely difficult to classify, and an explorative **laparoscopy** could be considered during the surgical approach in this specific group. Keeping this consideration, it is recommended that all ovarian cysts should be removed via a laparoscopic bag or via a colpotomy using a transvaginal tube. Spillage is to be minimized as much as possible, however even after judicious precaution spillage is still cannot be completely eliminated.

## **OVARIAN TORSION**

Ovarian torsion in benign cystic tumors can be encountered especially in dermoid or mucinous cysts. Clinically adnexal torsion is usually managed by doing adnexectomy to prevent embolism of thrombosed ovarian veins and its sequelae. However, in patient who needs to preserve the ovarian function, conservative management with untwisting of the adnexa, followed by cystectomy would be a better option. **Dah-Ching Ding, Sidney S., Chen** reported a case of a torqued cystic teratoma measuring 9.7 x 6.5 x 6.2 cm in which detorsion was performed by laparoscopy and they found no complication of embolism. **Rody A, et al** reported that complications have been noted in nine of 214 cases (4%) of twisted ovary, if detorsion was performed. (11)

Furthermore, **Aharoni et al** reported a case of pelvic abscess formation after performing a detorted ovary that subsequently found out to be a dermoid cyst. Whenever the ovary appeared grossly necrotic or is suspected to be dermoid, Aharoni suggested that it should be removed promptly because it may contain tissue components that cannot be eliminated by the peritoneal immune system. (12,13) **Chew et al** reported a detorsion of a hyperstimulated ovarian in a pregnant woman after a following an IVF cycle. He suggested that the unwinding procedure did not result in any complication and the pregnancy was not effected. (14)

However, there are several factors that should be kept in mind like if there are risk factors for thromboembolism (e.g. obesity, bed-ridden patient, oral contraceptive use, pregnancy). Preservation may not be worthwhile in prolonged torsion, since extensive, irreversible adnexal necrosis has been documented after torsion for longer than 48 hours. In conclusion, laparoscopic conservative surgery for adnexal torsion might still be the intervention of choice in young women to preserve reproductive ability. (12,13,14)

## Conclusion

Laparoscopy field has evolved dramatically in the recent years. Most of ovarian masses can be operated by laparoscopy. While benign ovarian pathology remains the most common indication for laparoscopy treatment, borderline ovarian tumor still left some uncertainty whether it is better be handled by open laparotomy or laparoscopy can still be justified. Nonetheless, if laparoscopy were done for borderline tumor, we must keep in mind that the threshold of conversion to laparotomy has to be lowered to get the best surgical staging if it is difficult to be done laparoscopically. Although some reports denies it, the ruptured and spilling of ovarian cyst content of a borderline tumor also might create more problem to the patient as peritoneal metastases can developed. This spesific problem can be lessen if prompt reconversion is taken because most reports showed that laparoscopy has higher tendency of rupturing ovarian cyst compared to open laparotomy. IDermoid cyst and torsion of ovarian tumor itself may benefit from laparoscopic surgery, given proper technique is kept in mind. It is also a good practice to always use an endobag before rupturing and or extracting any ovarian cyst. The author believes that bigger clinical trials that have longer periode of follow up are still needed to extract the best conclusion in this particular issue.

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