

Management of Ovarian Cysts: Current Approaches and Impact of Surgical Hemostasis on Ovarian Reserve

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Abstract

Background: Ovarian cysts are common gynecological conditions that affect females across different age groups. Their management depends on several factors, including cyst type, size, sonographic appearance, symptom severity, patient age, menopausal status, fertility wishes, and the possibility of malignancy. Most simple functional cysts in reproductive-age women resolve spontaneously and can be managed conservatively with clinical and ultrasonographic follow-up. Medical treatment is mainly directed toward symptom relief and prevention of recurrence, whereas surgery is indicated for persistent, enlarging, symptomatic, complicated, or suspicious ovarian cysts. Laparoscopic cystectomy is currently preferred for most benign ovarian cysts because it provides faster recovery, less postoperative pain, shorter hospital stay, and better cosmetic outcomes than laparotomy. However, preservation of ovarian reserve remains a major concern, particularly during hemostasis after cystectomy. Bipolar electrocoagulation provides rapid and effective bleeding control but may cause thermal damage to healthy ovarian tissue, while suturing may better preserve ovarian reserve despite being technically more demanding. This review summarizes the conservative, medical, and surgical management of ovarian cysts, with particular emphasis on laparoscopic cystectomy and the comparative effects of bipolar coagulation and suturing on ovarian reserve.

Keywords: Ovarian cyst; Conservative management; Medical management; Laparoscopic cystectomy; Bipolar coagulation; Ovarian suturing; Ovarian reserve; Anti-Müllerian hormone.

Introduction:

The management of ovarian cyst depends on several important factors, including the cyst type, size, sonographic appearance, symptom severity, patient age, and menopausal status. Most ovarian cyst in reproductive-age women is functional and benign in nature, with many resolving spontaneously within a few menstrual cycles. Consequently, conservative management with regular follow-up is considered appropriate in asymptomatic patients with simple cyst and reassuring imaging findings. Surgical intervention is generally reserved for cyst that are persistent, enlarging, symptomatic, complicated, or suspicious for malignancy (1).

A thorough clinical evaluation should be performed before deciding the appropriate management plan. This includes detailed history taking, physical examination, pelvic ultrasonography, and laboratory investigations when indicated. Ultrasound remains the primary imaging modality for assessment of ovarian cyst because it helps determine cyst morphology, size, septations, solid components, papillary projections, and vascularity. Tumor markers such as CA-125 may also be useful, especially in postmenopausal women or when malignancy is suspected. Management strategies can be broadly divided into conservative management, medical management, and surgical management (2, 3).

Conservative (Expectant) Management:

Expectant management is the preferred approach for most simple functional ovarian cyst, particularly in premenopausal women. Functional cyst such as follicular cysts and corpus luteum cyst commonly regress spontaneously within 6–8 weeks without treatment. Therefore, observation with periodic ultrasonographic follow-up is considered safe in asymptomatic patients with benign-appearing cyst (4).

Simple cyst smaller than 5 cm in premenopausal women usually require no intervention and may only need reassurance. Cyst measuring 5–7 cm may require follow-up imaging, whereas larger cysts or those with complex morphology warrant closer evaluation. In postmenopausal women, even small ovarian cysts require more careful assessment because of the increased risk of malignancy (4).

Patients managed conservatively should be educated about warning symptoms such as sudden severe pelvic pain, abdominal distension, vomiting, dizziness, or fever, which may indicate complications like torsion, rupture, or hemorrhage. Follow-up intervals are usually individualized according to cyst characteristics and patient risk factors (5).

Medical Management:

Medical management of ovarian cyst mainly focuses on symptom control and prevention of recurrence rather than elimination of existing cyst. Analgesics such as acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs) are commonly prescribed for mild-to-moderate pelvic pain. Local heat application may additionally help relieve pelvic muscle spasm and discomfort (4).

Hormonal therapy, particularly combined oral contraceptive pills (COCs), has historically been used to suppress ovulation and reduce the formation of new functional ovarian cyst. Although oral contraceptives may decrease recurrence rates, evidence suggests that they do not significantly accelerate the resolution of existing cyst. Therefore, hormonal therapy is primarily beneficial in women with recurrent functional cyst or those seeking contraception simultaneously (6).

In selected cases, gonadotropin-releasing hormone (GnRH) analogues may be used, especially when ovarian cysts are associated with endometriosis. These agents suppress ovarian hormonal activity and may reduce the size of endometriomas. However, prolonged use is limited by hypoestrogenic side effects such as bone loss and vasomotor symptoms (7).

Medical management is most suitable for:

- Functional ovarian cysts.
- Mildly symptomatic patients.
- Recurrent cyst formation.
- Patients unfit for surgery.
- Adolescents and reproductive-age women with reassuring imaging findings.

Despite conservative and medical management, persistent or suspicious cyst requires surgical evaluation (8, 9).

Surgical Management:

Surgical intervention is indicated when ovarian cyst is:

- Persistent after observation.
- Large or progressively enlarging.

- Symptomatic.
- Complex on imaging.
- Suspicious for malignancy.
- Associated with complications such as torsion, rupture, or hemorrhage.

The choice of surgical procedure depends on several factors, including the patient's age, fertility wishes, menopausal status, cyst characteristics, and intraoperative findings. The principal goals of surgery are symptom relief, exclusion of malignancy, prevention of complications, and preservation of ovarian function whenever possible **(10)**.

Cystectomy:

Cystectomy involves surgical excision of the cyst while preserving the surrounding healthy ovarian tissue. It is considered the treatment of choice in women of reproductive age because it preserves ovarian hormonal function and fertility potential. Ovarian cystectomy can be performed using either laparoscopy or laparotomy depending on the cyst size and suspicion of malignancy.

Careful surgical technique is essential to minimize damage to normal ovarian tissue and preserve ovarian reserve. Hemostasis during cystectomy may be achieved by suturing or electrosurgical coagulation; however, excessive thermal injury should be avoided because it may adversely affect ovarian reserve **(11)**.

Oophorectomy:

Oophorectomy refers to removal of one or both ovaries and is generally reserved for cases where ovarian preservation is not feasible. This may occur when:

- The ovary is extensively damaged.
- The cyst completely replaces ovarian tissue.
- Malignancy is suspected or confirmed.
- The patient is postmenopausal.

Unilateral oophorectomy preserves endocrine function and fertility potential if the contralateral ovary is healthy, whereas bilateral oophorectomy results in surgical menopause and infertility **(12)**.

Laparotomy:

Laparotomy is an open surgical approach involving a large abdominal incision to access the pelvic cavity. Although less commonly performed today, it remains important in selected clinical situations. Laparotomy is usually indicated for:

- Very large ovarian cysts.
- Suspicion of ovarian cancer.
- Complex pelvic masses.
- Severe adhesions.
- Hemodynamic emergencies.

This approach provides excellent surgical exposure and allows thorough abdominal exploration, staging procedures, and safer removal of potentially malignant tumors. In many cases, the cyst or ovary is removed intact and sent for histopathological examination to determine the exact diagnosis **(13)**.

However, laparotomy is associated with several disadvantages compared with minimally invasive surgery, **including:**

- Greater postoperative pain.
- Increased blood loss.
- Longer hospitalization.
- Delayed recovery.
- Higher risk of postoperative adhesions and wound complications.

Despite these drawbacks, laparotomy remains the preferred approach when malignancy cannot be excluded or when extensive surgical management is anticipated **(14, 15)**.

Laparoscopy:

Laparoscopy is currently considered the gold standard surgical approach for the management of most benign ovarian cyst because it is minimally invasive and associated with faster postoperative recovery and reduced surgical morbidity. The procedure is performed through small abdominal incisions using a laparoscope and specialized instruments that allow visualization and manipulation of pelvic structures with minimal tissue trauma **(11, 15)**. Laparoscopic management is particularly suitable for benign-appearing ovarian cysts, including functional cysts, dermoid cysts, and endometriomas. During surgery, the cyst wall is carefully dissected from the normal ovarian tissue and removed, usually using an endoscopic retrieval bag to minimize intraperitoneal spillage of cyst contents **(10)**.

Advantages of Laparoscopy

Laparoscopic surgery offers several advantages over conventional open surgery, including reduced postoperative pain, smaller abdominal scars, shorter hospital stay, faster recovery, lower intraoperative blood loss, reduced postoperative adhesion formation, and lower risk of wound complications **(14, 15)**.

Because of these benefits, laparoscopy has become the preferred approach for fertility-preserving ovarian surgery in reproductive-age women **(11)**.

Hemostasis During Laparoscopic Ovarian Cystectomy:

Achieving adequate hemostasis during laparoscopic cystectomy is essential to prevent excessive bleeding while preserving healthy ovarian tissue and ovarian reserve. The two most commonly used methods for hemostasis are bipolar electrocautery and suturing of the ovarian tissue **(16, 17)**.

Bipolar Electrocoagulation in Laparoscopic Cystectomy:

Bipolar electrocautery is widely used during laparoscopic ovarian cystectomy because it is technically simple, rapid, and effective in controlling bleeding. Bipolar energy works by passing electrical current between the two tips of the forceps, producing localized coagulation with less lateral thermal spread compared with monopolar electrosurgery **(16)**. Despite its effectiveness, excessive use of bipolar coagulation may result in thermal damage to the surrounding healthy ovarian tissue. This thermal injury can impair ovarian blood supply, destroy primordial follicles, and reduce ovarian reserve **(16, 17)**.

Several studies have demonstrated postoperative reductions in serum anti-Müllerian hormone (AMH) levels following extensive bipolar coagulation during ovarian cystectomy, particularly in women with endometriomas **(16, 18)**.

The degree of ovarian damage is influenced by duration of energy application, power settings used, number of coagulation points, and extent of ovarian tissue exposed to thermal spread **(17)**.

Therefore, surgeons are advised to use the lowest effective energy settings and minimize coagulation time whenever possible to preserve ovarian function (11).

Suturing of the Ovarian Tissue:

Laparoscopic suturing is an alternative method for achieving hemostasis after ovarian cystectomy. In this technique, bleeding ovarian tissue is controlled mechanically by approximation of the ovarian edges using absorbable sutures rather than thermal coagulation (11).

Suturing is considered more tissue-conservative because it avoids thermal injury to the ovarian cortex and may therefore better preserve ovarian reserve (17).

Several studies comparing suturing with bipolar coagulation have shown smaller postoperative declines in AMH levels in patients managed with suturing techniques (17, 18).

However, laparoscopic suturing is technically more demanding, requires advanced laparoscopic skills, may increase operative time, and can occasionally lead to excessive tissue ischemia if sutures are applied too tightly (11).

Despite these limitations, suturing is increasingly favored in fertility-preserving surgery, especially in women with bilateral cysts, diminished ovarian reserve, infertility, or endometriosis (17).

Comparative Impact on Ovarian Reserve:

The choice between bipolar coagulation and suturing remains controversial and depends on surgeon experience, operative conditions, and patient fertility considerations (11).

Bipolar coagulation provides faster hemostasis, shorter operative time, and easier technical application (16).

In contrast, suturing may offer better preservation of ovarian reserve, reduced thermal injury, and lower postoperative decline in AMH levels (17, 18).

Current evidence suggests that minimizing thermal damage during ovarian surgery is important for preserving ovarian function. Consequently, many surgeons now adopt combined or modified techniques using limited bipolar coagulation followed by selective suturing to balance effective hemostasis with ovarian preservation (11, 17).

Limitations of Laparoscopy:

Despite its advantages, laparoscopy may not be appropriate in all clinical situations, including very large ovarian masses, extensive pelvic adhesions, hemodynamic instability, severe cardiopulmonary disease, and cases with high suspicion of ovarian malignancy (15).

Intraoperative cyst rupture should be minimized, particularly in dermoid cysts and potentially malignant masses, because spillage may lead to chemical peritonitis or dissemination of malignant cells (10).

References:

1. Kaijser, J., Van Gorp, T., Sayasneh, A., Vergote, I., Bourne, T., & Timmerman, D. (2014). Comparison of risk prediction models and adnexal rules to predict malignancy in ovarian masses: a prospective validation study. *Ultrasound in Obstetrics & Gynecology*, 44(2), 233–238.
2. Timmerman D, Testa AC, Bourne T, et al. (2016). Simple ultrasound-based rules for the diagnosis of ovarian cancer. *Ultrasound in Obstetrics & Gynecology*, 48(1), 9–16.
3. Berek JS, Novak E (2020). *Berek & Novak's Gynecological*. 16th ed. Wolters Kluwer.
4. Care, P. P. (2019). ACOG committee opinion. *Obstetrics Gynecol*, 134, e84-9.

5. The ESHRE Guideline Group on Ovarian Stimulation, Bosch E, Broer S, Griesinger G, Grynberg M, Humaidan P, et al. (2020). ESHRE guideline: ovarian stimulation for IVF/ICSI. *Human Reproduction Open*, 2020(2): hoaa009.
6. Ali, A. H. (2022). Contraceptive effect on ovarian cysts. *Drug and Pharmaceutical Science Archives*, 2(4), 25–30.
7. Luo L, Zhao G (2023). Analysis of the effectiveness of evidence-based management care combined with psychological care in ovarian cyst debulking. *Archives of Clinical Psychiatry*, 50(2).
8. Sethi N, Agrawal M, Patel A, Reddy LS, Bhatt DM, Patel A, et al. (2024). Surgical technique and fertility outcomes: A comprehensive review of open and laparoscopic cystectomy in women of reproductive age. *Cureus*, 16(10).
9. Hoffman, B. L., Schorge, J. O., Schaffer, J. I., Halvorson, L. M., Bradshaw, K. D., & Cunningham, F. G. (2020). *Williams Gynecology* (4th ed.). McGraw-Hill Education.
10. Shaltout MF, Maged AM, Abdella R, Sediek MM, Dahab S, Elsherbini MM, et al. (2022). Laparoscopic guided minilaparotomy: A modified technique for management of benign large ovarian cysts. *BMC Women's Health*, 22(1): 269.
11. Li, C. Z., Liu, B., Wen, Z. Q., & Sun, Q. (2009). The impact of electrocoagulation on ovarian reserve after laparoscopic excision of ovarian cysts: A prospective clinical study. *Fertility and Sterility*, 92(4), 1428–1435.
12. Song, T., Kim, W. Y., Lee, K. W., & Kim, K. H. (2022). Comparison of ovarian reserve after hemostasis by bipolar coagulation versus suturing during laparoscopic ovarian cystectomy. *International Journal of Gynecology & Obstetrics*, 158(2), 312–318.
13. Mohamed, M. L., Hassan, A. M., & El-Sayed, H. A. (2023). Effect of bipolar coagulation versus suturing on ovarian reserve after laparoscopic ovarian cystectomy. *Middle East Fertility Society Journal*, 28(1), 33–40.