

Laparoscopic guided minilaparotomy. A novel technique for management of
benign large ovarian cysts: An interventional study

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Key message

Laparoscopic guided minilaparotomy is a safe effective technique for management of large benign ovarian cysts with minimal affection of ovarian reserve.

ABSTRACT:

Objective to evaluate the efficiency and safety of a novel technique to keep benefits of laparoscopic management in women with large ovarian benign cysts without affection of the ovarian reserve

Design: An interventional study

Setting: Kasr Alainy medical school, Cairo university hospital

Population: 112 women with large benign ovarian cyst candidate for ovarian cystectomy.

Methods: The technique started with laparoscopy followed by guided cyst aspiration followed by exteriorization of the ovary through minilaparotomy and completion of cystectomy through microsurgical technique.

Main Outcome Measures: The primary outcome was ipsilateral recurrence of the cyst. Other outcomes included ovarian reserve assessment and postoperative pain.

Results: The number of women with recurrence in the ipsilateral ovary after 12, 18 and 24 months were 5 (4.5%), 16 (14.3%), 20 (17.85%) respectively. Assessment of ovarian reserve revealed a significant decrease in the level of serum AMH (2.82 ± 0.44 vs. 2.50 ± 0.42) and a significant increase in AFC (3.5 ± 1.7 vs. 4.9 ± 1.3) after our novel technique in surgical treatment of ovarian cysts (P value < 0.001). The operative time was 50 ± 7 and 62 ± 7 minutes in unilateral and bilateral cysts respectively.

Conclusions: Laparoscopic guided minilaparotomy is a safe and effective technique for the management of large benign ovarian cysts with minimal recurrence rate, ovarian reserve affection and adhesions.

Keywords: adhesion formation; benign large ovarian cyst; laparoscopy; minilaparotomy; ovarian reserve.

Trial registration: clinical trial registry no. NCT03370952. Registered 13 December 2017, <https://clinicaltrials.gov/ct2/show/NCT03370952>

Background:

The incidence of ovarian cysts is 5 to 15 % and it show minimal variations with different demographic data [1] and many of these cysts are functional. The rest are neoplastic ones and most of them are benign [2].

Whiteman and coworkers reported that benign ovarian cysts represented 7% of women admission for gynecological management [3].

Persistent simple ovarian cysts reaching 10 cm or more and complex cysts are candidate for surgical intervention [4].

When compared to laparotomy, laparoscopic management has many advantages for the patient and it is safe for both cystectomy and ovariectomy procedures [5,6]

Laparoscopy offers faster recovery, better cosmesis, less pain felt postoperatively and less adhesion when compared to laparotomy [6,7].

The main points that should be considered in ovarian cystectomy is the gentle handling of tissues to minimize adhesions and to reconstruct the normal anatomy of the ovary allowing the normal ovum pick up procedure by the fallopian tube [2].

The difference between laparoscopy and laparotomy is not only the mode of access to the operative field but also non palpation of tissues, counterintuitive motion, limited tissue movements and the replacement of the three dimensional eye image by the two dimensional monitor image. [2,7]

There are traditional believes that laparotomy is preferred for women with large cysts and in cases of adhesions that may limit access to the cyst and its mobility [2].

The aim of our study is to keep benefits of laparoscopic management in women with large ovarian benign cysts without increasing the risks of affecting the ovarian reserve used with cauterization through a novel combined laparoscopic and minilaparotomy technique. Also our novel technique aims to minimize pelvic adhesions and to ensure complete removal of large ovarian cysts and to reduce unintended gross spillage in case of an unexpected ovarian malignancy

Methods

A prospective cohort study was conducted at Kasr Alainy medical school, Cairo university hospital on 112 women admitted to gynecology department with the diagnosis of large ovarian cysts during the period from December 2017 to July 2020. All participants have signed an informed written consent after full explanation of the procedure, its potential risks and benefits. The study was approved by gynecology and obstetrics department ethical committee.

All participants were candidate for ovarian cystectomy for a large benign ovarian cyst and their age ranged from 18 to 35 years old.

The diagnosis of benign nature of the cyst was based on clinical evaluation and confirmed by 3D ultrasound examination and Doppler studies.

Inclusion criteria included women with unilateral or bilateral ovarian cyst with a mean diameter of 10 cm or more and having a good ovarian reserve (diagnosed with antimullerian hormone > 1 ng/ml & antral follicular count > 4). Women with solid ovarian masses, those who were unfit for surgery and women with BMI > 30 were excluded from our study. Exclusion criteria also involved women with contraindications for laparoscopy.

All participants were subjected to full history followed by complete physical examination and evaluation of ovarian reserve with the routine preoperative investigations. CA 125 level was measured in all women.

Day 2 transvaginal ultrasound (or transrectal in virgins) was done using a 7.5 MHz vaginal probe of the General Electric Voluson E8 ultrasound unit (GE Healthcare Austria GmbH, Seoul, Korea) to confirm the presence and assess the size, side, consistency of the ovarian cyst & to assess the AFC (Number of visible follicles from 2 to 10 mm) in both ovaries. That was followed by transabdominal evaluation of the cysts using the same machine.

The technique was created by Professor Fadel Shaltout. Under general anaesthesia, the patient was placed in the modified dorsal lithotomy position (to ensure lax anterior abdominal wall). The patient is then prepped and draped in the usual fashion for an abdominal and vaginal procedure. In non- virgin patients, vaginal speculum was inserted into the vagina to expose the cervix; a uterine manipulator is inserted in the cervix followed by placement of a Foley's catheter in the bladder. As regards port placement, a 10-mm umbilical trocar is inserted. A panoramic view of the pelvis was obtained together with full assessment of the ovarian cyst. Lysis of any surrounding adhesions was done to free the wall of the cyst before aspiration to avoid blind traction on these adhesions exposing the patient to various organ injuries.

Veress needle was inserted in the midline 2 cm above the symphysis pubis to aspirate the cyst under laparoscopic guidance (to guide the entry of the needle into the cyst wall). After partial cyst aspiration, a transverse mini-laparotomy is done (about 2 to 3 cm in length) in the midline 2 cm above the symphysis pubis. A long shanks artery forceps is introduced inside the abdominal cavity to grasp the top of the aspirated cyst under laparoscopic guidance. Then, the artery is pulled gently to the outside to deliver the ovary with its cyst at the mini-laparotomy skin incision outside the body followed by completion of cyst evacuation through a wide suction cannula.

Delivering of the cyst outside the body was done only after complete evacuation of air to minimize trauma to the infundibulopelvic ligament. Careful handling and traction is applied to avoid injury of both the ovarian tissue or/and infundibulopelvic ligament. Following the delivery of the ovary, the abdominal incision is temporary closed using (E-shaped 10 x 10 cm) rubber shield (to avoid any soiling of abdominal cavity with blood or cystic fluid , particularly in case of an unexpected ovarian malignancy, and give the chance to reinflate the abdominal cavity later on)

Classic ovarian cystectomy was done using microsurgical techniques in which the cyst wall will be dissected gently and carefully from the healthy ovarian tissue followed by perfect hemostasis and re-fashioning of the remaining ovarian tissue using Vicryl 3/0 or 4/0 sutures according to the thickness of the cyst wall. Irrigation of the external ovarian surface was done using normal saline to ensure removal of any blood and minimize peritoneal contamination (figure 2).

The stitched ovary is pushed gently inside the abdominal cavity and the mini-laparotomy is re-covered by the rubber shield (to allow re-inflation of the abdominal cavity). The ovary is reassessed under laparoscopic guidance to ensure perfect hemostasis and normal position of the ovary. Pelvic irrigation was done using normal saline.

Closure of the abdominal incisions (trocar port & mini-laparotomy) was done.

In women with huge cysts that reaching above the level of umbilicus, we started the operation by the minilaparotomy incision and start suction of the cyst under vision as it is stretching the overlying peritoneum. Suction is continued till the cyst size decrease below the umbilical level. The laparoscopy was done, then grasping the top of the cyst was done and its upper part was extruded outside the body followed by completion of cyst evacuation. The rest of technique was the same as smaller cysts.

The patient was transferred to the recovery room. The patient was discharged after 12 hours. Removal of the stitches was done after 1 week. Follow up at 2, 6, 12 and 24 months was done using ultrasonographic pelvic assessment and AMH and AFC as markers of ovarian reserve.

The primary outcome parameter was the recurrence of ovarian cysts in the ipsilateral ovary (recurrence was defined as the presence of ovarian cysts ≥ 2 cm). Other outcomes included ovarian reserve assessment, postoperative pain and patients satisfaction.

Results

Figure 1 describe the flow chart of participants.

The characteristics of the studied population including age, gravidity, parity, body mass index and number of previous abortions are described in table 1.

The size, side and nature of the ovarian cysts are shown in table 1.

Assessment of ovarian reserve revealed a significant decrease in the level of serum AMH and a significant increase in AFC after our novel technique in surgical treatment of ovarian cysts (table 2).

The operative time is described in table 4 and postoperative recovery including VAS pain score, intestinal motility recovery, patient mobilization and occurrence of shoulder pain is clearly shown in table 3.

The number of women with recurrence in the ipsilateral ovary after 12 , 18 and 24 months were 5,16,20 respectively (table 3).

Comparison between women with unilateral and bilateral ovarian cysts regarding the operative time, VAS pain score, occurrence of shoulder pain, intestinal recovery, women mobilization, and recurrence after 24 months are shown in table 4.

Discussion

This technique is associated with many advantages as minimal blood loss, less postoperative pain, more convenient scar appearance and shorter hospital stay. So the laparoscopic approach had become the standard for benign small ovarian cysts [8].

The difficulty of laparoscopic management of large ovarian tumors is related to restricted pelvic space so increasing the operative time, blood loss with higher possibility to conversion to laparotomy [9].

In laparoscopic ovarian cystectomy for large cysts, the rate of conversion to laparotomy was 0.45% and 2.6% and perioperative complications were reported in 1.3% and 1.6% in the Japan Society for Endoscope Surgery and Ghezzi trials respectively [10,11].

In our experience, we observed a major problem in managing large ovarian cyst through laparoscopy, that was the excess need for cauterization for the remnant ovarian tissue to control blood loss and none of the investigators who used laparoscopic management of large cysts commented or evaluated the ovarian reserve after the operation.

In 2004 Pelosi and colleague tried a technique of management of large ovarian cysts. They claimed that all procedures were successful without the need to laparoscopic aid or conversion to laparotomy with better cosmetic scar. They approached the cyst in 38 women through a cruciate incision transverse limb at skin and the vertical limb at the anterior rectus fascia. They used a surgical

adhesive glue large plastic wound dressing to the cyst surface to prevent spillage of the cyst contents into the peritoneal cavity then they aspirated the cyst till its shrinkage to the size allowing its delivery along the incision. They performed the conventional cystectomy or ovariectomy then returned the remnants to the abdominal cavity [12].

Although this technique allowed better complete removal of cyst wall without the need for the use of excessive ovarian cauterization, this apparently good technique had major defect. The extrusion of the cyst was done blindly which expose the patient to hazards of injury of pelvic or abdominal organs as a result of traction and cutting of adhesions between the cyst and these organs blindly.

In our technique, we avoided that serious invisible injury through laparoscopic vision of the cyst and freeing it from any surrounding adhesions before delivering it.

In our novel technique, all procedures were completed with only 4 cases out of 112 needed conversion to laparotomy resulted from failed laparoscopy, no single operative complication was reported and the most important the ovarian reserve evaluated after 6 months of the procedure was improved. Although we observed a statistically significant decrease in the level of AMH (from 2.82 ± 0.44 to 2.50 ± 0.42 which has a minimal clinical significance), that was compensated with a significant

increase in AFC. This minimal affection of the ovarian reserve was related to the use of microsurgical technique with avoidance of both diathermy and cold knife dissection as both of them affects the normal ovarian tissue adjacent to cyst wall.

Also exteriorization of the cyst allowed reconstruction of the stretched ovarian tissue over large cyst (which is not always feasible in laparoscopic surgery) . This clearly allowed preservation of most of the ovarian tissue with minimal affection of the ovarian reserve

Our technique was successful in both unilateral and bilateral ovarian cysts. None of the operated women have been proved to have malignancy after pathological examination as we have strict selection criteria and proper preoperative evaluation.

Also we claim that our novel technique is better than both laparoscopy and laparotomy in minimizing pelvic adhesions. Actually, we avoided all risk factors of adhesions named minimal peritoneal trauma and exposure, avoiding multiple trauma associated with laparoscopy and towel trauma associated with laparotomy, minimal contaminations that occurs commonly with laparoscopy. That is particularly important in managing cysts with irritant contents as dermoid and mucinous cysts.

The main limitation of our study was the inability to confirm minimal adhesions as it needs a second look laparoscopy to assess and that wasn't convenient to most of

our patients. However we can ensure minimal pelvic postoperative adhesions resulted from minimal peritoneal trauma and exposure, avoiding peritoneal contamination with cyst contents or blood and the use of perfect closure of the cyst microsurgical without suture knots at the external surface of the cyst.

Another clear advantage of our technique is the assurance of complete cyst removal which can never be confirmed at laparoscopy and that led to minimal recurrence rate reported by our patients.

To the best of our knowledge, our study is unique and evaluated a novel and could be a standardized technique for management of large benign ovarian cysts. The limitation of that technique is the presence of dense adhesions surrounding the cyst making its laparoscopic dissection hazardous and that was not encountered in our study as a result of proper patient's selection for the technique. The main limitation of our study was the absence of a control group with classic management of large ovarian cysts with laparotomy. We believed that all patients deserved to benefit from our technique.

The future of that technique is to apply it on women with endometriosis as they are usually young and seeking fertility and laparoscopic management with excessive cauterization could affect their ovarian reserve.

We can conclude that Laparoscopic guided minilaparotomy is a safe effective technique for management of large benign ovarian cysts with minimal recurrence rate , ovarian reserve affection and adhesions

We recommend this novel technique for all women with large benign ovarian cysts who wants to preserve their fertility for future fertility. Also this technique can be used in older women with confirmed benign nature of the cyst and not candidate for hysterectomy as it has a better postoperative recovery than laparotomy as confirmed by our results.

List of abbreviations

AFC Antral follicular count

AMH anti-Mullerian hormone

VAS Visual analogue scale

Declarations

Ethics approval and consent to participate: The study was approved by the Kasr Alainy Hospital Ethical Committee. Approval number 171611. All participants provided an informed written consent after explaining the aim of the study, the procedure & the potential hazards.

Consent for publication: **Not applicable**

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Authors' contributions:

MFS : surgical management and manuscript revision

AMM : Data analysis, manuscript writing

SSZ : Data collection, manuscript writing

ROE : Data collection, manuscript writing

RA : Data analysis , manuscript revision

MMS: Data analysis , manuscript revision

SD: Data analysis , manuscript revision

MME : Data collection, manuscript writing

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Compliance with Ethical Standards

The study was performed in accordance with the Declaration of Helsinki ethical standards. Informed consents were taken from study participants.

Drs. MF Shaltout, , AM Maged, SS Zaki, RO Elkomy,R Abdella, M Sedeik, S Dahab and M Elsherbini, have no conflicts of interest or financial ties to disclose

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Figure legends

Figure 1 Consort flow of patients through the study

Figure 2 Extrusion of the cyst, Microsurgical cystectomy and ovarian closure