
SPECIAL ARTICLE

Laparoscopic Management of Ovarian Mass and Ectopic Pregnancy

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Adnexae comprise mainly the ovaries and the fallopian tubes as well as supporting structure of the uterus, the vascular and lymphatic channel. The adnexal mass, which needs surgery, might be treated by the traditional way, which is laparotomy, or laparoscopic surgery. In this paper, laparoscopic management of ovarian cysts and ectopic tubal pregnancy will be described.

I. Laparoscopic management of ovarian cysts

Laparotomy seems to be the most appropriate method for management of most ovarian cysts. From the oncologic point of view, laparotomy would allow surgeons to scrutinize details of the abdominal organs as well as to search sites of metastasis, if any. Anyhow, laparotomy can not be done without consequences such as abdominal wall adhesions, and scars on the ovarian surface that might compromise future fertility, in case of a benign ovarian cyst. As most of ovarian cysts are benign, laparoscopy seems to be the most appropriate mean of management.^(1, 2) And because laparotomy has still been the gold standard method of management malignant ovarian tumor, so the pre- and intra-operative evaluation of the ovarian cyst is one of the most critical steps in the laparoscopic procedure.^(2, 3)

The important preoperative evaluation is ultrasonography especially transvaginal.⁽⁴⁾ Computerized tomography (CT) scan and Magnetic Resonance Imaging (MRI) are used in some specific cases. Ascites, intracystic papillary projections, solid echogenicity are some major ultrasonographic finding in malignant ovarian cysts.⁽⁴⁾ Doppler flow study by ultrasonography has its controversial result in predicting malignancy. A low resistance index in a doppler flow study in a certain vessel of a mass means that the blood flow to that mass is high which might compatible with thin wall vessels and arteriovenous shunt found in malignant mass. At present, the doppler flow study should be considered as investigational and should need further study. Only the patients, whose lesions considered being benign, both clinically and ultrasonographically, are fitted for laparoscopy.

Tumor markers such as CA-125 are of limited value in predicting common epithelial ovarian cancer. The level above 35 U/ml has a significant correlation with ovarian malignancy in postmenopausal women but not in those in premenopause.^(3,5) It could be a part of the investigation in postmenopausal women whose pelvic masses are suspicious of early stage malignancy.

Procedures in Laparoscopy⁽⁶⁻¹⁰⁾

A.) Laparoscopic Diagnosis

1. Thoroughly inspection

This is the very first step after the laparoscope is inserted into the abdominal cavity. We have to look around at the abdominal structures but to focus onto the pelvic structures especially the ovaries. To find out primarily whether there are papillary projections on the ovarian cyst and the surrounding peritoneum or not. These projections might be missed during routine ultrasonography. A grasping forceps is introduced through the suprapubic 5-mm trocar to grasp the ovarian ligament and flip it over so that the entire ovary can be mobilized and inspected. The contralateral ovary and the whole abdominal cavity starting from pelvic peritoneum, left paracolic gutter, liver, right hemi-diaphragm, falciform ligament, left hemi-diaphragm, stomach, omentum, right paracolic gutter, colon and small bowel are also inspected for the evidence of seedling. Ascites is another evidence of malignancy especially if it is serosanguinous or turbid in color and translucency. Peritoneal fluid, either from aspiration or washing, must be collected for cytological study in all cases.

If the laparoscopic finding is highly suspicious of malignancy, papillary projection or solid ovarian tumor, an immediate laparotomy is still the standard treatment. In doubtful findings, tissue for frozen section is suggested. If the frozen section is reported to be malignant, immediate conversion to laparotomy is advisable.

If the ovarian surface is smooth, regular and there is no suspicion of malignancy, one can puncture the cyst for laparoscopic diagnosis.

2. Puncture and intracystic inspection

In case of benign finding by external evaluation of laparoscopy, internal evaluation of an ovarian cyst can be performed by puncture of the cyst and the internal lining of the cyst wall can be visualized. A grasping forceps is inserted into the side lower abdominal port in order to grasp the ovarian ligament and the ovarian cyst is raised close to the suprapubic trocar sheath. Then a 5-mm conical suprapubic trocar

with its sheath is punctured into the cyst. The fluid content is aspirated by suction canula. Then alternatively suckling and irrigating with warm saline or ringer lactate solution is liberally performed bit by bit in order to minimize spillage of fluid content. Thorough peritoneal lavage is advised to decontaminate the spillage, if any. After that, scissors are used for widening the punctured site and the laparoscope is introduced into the cyst. Careful inspection should be performed for the sign of malignancy.

In postmenopausal patients or in highly suspicious masses, ipsilateral adnexectomy should be performed and specimen transferred into a laparoscopic bag. Intracystic examination will be done outside the abdomen after the intracystic content is aspirated within the bag and the whole specimen is extracted via 10-mm port avoiding contamination. Frozen section is encouraged in these cases.⁽¹¹⁾

B.) Laparoscopic Management of Benign Ovarian Cysts

1. Puncture and Biopsy

This procedure is acceptable for a functional ovarian cyst. Laparoscopic diagnosis of a functional ovarian cyst is still far from being accurate. Ten percent of the cases turn out to be benign ovarian cysts by pathological examination. Puncture and biopsy of benign ovarian cysts carry 30 percent chance of recurrence which might be a consequence of the procedure. To prevent this event, the entire cyst wall should be removed. Unfortunately, the functional ovarian cyst wall can not be peeled off in one piece. It usually has to be torn in small pieces in the process of enucleation and it is not possible to peel off the entire cystic lining. So, the biopsy can only be performed in most of the cases.

2. Transparietal Enucleation of Ovarian Cysts

This technique is to mobilize the entire ovary and its cyst through the small abdominal incision namely minilaparotomy under the laparoscopic guidance, and the enucleation of the cyst wall will be

done outside the abdominal cavity. This procedure might be limited due to extensive adhesion and a very thick abdominal wall in obese patients. After enucleation, the bleeding points should be checked closing of the internal ovarian defect with suture material can be carried out if the gap of the affected ovary is large and wide. Then the entire ovary is repositioned into the pelvic cavity and rechecked again by laparoscopy.

3. Intraperitoneal Enucleation of Ovarian Cyst

This method is different from the transparietal enucleation of ovarian cysts that the enucleation is carried out within the abdominal cavity. As mentioned above, the chance of cystic rupture is around 70 percents if one is trying to perform enucleation of the cyst without prior puncture. This is true if the size of the cyst is above five centimeters.⁽⁹⁾ The development of our technique has been inspired after Professor MA Bruhat and his colleagues. Three second-trocars are inserted at suprapubic area in the mid-suprapubis and on both lateral aspect of Pfannenstiel line by avoiding the inferior epigastric vessels. After puncturing of the cyst as well as cleansing its content with suction and irrigation, scissors are used for widening the punctured site and cystoscopy is performed to confirm the benign laparoscopic finding. The cleavage plane between the cyst wall and ovarian cortex is carefully identified at the punctured site and two atraumatic grasping forceps are applied, one on the cyst wall the other to the ovarian cortex. Pulling the two grasping forceps in the opposite direction, the cyst wall will be detached from the underlining ovarian tissue. The bleeding points can be cauterized with bipolar cautery while enucleation is in progress or can be checked at the end of the procedure. The specimen is then removed using the laparoscopic bag. The open ovarian defect is left without suturing or the intraovarian tissue can be approximated with chromic catgut 4/0 if the defect is very large. The sutures used for ovarian defect approximation especially onto outer surface of ovarian cortex may lead to tissue ischemia and additional adhesion formation.

Extraction of The Specimens

To minimize cystic content contamination onto the abdominal wall, the cyst wall or ovarian tissue is put into a laparoscopic bag before removing it through a 10-mm trocar port. A 5-mm grasper, inserted through the 10-mm trocar port which is attached with a 5-mm external reducer, is used for extracting specimens or the laparoscopic bag. A 10-mm grasper is not suitable for 10-mm trocar for the graspers' arms, while grasping, could not be in its closing position and therefore can not be passed through the trocar tip.

This technique is also applied for removing other potential oncologic specimens i.e. retroperitoneal lymph nodes, to decrease chance of port-site metastasis as well as for endometriotic specimens in order to decrease the chance of surgical wound endometrioma.

We currently applied plastic green bag which is used for wrapping surgical instruments in ethylene oxide gas resterilization, for extracting the specimens. We seal one end of the green bag with an electrical sealing machine. The bag is tight enough to withstand the extracting procedure. We also extract the open end of the bag through the 11-mm umbilical port which is used for the 10-mm laparoscope. While doing this, a 5-mm grasper passing via mid-suprapubic port is used for grasping the open end of the specimen-filled bag and load through the tip of 11-mm umbilical port. The umbilical trocar is then slowly withdrawn under vision along with 5-mm graspers tip which is grasping the open end of the bag. The free end of the grasper's tip is finally seen at the umbilical incision. The open end of the bag is held with an arterial clamp and the bag is released from the 5-mm trocar. To prevent wound contamination, the extraction is then made through the open end of the bag if the specimen is large or the entire bag is pulled through the umbilical incision if it is small enough. The limitation of this technique is that the blinded end of the bag can not be monitored during external extracting procedure, so accidentally minute leakage of the bag might not be detected. In order to overcome this limitation, a 5-mm laparoscope is introduced through lower abdominal

port on left side and open end of plastic bag is pulled, under visualization, with a 5-mm grasper passing through 10-mm umbilical trocar in which a 5-mm external reducer has been attached. The whole process of specimen extraction is then under monitoring.

II. Laparoscopic management of ectopic pregnancy

Ectopic pregnancy is the state of pregnancy that occurs outside the uterine cavity.⁽¹²⁾ The most common site of ectopic pregnancy is at ampullary portion of fallopian tube. The fate of ectopic pregnancy might be spontaneous resolution, abortion or rupture of the ectopic mass. Delayed diagnosis may lead to hypovolemic shock while early diagnosis and proper management could minimize the morbidity and mortality as well as might preserve future fertility function. Laparoscopic management, currently, has an important role in ectopic pregnancy management.⁽¹²⁻¹⁴⁾

General consideration

Laparoscopic management of ectopic pregnancy could be conservative ones as linear salpingostomy, salpingotomy, partial resection or a radical one as salpingectomy.⁽¹²⁾ Salpingostomy by its name is to open at the anti-mesenteric part of the fallopian tube, evacuate the conceptive product and leave the tubal defect healed by secondary-intention. In salpingotomy, the tubal defect will be closed by fine suture material. This technique might lead to tubal obstruction and tubal adhesion due to edema and increased vascularity. Ampullary pregnancy is usually treated by linear salpingostomy but isthmic pregnancy is better be treated by partial salpingectomy or segmental resection of the affected part. Linear salpingostomy onto the isthmic portion of the fallopian tube may lead to tubal obstruction or tubal fistula. Salpingectomy is reserved for those who have severe tubal damage or the size of the ectopic mass is greater than 5 cm or for those whose chance of recurrence ectopic pregnancy are increased in next pregnancy, which are found in

antecedent history of repeated ectopic pregnancy, previously tubal surgery and tubal adhesion or hydrosalpinx. Salpingectomy is also suitable for those whose cardiovascular status is unstable or significant intraabdominal bleeding.

Combined clinical, ultrasound and serum β -hCG are crucial in early detection of ectopic pregnancy.⁽¹⁵⁾ Almost all of the patients in artificial reproductive technologies are routinely followed by ultrasonography and serial β -hCG, so early ectopic pregnancies are always detected. Contradictory, should a physician not keep ectopic pregnancy in one of differential diagnosis, it could easily be misinterpreted as threatened abortion or dysfunctional uterine bleeding. Delayed management might turn conservative surgery of the fallopian tube to salpingectomy, turn laparoscopy to laparotomy as well as unnecessary blood transfusion or turn morbidity to mortality!

Laparoscopic Salpingostomy

After the first trocar is introduced at subumbilical incision for laparoscope, two or three accessory 5 mm ports are made along the Pfannenstiel line, one at the mid suprapubic area while the other two are on each side of the line. The whole abdominal cavity should be thoroughly examined and the blood in the abdominal cavity has to be removed. Diluted vasopressin (20 units in 50-100 ml of normal saline solution), introduced via laparoscopic needle or small gauge spinal needle, is injected at serosal surface and tubal mesentery of affected part of the tube. Care should be taken not to inject into the vascular channel, for alteration of the cardiovascular system might occur. The affected part will become whitish pale due to local vasoconstriction. Monopolar cutting current is applied at antimesenteric surface of the ectopic mass using fine-laparoscopic-needle probe starting from the proximal part of the mass. This incision should be large enough, in average 1 cm in length, to allow a suction-irrigation probe or the end of the graspers to enter. The conceptive product, which usually locates at the proximal part of the ectopic mass, is then extracted by graspers or sucked out. Bleeding is

usually minimal in most of the cases. Should bleedings occur, a fine bipolar coagulation probe could be introduced to control them. Care should be taken not to destroy vast areas of the tubal lining. Precise bipolar coagulation at the bleeding points could preserve the tubal patency and function. Thorough irrigation at the incisional site might flush the clotted blood or remained conceptive tissue from the tubal lumen. The conceptive product is then removed through 10-mm port using a laparoscopic bag in order to diminish port site contamination. The pelvic cavity is copiously irrigated and sucked out to remove remained conceptive product, if any.

Laparoscopic Salpingectomy

Three accessory ports are made as in laparoscopic salpingostomy. Various techniques can be applied for salpingectomy. These include bipolar coagulation and cutting with scissors, monopolar coagulation and cutting with scissors or monopolar cutting, loop tie and cutting with hook-scissors, and linear stapler device.

The fallopian tube proximal to the ectopic mass is raised up with atraumatic graspers. A bipolar coagulation probe is introduced to the isthmic portion of the tube and coagulates the tube just close to the uterine cornue, and cut with scissors. The cut end of the tube is held up with graspers. Serials of alternative bipolar coagulation and scissors cutting will now be applied along the mesenteric aspect of the tube by staying as close as possible to the tube in order to avoid excessive destruction of the tubal branch of ovarian vessels which might lead to decreasing blood supply of the ipsilateral ovary. The distal end of tubal mesentery, which contains ovarian vessel can be coagulated with bipolar current or doubly tied with suture material and then cut with hook scissors. Care should be taken as the ureter runs close to the infundibulopelvic ligament and could be unintentionally injured. The ureters are easily identified in thin patients but not in thick ones. The right ureter can be identify as it crosses the bifurcation of iliac artery even in thick patient while the left ureter

is covered behind the sigmoid colon and may not be easily visible. The specimen is removed through 10-mm port by pre-putting into the laparoscopic bag.⁽¹⁶⁾

Bipolar coagulation and mechanical cutting with scissors is currently our practice. It has been shown to have advantage over coagulation with monopolar electrical current because of its reduced thermal tissue damage. The use of a linear stapler device is also one of the good technique for salpingectomy because it significantly reduces the time of the procedure. Though the cost of this disposable instrument is high and it needs a 10mm accessory port to introduce the device. In developing countries especially Thailand, electrosurgery and mechanical surgical instruments are appropriate. Many outstanding laparoscopic centers in European countries and in the USA are still using these techniques in their daily practices.

Serum β -hCG should be taken at 48-72 hours after the operation and then weekly until obtaining negative result. Failure declination of serum β -hCG, needs close observation or active management. In this case, retained intratubal conceptive product in salpingostomy or retained intraabdominal conceptive product in salpingectomy is suspected. Prescription of methotrexate is mandatory.

In conclusion, adnexal mass is a common gynecologic problem. Mostly are ovarian cysts and ectopic pregnancy. Preoperative evaluation of ovarian cyst may lead to proper management. For most of ovarian cysts are benign, laparoscopic treatment of ovarian cyst seems to be the treatment of choice. In case of malignant suspicion, vertical midline laparotomy is the gold standard of treatment.

Most of ectopic pregnancy occurs at ampullary portion of fallopian tube. Laparoscopic surgical intervention has currently become a new standard of treatment in many medical centers. Salpingostomy and salpingectomy can be done by laparoscopy. The patients will gain the benefits from laparoscopic procedure such as less postoperative pain, less hospital stay and early return to their normal activities.

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