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Ovarian Cysts

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Overview

Background

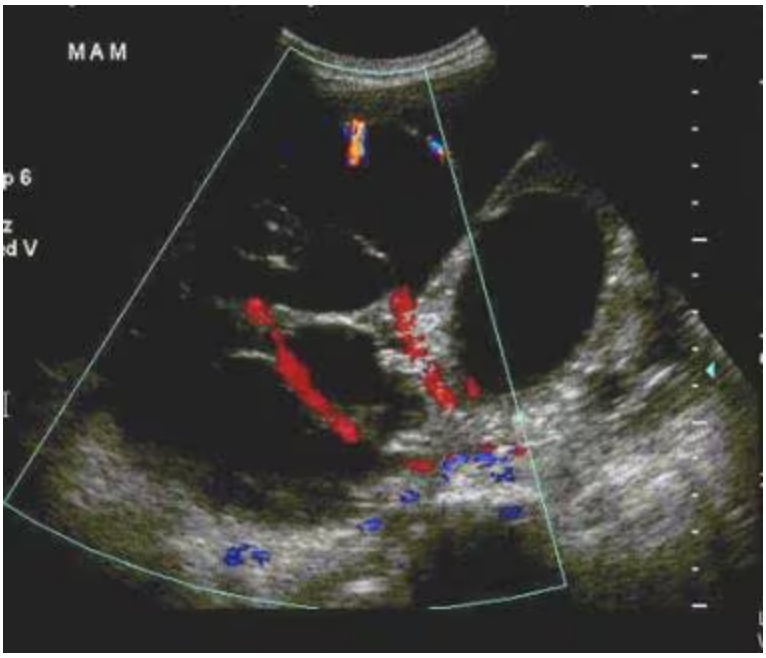
An ovarian cyst is a sac filled with liquid or semiliquid material that arises in an ovary. The number of diagnoses of ovarian cysts has increased with the widespread implementation of regular physical examinations and ultrasonographic technology. The discovery of an ovarian cyst causes considerable anxiety in women owing to fears of malignancy, but the vast majority of ovarian cysts are benign.[1]

These cysts can develop in females at any stage of life, from the neonatal period to postmenopause. Most ovarian cysts, however, occur during infancy and adolescence, which are hormonally active periods of development. Most are functional in nature and resolve without treatment.

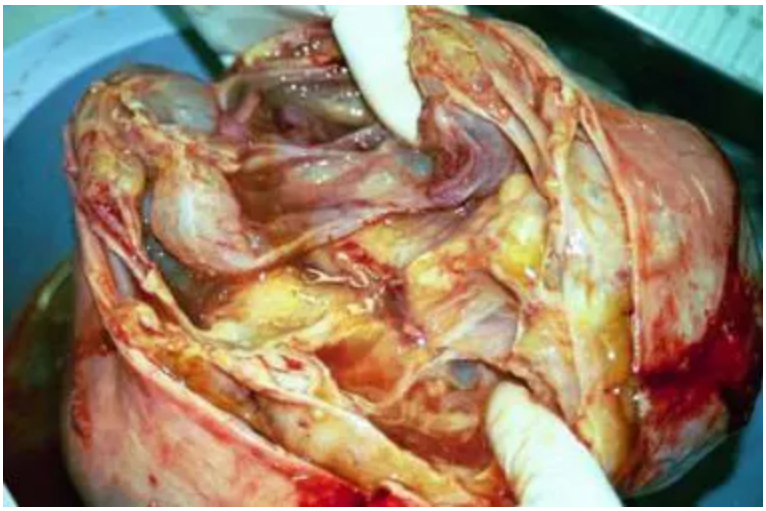
However, ovarian cysts can herald an underlying malignant process or, possibly, distract the clinician from a more dangerous condition, such as ectopic pregnancy, ovarian torsion, or appendicitis. (On the other hand, an inverse relationship may exist between ovarian cysts and breast cancer.[2,3])

When ovarian cysts are large, persistent, painful, or have concerning radiographic or examination findings, surgery may be required, sometimes resulting in removal of the ovary. A large ovarian cyst is shown in the images below.

A multilocular right ovarian cyst that is 24 cm in diameter. It is seen with the adjacent fallopian tube and uterus. The infundibulo-pelvic ligament carrying the ovarian artery and vein has been divided. Histology reported a mucinous cystadenocarcinoma of low malignant potential. Image courtesy of C. William Helm, MBBChir.



Transabdominal sonogram of a multilocular right ovarian cyst that is 24 cm in diameter, with the adjacent fallopian tube and uterus. The infundibulo-pelvic ligament carrying the ovarian artery and vein has been divided. This sonogram demonstrates a large, complex cystic mass with vascularity within the septations. Red and blue colors show blood flow towards and away from the transducer. The resistive index was low. Histology reported a mucinous cystadenocarcinoma of low malignant potential. Courtesy Patrick O'Kane, MD.



A multilocular right ovarian cyst that is 24 cm in diameter has been removed and cut open. It has a smooth surface and a multicystic internal structure. Image courtesy of C. William Helm, MBBChir.

Emergency diagnosis

Abdominal pain in the female can be one of the most difficult cases to diagnose correctly in the emergency department (ED). The spectrum of gynecologic disease is broad, spanning all age ranges and representing various degrees of severity, from benign cysts that eventually resolve on their own to ruptured ectopic pregnancy that causes life-threatening hemorrhage.

When presented with this scenario, the goal of the emergency physician is to rule out acute causes of abdominal pain associated with high morbidity and mortality, such as appendicitis, ovarian torsion, or ectopic pregnancy; to assess for the possibility of neoplasm or malignancy; and either to refer the patient to the appropriate consultant or to discharge them with a clear plan for follow-up with an obstetrician/gynecologist.

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Pathophysiology

Functional cysts

The median menstrual cycle lasts 28 days, beginning with the first day of menstrual bleeding and ending just before the subsequent menstrual period. The variable first half of this cycle is termed the follicular phase and is characterized by increasing follicle-stimulating hormone (FSH) production, leading to the selection of a dominant follicle that is primed for release from the ovary.[4]

In a normally functioning ovary, simultaneous estrogen production from the dominant follicle leads to a surge of luteinizing hormone (LH), resulting in ovulation and the release of the dominant follicle from the ovary and commencing the luteinizing phase of ovulation.

After ovulation, the follicular remnants form a corpus luteum, which produces progesterone. This, in turn, supports the released ovum and inhibits FSH and LH production. As luteal degeneration occurs in the absence of pregnancy, the progesterone levels decline, while the FSH and LH levels begin to rise before the onset of the next menstrual period.

Follicular cysts

Different kinds of functional ovarian cysts can form during this cycle. In the follicular phase, follicular cysts may result from a lack of physiologic release of the ovum due to excessive FSH stimulation or lack of the normal LH surge at midcycle just before ovulation. Hormonal stimulation causes these cysts to continue to grow. Follicular cysts are typically larger than 2.5 cm in diameter and manifest as a discomfort and heaviness. Granulosa cells that line the follicle may also persist, leading to excess estradiol production, which, in turn, leads to decreased frequency of menstruation and menorrhagia.

Corpus luteal cysts

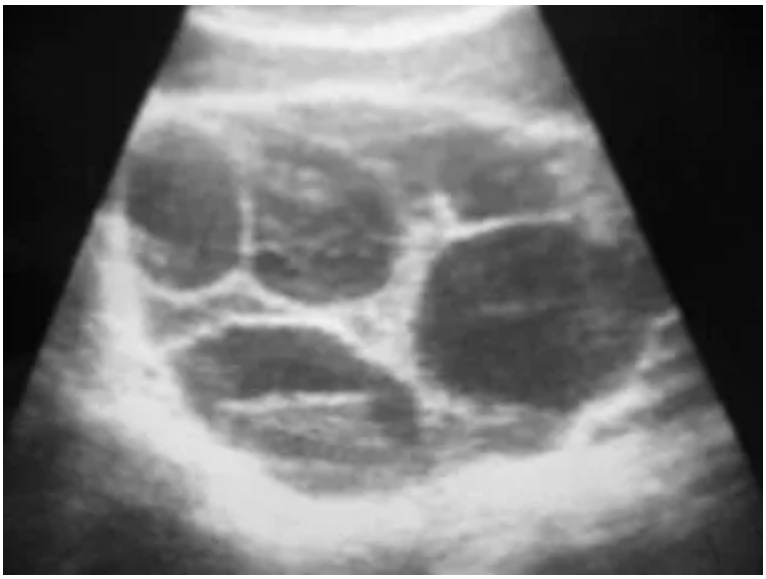
In the absence of pregnancy, the lifespan of the corpus luteum is 14 days. If the ovum is fertilized, the corpus luteum continues to secrete progesterone for 5-9 weeks, until its eventual dissolution in 14 weeks' time, when the cyst undergoes central hemorrhage. Failure of dissolution to occur may result in a corpus luteal cyst, which is arbitrarily defined as a corpus luteum that grows to 3 cm in diameter. The cyst can cause dull, unilateral pelvic pain and may be complicated by rupture, which causes acute pain and possibly massive blood loss.

Theca-lutein cysts

Theca-lutein cysts are caused by luteinization and hypertrophy of the theca interna cell layer in response to excessive stimulation from human chorionic gonadotropin (hCG) These cysts are predisposed to torsion, hemorrhage, and rupture.

Theca-lutein cysts can occur in the setting of gestational trophoblastic disease (hydatidiform mole and choriocarcinoma), multiple gestation, or exogenous ovarian hyperstimulation.

These cysts are associated with maternal androgen excess in up to 30% of cases but usually resolve spontaneously as the hCG level falls. Theca-lutein cysts are usually bilateral and result in massive ovarian enlargement, a characteristic of the condition termed hyperreactio luteinalis.[5] (See the image below.)



Theca-lutein cysts replacing an ovary in a patient with a molar pregnancy. Despite their size these cysts are benign and usually resolve after treatment of the underlying disease. Image courtesy of C. William Helm, MBBChir.

Luteoma of pregnancy

A luteoma of pregnancy results when ovarian parenchyma is replaced by proliferation of luteinized stromal cells that may become hormonally active with production of androgens. Maternal virilization can occur in up to 30% of cases, with a 50% risk of virilization of the female fetus; male fetuses are unaffected. Luteoma of pregnancy appears as complex, heterogenous, hypoechoic mass on ultrasonography. After completion of pregnancy, the mass typically resolves and testosterone levels typically normalize.[6]

Neoplastic cysts

Neoplastic cysts arise via the inappropriate overgrowth of cells within the ovary and may be malignant or benign. Malignant neoplasms may arise from all ovarian cell types and tissues. The most frequent by far, however, are those arising from the surface epithelium (mesothelium); most of these are partially cystic lesions. The benign counterparts of these cancers are serous and mucinous cystadenomas. Other malignant ovarian tumors may also contain cystic areas, including granulosa cell tumors from sex cord stromal cells and germ cell tumors from primordial germ cells. Cystic spaces within a tumor are seen in the image below.

Cross-section of a clear cell carcinoma of the ovary. Note the cystic spaces intermingled with solid areas. Image courtesy of C. William Helm, MBBChir.

Teratomas

Teratomas are a form of germ cell tumor[7] containing elements from all 3 embryonic germ layers, ie, ectoderm, endoderm, and mesoderm. A mature cystic teratoma is shown in the image below.

A dermoid cyst (mature cystic teratoma) after opening the abdomen. Note the yellowish color of the contents seen through the wall. Image courtesy of C. William Helm, MBBChir.

Endometriomas

Endometriomas are blood-filled cysts arising from the ectopic endometrium. Endometriomas are associated with endometriosis, which can cause dysmenorrhea and dyspareunia.

Polycystic ovarian syndrome

In polycystic ovarian syndrome, the ovary often contains multiple cystic follicles 2-5 mm in diameter as viewed on sonograms. The cysts themselves are never the main problem, and discussion of this disease is beyond the scope of this article.

Risk factors

Risk factors for ovarian cyst formation include the following:

- Infertility treatment - Patients being treated for infertility by ovulation induction with gonadotropins or other agents, such as clomiphene citrate or letrozole, may develop cysts as part of ovarian hyperstimulation syndrome
- Tamoxifen - Tamoxifen can cause benign functional ovarian cysts that usually resolve following discontinuation of treatment
- Pregnancy - In pregnant women, ovarian cysts may form in the second trimester, when hCG levels peak[5]
- Hypothyroidism - Because of similarities between the alpha subunit of thyroid-stimulating hormone (TSH) and hCG, hypothyroidism may stimulate ovarian and cyst growth[8]
- Maternal gonadotropins - The transplacental effects of maternal gonadotropins may lead to the development of neonatal and fetal ovarian cysts[9]
- Cigarette smoking - The risk of functional ovarian cysts is increased with cigarette smoking; risk from smoking is possibly increased further with a decreased body mass index (BMI)[10,11]
- Tubal ligation - Functional cysts have been associated with tubal ligation sterilizations[12]

Risk factors for ovarian cystadenocarcinoma include the following:

- Strong family history
- Advancing age
- White race
- Infertility
- Nulliparity
- History of breast cancer

- BRCA gene mutations

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Epidemiology

United States statistics

Ovarian cysts are found on transvaginal sonograms in nearly all premenopausal women and in up to 18% of postmenopausal women (women develop one or more Graafian follicles each menstrual cycle, which appear as cysts on imaging).[13] Most of these cysts are functional in nature and benign. Mature cystic teratomas, or dermoids, represent more than 10% of all ovarian neoplasms. Ovarian cysts are the most common fetal and infant tumor, with a prevalence exceeding 30%.[14]

The incidence of ovarian carcinoma is approximately 15 cases per 100,000 women per year. In the United States, ovarian carcinomas are diagnosed in nearly 21,000 women annually, causing an estimated 12,730 deaths.[15] Most malignant ovarian tumors are epithelial ovarian cystadenocarcinomas.

Tumors of low malignant potential make up approximately 20% of malignant ovarian tumors, whereas less than 5% are malignant germ cell tumors, and approximately 2% are granulosa cell tumors.[16]

Race-related demographics

Malignant epithelial ovarian cystadenocarcinomas are the only ovarian cysts associated with a race predilection. Women from northern and western Europe and North America are affected most frequently, whereas women from Asia, Africa, and Latin America are affected least frequently.[17]

Within the United States, age-adjusted incidence rates in surveillance areas are highest among American Indian women, followed by White, Vietnamese, Hispanic, and Hawaiian women. Incidence is lowest among Korean and Chinese women.

Among women for whom sufficient numbers of cases are available to calculate rates based on age, incidence in those aged 30-54 years is highest in White women, followed by Japanese, Hispanic, and Filipino women. For women aged 55-69 years, the highest rates occur in White women, followed by Hispanic and Japanese women. Among women aged 70 years or older, the highest rate occurs among White women, followed by those of African descent and Hispanic women.

Age-related demographics

Functional ovarian cysts can occur at any age (including in utero) but are much more common in women of reproductive age. They are rare after menopause. Luteal cysts occur after ovulation in reproductive-age women. Most benign neoplastic cysts occur during the reproductive years, but the age range is wide and they may occur in persons of any age.

The incidence of epithelial ovarian cystadenocarcinomas, sex cord stromal tumors, and mesenchymal tumors rises exponentially with age until the sixth decade of life, at which point the incidence plateaus.

Tumors of low malignant potential occur at a mean age of 44 years, with a span from adolescence to senescence. The average age is more than a decade less than that for invasive cystadenocarcinoma. Germ cell tumors are most common in adolescence and rarely occur in women older than 30 years.

In a child found to have a symptomatic abdominopelvic mass, the ovary is the most common site of origin.[18] Although such masses are infrequent occurrences, the percentage due to malignant tumors is thought to be higher than for older age groups. The most common are germ cell tumors, followed by epithelial and granulosa cell tumors. Such tumors may be partially cystic.

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Prognosis

The prognosis for benign cysts is excellent. All such cysts may occur in residual ovarian tissue or in the contralateral ovary. Overall, 70-80% of follicular cysts resolve spontaneously.[19]

Morbidity/mortality

Morbidity

Benign cysts can cause pain and discomfort related to pressure on adjacent structures, torsion, rupture, and hemorrhage (within and outside of the cyst). Morbidity also includes menorrhagia, an increased intermenstrual interval, dysmenorrhea, pelvic discomfort, and abdominal distention. Benign cysts rarely cause death.

Mucinous cystadenomas may cause a relentless collection of mucinous fluid within the abdomen, known as pseudomyxoma peritonei, which may be fatal without extensive treatment.

Approximately 3% of theca lutein cysts are complicated by torsion or hemorrhage, and approximately 30% of these cysts can cause maternal androgen excess.[5] Follicular cysts can cause excess estradiol production, leading to metrorrhagia and menorrhagia.

Ovarian cysts, and more specifically corpus luteal cysts, can rupture, causing hemoperitoneum, hypotension, and peritonitis. This can be exacerbated in women with bleeding dyscrasias, such as those with von Willebrand disease and those receiving anticoagulation therapy.

Ovarian torsion can complicate ovarian cysts and can result in ovarian infarction, necrosis, infertility, premature ovarian menopause, and preterm labor.[6]

Malignant ovarian cystic tumors can cause severe morbidity, including the following:

- Pain
- Abdominal distension
- Bowel obstruction
- Nausea
- Vomiting
- Early satiety
- Wasting
- Cachexia
- Indigestion
- Heartburn
- Abnormal uterine bleeding
- Deep venous thrombosis
- Dyspnea

Cystic granulosa cell tumors may secrete estrogen, leading to postmenopausal bleeding and precocious puberty in elderly patients and young patients, respectively.

In addition to the normal complications of cysts, the presence of cysts in pregnancy may cause obstructed labor.

A 2-year interim analysis from the International Ovarian Tumor Analysis Phase 5 (IOTA5) study showed that 80% of ovarian cysts considered benign on ultrasonography either disappeared or required no intervention. Only 12 of the 1919 women in the study received a diagnosis of ovarian cancer; thus, the 2-year cumulative risk of cancer was 0.4%.[20]

Malignancy is a common concern among patients with ovarian cysts. Pregnant patients with simple cysts smaller than 6cm in diameter have a malignancy risk of less than 1%. Most of these cysts resolve by 16-20 weeks' gestation, with 96% of these masses resolving spontaneously.[21] In postmenopausal patients with unilocular cysts, malignancy develops in 0.3% of cases. A systematic review and meta-analysis by Liu et al found that the malignancy rate (including borderline tumors) for simple ovarian cysts in postmenopausal women was approximately 1 in 10,000.[22]

In complex, multiloculated cysts, the risk of malignancy climbs to 36%. If cancer is diagnosed, regional or distant spread may be present in up to 70% of cases, and only 25% of new cases will be limited to stage I disease.[23]

Mortality

Mortality associated with malignant ovarian carcinoma is related to the stage at the time of diagnosis, and patients with this carcinoma tend to present late in the course of the disease. The 5-year survival rate overall is 41.6%, varying between 86.9% for International Federation of Gynecology and Obstetrics (FIGO) stage Ia and 11.1% for stage IV.

A distinct group of less aggressive tumors of low malignant potential runs a more benign course but still is associated with definite mortality. The overall survival rate is 86.2% at 5 years.[6]

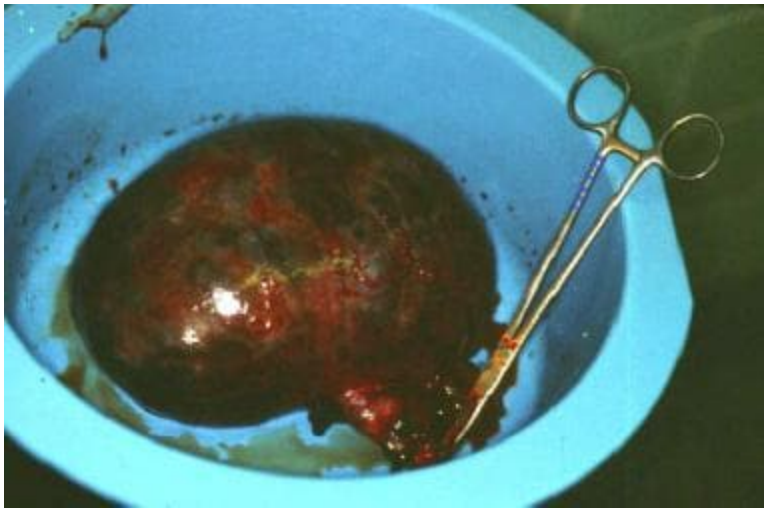
The potential of benign ovarian cystadenomas to become malignant has been postulated but, to date, remains unproven. Malignant change can occur in a small percentage of dermoid cysts (associated with an extremely poor prognosis) and endometriomas.

Complications

Ovarian cysts have a broad range of potential outcomes. In most cases, the cyst is benign and asymptomatic, requires no further management, and will resolve on its own. In other cases, ovarian cyst–related accidents, such as rupture and hemorrhage or torsion, occur.

Torsion

Ovarian cysts larger than 4 cm in diameter have been shown to have a torsion rate of approximately 15%. Ovarian torsion involves the rotation of the ovarian vascular pedicle, causing obstruction to venous and, eventually, arterial flow that can lead to infarction. (See the image below.)



An ovarian cyst that underwent torsion (twisting of the vascular pedicle). The patient presented with a short history of severe lower abdominal pain. The twisted pedicle can be seen attached to the cyst, which has turned dusky due to ischemia. No viable epithelial lining was available for histologic diagnosis. Image courtesy of C. William Helm, MBBChir.

Most torsion cases occur in premenopausal females of childbearing age, but up to 17% of cases affect prepubertal and postmenopausal women. It is also strongly associated with ovarian stimulation and polycystic ovarian syndrome. Ovarian torsion is more common on the right side owing to the sigmoid colon restricting the mobility of the left ovary.

Malignancy may be seen in up to 2% of cases of ovarian torsion. The most common ovarian mass associated with torsion is a dermoid cyst.

CT scanning and ultrasonography can assist with diagnosis. The absence of blood flow within an ovary can support the diagnosis of torsion but is neither sensitive nor specific. Treatment options include laparoscopic “detorsion” and adnexal preservation in premenopausal women and salpingo-oophorectomy in postmenopausal women. Ovarian function may be preserved with laparoscopic detorsion in 90% of cases.

Rupture

The outcome of ovarian cyst rupture is evaluated based on associated symptoms and will dictate whether the patient is discharged or admitted for laparoscopy.

Ovarian cyst rupture commonly occurs with corpus luteal cysts. They involve the right ovary in two thirds of cases and usually occur on days 20-26 of the woman’s menstrual cycle. Mittelschmerz is a form of physiologic cyst rupture. In pregnant women, hemorrhagic corpus luteal cysts are usually seen in the first trimester, with most resolving by 12 weeks' gestation. Hemorrhage and shock may occur and may present late in the symptomatology.

In ovarian cyst rupture, ultrasonography may demonstrate free fluid in the pouch of Douglas in 40% of cases. Cyst rupture and hemorrhage may be treated conservatively with observation if the patient is stable, with follow-up scanning in 6 weeks to confirm hemorrhage resolution. Laparoscopy is indicated in hemodynamic compromise, possibility of torsion, no relief of symptoms within 48 hours, or increasing hemoperitoneum or falling hemoglobin concentration. The hemoperitoneum that results from a ruptured hemorrhagic ovarian cyst can pose a risk of hypovolemic shock.[24]

Presentation

History

Most patients with ovarian cysts are asymptomatic, with the cysts being discovered incidentally during ultrasonography or routine pelvic examination. Some cysts, however, may be associated with a range of symptoms, sometimes severe,[13] although malignant ovarian cysts commonly do not cause symptoms until they reach an advanced stage.

Pain or discomfort may occur in the lower abdomen. Torsion (twisting) or rupture may lead to more severe pain. Cyst rupture is characterized by sudden, unilateral, sharp pelvic pain. This can be associated with trauma, exercise, or coitus.[13,25] In addition, cyst rupture can lead to peritoneal signs, abdominal distention, and bleeding that is usually self-limited.

Other symptoms include the following:

- Patients may experience discomfort with intercourse, particularly deep penetration
- Having bowel movements may be difficult, or pressure may develop, leading to a desire to defecate
- Micturition may occur frequently, due to pressure on the bladder
- Irregularity of the menstrual cycle and abnormal vaginal bleeding may occur; the intermenstrual interval may be prolonged, followed by menorrhagia[26]
- Young children may present with precocious puberty and early onset of menarche
- Patients may experience abdominal fullness and bloating
- Patients may experience indigestion, heartburn, or early satiety
- Endometriomas are associated with endometriosis, which may cause dysmenorrhea or dyspareunia
- Polycystic ovaries may be part of the polycystic ovarian syndrome, which includes hirsutism, infertility, oligomenorrhea, obesity, and acne
- Some patients may experience tenesmus

Theca-lutein cysts are commonly bilateral and thus can cause bilateral, dull pelvic pain.[5] These cysts may be associated with excess stimulation, as is seen in pregnancy (in particular twins), a large placenta, and diabetes. Newborns may also develop theca-lutein cysts, due to the effects of maternal gonadotropins. In rare cases, these cysts may develop in the setting of hypothyroidism, owing to similarities between the alpha subunit of TSH and hCG.[5,27]

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Physical Examination

Palpation

A large cyst may be palpable on abdominal examination, but gross ascites may interfere with palpation of an intra-abdominal mass.

Although normal ovaries may be palpable during the pelvic examination in thin, premenopausal patients, a palpable ovary should be considered abnormal in a postmenopausal woman. If a patient is obese, palpating cysts of any size may prove difficult.

Sometimes, discerning the cystic nature of an ovarian cyst may be possible, and it may be tender to palpation. The cervix and uterus may be pushed to one side.

Other masses may be palpable, including fibroids and nodules in the uterosacral ligament consistent with malignancy or endometriosis.

Other symptoms

Hemorrhage due to cyst rupture may lead to tachycardia and hypotension. Blood pressure monitoring may show orthostatic hypotension.

Some complications of ovarian cysts, such as ovarian torsion, may result in hyperpyrexia.[13]

Examination reveals moderate to severe unilateral or bilateral lower abdominal tenderness in some women with an ovarian cyst.

Some complications of ovarian cysts may result in adnexal tenderness or cervical motion tenderness. However, up to 88% of ovarian cysts may be asymptomatic and missed on pelvic exam.[28]

If hemorrhage or peritonitis ensues, the patient may present with a diffusely tender abdomen with rebound tenderness and guarding; in addition, a distended abdomen may be found on abdominal examination.

Advanced malignant disease may be associated with cachexia and weight loss, lymphadenopathy, shortness of breath, and signs of pleural effusion.

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Diagnostic Considerations

During an ED workup, it is imperative that life-threatening or causes of abdominal and/or pelvic pain associated with high morbidity be excluded before ovarian cyst is diagnosed. This includes ruling out emergent female gynecologic and urologic symptoms such as ectopic pregnancy, ovarian torsion, tubo-ovarian abscess, or other conditions such as appendicitis or diverticulitis.

After etiologies of acute abdominal pain are ruled out, the physician's primary concern is to determine whether the pain or pelvic mass reflects a possible neoplastic etiology, which must be assessed further by a gynecologist in the ED or in an outpatient setting in an appropriate time frame.

Conditions to consider in the differential diagnosis of ovarian cyst include the following:

- Abdominal abscess
- Ectopic pregnancy
- Hydronephrosis
- Hydrosalpinx
- Ovarian torsion
- Paraovarian cyst
- Pedunculated leiomyoma
- Pelvic kidney
- Pelvic lymphocele
- Peritoneal cyst
- Polycystic ovarian syndrome
- Psoas abscess
- Renal calculi
- Salpingitis
- Tubal disease
- Tubo-ovarian abscess
- Urethral diverticulum

Differential Diagnoses

- Endometriosis
- Inflammatory Bowel Disease
- Ovarian Cancer
- Appendicitis
- Diverticulitis
- Meckel Diverticulum
- Pelvic Inflammatory Disease

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Workup

Workup

Approach Considerations

An ultrasonographic examination of the pelvis should be obtained if a patient is thought to have a pelvic mass on clinical examination. Always be vigilant about patients with an increased risk of ovarian cancer and arrange appropriate evaluation. Complex ovarian masses should be assumed to be a cancer until proven otherwise, particularly in a patient who is post-menopausal or has a prior history of breast cancer or a family history of breast/ovarian cancer.

If a patient has large fibroids, it is possible to miss concomitant ovarian pathology clinically and on ultrasonographic examination.

Because of the routine use of ultrasonography, ovarian cysts are commonly diagnosed in pregnancy.[8] Cysts should be evaluated in pregnant patients in the same way that they are in nonpregnant patients, with ultrasonographic examinations; however, note that cancer antigen 125 (CA-125) testing is not reliable, particularly during early pregnancy. Magnetic resonance imaging (MRI) should be used rather than computed tomography (CT) scanning, but ultrasonography is usually sufficient.[29]

Histologic findings

The definitive diagnosis of all ovarian cysts is made based on histologic analysis. Each cyst type has characteristic findings.

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Procedures

Culdocentesis

Using needle aspiration to obtain fluid for cytologic examination provides inaccurate cytologic results, and needle aspiration is an inappropriate method for cyst drainage in most cases. In fact, because of its associated complications (bowel perforation, abscess rupture, trauma to a pelvic kidney), culdocentesis is now largely of historical interest. Its use has generally been replaced by ultrasonography.[30,31]

Diagnostic laparoscopy

Performing diagnostic laparoscopy may sometimes be necessary to inspect a suggestive adnexal cystic mass. Laparoscopy offers the advantage of decreased morbidity, improved postoperative recovery, and decreased cost compared with laparotomy.

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Laboratory Tests

No laboratory tests are diagnostic for ovarian cysts. However, the following laboratory tests can aid in the differential diagnosis and in the diagnosis of cyst-related complications:

- Urinary pregnancy test - Should always be performed in all women of childbearing age with abdominal pain or similar complaints

- Complete blood count (CBC) – Should focus on hematocrit and hemoglobin levels to evaluate for anemia caused by acute bleeding; the white blood cell (WBC) count may be elevated not only in complications of ovarian cyst, especially torsion, but also in infectious, pathologic abdominal conditions, such as appendicitis
- Urinalysis - Should be obtained to rule out other possible causes of abdominal or pelvic pain, such as urinary tract infections and kidney stone
- Endocervical swabs - Should be obtained to assess for chlamydia and gonorrhea if pelvic inflammatory disease is among the differential diagnoses

Cancer antigen 125

Keep in mind the possibility of cancer when managing an ovarian cyst.[32] Cancer antigen 125 (CA125) is a protein expressed on the cell membrane of normal ovarian tissue and ovarian carcinomas. A serum level of less than 35 U/mL is considered normal, although in some laboratories, the upper limit of normal may be lower than this.

While CA125 values are elevated in 85% of patients with epithelial ovarian carcinomas overall, the value is elevated in only 50% of patients with stage I cancers confined to the ovary.[33] CA125 levels are also elevated in patients with some benign conditions or other malignancies and in 6% of healthy patients.

Moreover, CA125 should not be drawn in pregnant patients with ovarian cysts or in the acute setting with ovarian cyst accidents, as this marker is raised in peritonitis, hemorrhage, cyst rupture, and infection, as well as in menstruation, fibroids, and endometriosis.

The finding of an elevated CA125 level is most useful when combined with an ultrasonographic investigation while assessing a postmenopausal woman with an ovarian cyst.

CA125 is not useful when used alone as a single, 1-time test for ovarian cancer screening; however, it may have increased value when serial measurements are performed over time, if these measurements are incorporated into a risk of ovarian cancer algorithm (ROCA).

Additional markers for ovarian cancer

Extensive research is ongoing to find an accurate blood test for the detection of early ovarian cancer or precancer. Other markers have been investigated, including lysophosphatidic acid, tumor-associated glycoprotein 72 (TAG72), OVX1, macrophage colony-stimulating factor (M-CSF), leptin, osteopontin, insulin-like growth factor II, and macrophage inhibitory factor.

Estimation of a panel of some of these blood markers—leptin, prolactin, osteopontin, insulinlike growth factor, macrophage inhibitory factor, and CA125—is included in an immunoassay marketed under the name Ovasure.[34,35,36] This product is meant to aid in the assessment of whether a previously detected ovarian mass may be benign or malignant, prior to surgery.

Newer experimental markers have been identified through various laboratory techniques. These include mesothelin, human epididymis protein 4, kallikrein, and haptoglobin alpha. The use of markers in tumor marker panels may increase the sensitivity but decreases the specificity.[37]

Other tumor marker values may be elevated in patients with neoplastic ovarian cysts. These include serum inhibin in granulosa cell tumors, alpha fetoprotein in endodermal sinus tumors, lactic dehydrogenase in dysgerminomas, and alpha fetoprotein and beta hCG in embryonal carcinomas.

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Ultrasonography

This is the primary imaging tool for a patient considered to have an ovarian cyst.[1,38] Findings can help to define a cyst's morphologic characteristics. If the ultrasonographic features are not typical of an ovarian cyst, follow-up ultrasonography can be performed to exclude ovarian neoplasm. Follow-up ultrasonography can also show resolution of a cyst.[39]

A normal ovary is 2.5-5 cm long, 1.5-3 cm wide, and 0.6-1.5 cm thick. In the follicular phase, several follicles are usually visible within the ovarian tissue.

On a sonogram, simple ovarian cysts have a uniformly thin, rounded wall and a unilocular appearance that is either hypoechoic or anechoic. They usually measure 2.5-15 cm in diameter, and posterior acoustic enhancement (a hyperechoic area) may be visible deep to the fluid-filled cyst.[25] These cysts are unlikely to be cancerous. Most commonly, they are functional follicular or luteal cysts or, less commonly, serous cystadenomas or inclusion cysts.

Complex cysts may have more than 1 compartment (multilocular), thickening of the wall, projections (papulations) sticking into the lumen or on the surface, or abnormalities within the cyst contents. Malignant cysts usually fall within this category, as do many benign neoplastic cysts.

A study by Smith-Bindman et al reported that simple cysts found with ultrasonography were not associated with an increased risk of ovarian cancer, however, complex cysts or solid masses were associated with a significant increased risk of ovarian cancer.[40]

Hemorrhagic cysts, endometriomas, and dermoids tend to have characteristic features on sonograms that may help to differentiate them from malignant complex cysts. A dermoid cyst is shown in the sonogram below.

Endovaginal sonogram shows a striking echogenic mass lateral to the uterus, with posterior acoustic shadowing giving a "tip-of-the-iceberg" appearance. This is pathognomonic for a dermoid cyst. Occasionally, this appearance may be mistaken for a gas-filled bowel. Courtesy of Patrick O'Kane, MD.

Sonograms may not be helpful for differentiating hydrosalpinx, paraovarian, and tubal cysts from ovarian cysts.

Corpus luteal cysts

A corpus luteal cyst, especially in pregnancy, tends to be larger and more symptomatic than a follicular cyst and is prone to hemorrhage and rupture. On a sonogram, it has a varied appearance ranging from a simple cyst to a complex cystic lesion with internal debris and thick walls.[6]

A corpus luteal cyst is typically surrounded by a circumferential rim of color, referred to as the “ring of fire,” on Doppler flow. Compared with a follicular cyst, a corpus luteal cyst has thicker, more echogenic, and more vascular walls. A hemorrhagic corpus luteal cyst has a variable echogenic pattern on ultrasonography, depending on clot formation and lysis in the cyst.[5] Fresh blood appears acutely anechoic. There is mixed echogenicity subacutely; chronically, the blood appears anechoic again, which is consistent with clot formation, retraction, and lysis.[25]

Hemorrhage into the cyst appears diffuse, with a reticular pattern described as a "fishnet pattern" or "spider web" appearance. Color Doppler ultrasonography shows no vascularity within the clot, whereas a solid nodule may show vascularity.

Ovarian torsion

The ultrasonographic appearance of ovarian torsion varies, but, most commonly, the ovary is enlarged. Massive ovarian edema may be seen with torsion, as the twisting of the pedicle impedes lymphatic drainage and venous outflow, leading to ovarian enlargement.

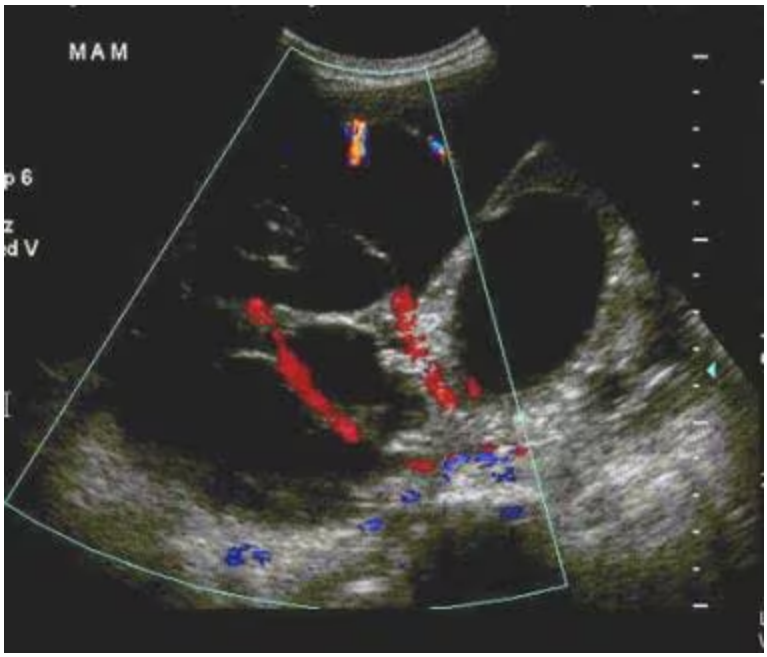
Torsion may be intermittent and recurrent, with spontaneous detorsion, allowing arterial and venous flow to the ovary to be observed on ultrasonography. Occasionally, a twisted vascular pedicle (referred to as the "whirlpool sign") may be visible during active torsion. However this is not a sensitive finding.[6]

Endovaginal ultrasonography

Endovaginal ultrasonography can help in a detailed morphologic examination of pelvic structures. This requires a handheld probe to be inserted into the vagina. It is relatively noninvasive and is well tolerated in reproductive-aged women and in post–reproductive-aged women who are still engaging in intercourse. It does not require a full bladder.

Transabdominal ultrasonography

Transabdominal ultrasonography is better than endovaginal ultrasonography for evaluating large masses and their subsequent complications, such as hydronephrosis or free fluid. It also allows assessment of other intra-abdominal structures, such as the kidneys and liver, as well as an ascites if present. Transabdominal ultrasonography is best performed with a full bladder to use as an acoustic window, in order to better visualize structures. A transabdominal sonogram is shown below.



Transabdominal sonogram of a multilocular right ovarian cyst that is 24 cm in diameter, with the adjacent fallopian tube and uterus. The infundibulo-pelvic ligament carrying the ovarian artery and vein has been divided. This sonogram demonstrates a large, complex cystic mass with vascularity within the septations. Red and blue colors show blood flow towards and away from the transducer. The resistive index was low. Histology reported a mucinous cystadenocarcinoma of low malignant potential. Courtesy Patrick O'Kane, MD.

Transvaginal ultrasonography with a higher-frequency probe allows better resolution of the ovary than a transabdominal lower-frequency probe.

3-D ultrasonography

Three-dimensional (3-D) ultrasonography may have advantages in the evaluation of ovarian cysts.[41,42]

Doppler flow studies

These studies can help to identify blood flow within a cyst wall and adjacent areas, including the tumor surface, the septa, solid parts within the tumor, and the peritumorous ovarian stroma. The principle is that new vessels within tumors have lower resistance to blood flow because they lack developed smooth muscle in the walls. This can be quantitated into a resistive or pulsatility index.

Estimation of the resistive index has limited clinical value in premenopausal women because of the great overlap of low-resistance flow characteristics in functional tumors and early cancers.

Determination of the presence or absence of any blood flow within certain cysts may be helpful in diagnosis. For instance, hemorrhagic cysts may contain fine internal septations that characteristically do not demonstrate blood flow on Doppler images.

Cancer screening

Using ultrasonography alone as a screening tool for ovarian cancer has been shown to lead to an overall positive predictive value of only 1-27%.[37] Two large studies have been using a combination of ultrasonography and serum CA125 testing.[37]

The United Kingdom Collaborative Trial of Ovarian Cancer Screening enrolled 202,000 postmenopausal women aged 50-74 years. Women of average risk were randomized to receive an annual pelvic examination, annual ultrasonography, or CA125 measurement (including the ROCA), with ultrasonography employed in patients with elevated CA125 levels. For primary invasive epithelial ovarian and tubal cancers, CA125 measurement (plus ultrasonography if indicated) had a specificity of 99.8% and a positive predictive value of 35.1%, whereas ultrasonography alone was associated with a specificity of 98.2% and a positive predictive value of 2.8%.[43]

In the National Institutes of Health Prostatic, Lung, Colorectal and Ovarian (NIH-PLCO) cancer study, more than 34,000 healthy, average-risk women aged 55-74 years were randomly assigned to receive either annual CA125 testing plus vaginal ultrasonography (interventional arm) or their usual care (control arm).[44] In assessing the screening arm, the positive predictive value for cancer was only 1.3%.

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CT Scanning

CT scanning is more sensitive but less specific than ultrasonography in detecting ovarian cysts. The addition of CT scanning to the workup of ovarian cysts offers very little additional information and usually does not alter treatment plans.[23]

CT scanning is best in imaging hemorrhagic ovarian cysts or hemoperitoneum due to cyst rupture. It can also be used to distinguish other intra-abdominal causes of acute hemorrhage from cyst rupture.[39] In addition, CT scanning allows examination of the abdominal contents and retroperitoneum in cases of malignant ovarian disease.

CT scanning should be avoided in pregnancy, if possible, to prevent radiation exposure to the fetus. MRI is a better option in these patients when ultrasonography cannot clearly elucidate the adnexal mass.

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MRI

MRI, in conjunction with ultrasonography, may provide marginal improvements in specificity, but in most cases, the additional cost in not justified.[23] MRI is instead reserved for cases in which ultrasonographic and CT scan findings are indeterminate in identifying a mass as an ovarian cyst safely in a pregnant patient.[29]

MRI scans have better soft tissue contrast than do to CT scans, particularly for identifying fat and blood products, and can provide a better idea of the organ of origin for gynecologic masses.

Simple ovarian cysts show low signal intensity with T1-weighted images and high signal intensity with T2-weighted images owing to the intracystic fluid.

Hemorrhagic cysts result in a high signal on T1-weighted images and an intermediate to high signal on T2-weighted images. Hemoperitoneum after cyst rupture appears bright on T2-weighted images and slightly hyperintense on T1-weighted images.[39]

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Treatment

Approach Considerations

Epidemiologic studies from the 1970s-1990s reported inverse relationships between oral contraceptive pill (OCP) use and surgically confirmed functional ovarian cysts. Short-term treatment with OCPs was thus used for initial management of ovarian cysts.

However, meta-analyses have since shown that there is no difference between OCP use and placebo in terms of treatment outcomes in ovarian cysts and that these masses should be monitored expectantly for several menstrual cycles. If a cystic mass does not resolve after this timeframe, it is unlikely to be a functional cyst, and further workup may be indicated.[45]

Many patients with simple ovarian cysts based on ultrasonographic findings do not require treatment. In a postmenopausal patient, a persistent simple cyst smaller than 10cm in dimension in the presence of a normal CA125 value may be monitored with serial ultrasonographic examinations.[1]

Premenopausal women with asymptomatic simple cysts smaller than 8cm on sonograms in whom the CA125 value is within the reference range may be monitored, with a repeat ultrasonographic examination in 8-12 weeks. Hormone therapy, including, as stated above, the use of the OCPs, is not helpful in resolving the cyst.[45]

According to ACOG guidelines, referral to a gynecologic oncologist is recommended for the following patients[1]:

- Postmenopausal patient with elevated CA125, imaging findings consistent with malignancy, ascites, a nodular or fixed mass, or evidence of metastases
- Premenopausal patient with very elevated CA125, imaging findings consistent with malignancy, ascites, a nodular or fixed mass, or evidence of metastases
- Premenopausal or postmenopausal patient with elevated malignancy predictive score such as the multivariate index assay, risk of malignancy index, or the Risk of Ovarian Malignancy Algorithm, or one of the ultrasound-based scoring systems from the International Ovarian Tumor Analysis Group

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Fetal and Neonatal Cysts

In female newborns, ovarian cysts are the most frequent type of abdominal tumor, with an estimated incidence of more than 30%.[9]

Fetal ovarian cysts are believed to be caused by hormonal stimulation, such as fetal gonadotropins, maternal estrogen, and placental hCG. In addition, an association between fetal ovarian cysts and maternal diabetes and fetal hypothyroidism has been identified.

Most fetal ovarian cysts are small and involute within the first few months of life and are not of clinical significance. They are generally diagnosed in the third trimester of pregnancy, and most tend to resolve at 2-10 weeks postnatally.[9]

Differential diagnoses of these cysts include urachal cysts, intestinal duplication abnormalities, cystic teratoma, and intestinal obstruction. Intrauterine ultrasonography is necessary to differentiate ovarian cysts from these other possibilities.[14]

Aspiration of these cysts can be performed but is associated with complications, such as reformation of cyst, infection, and premature labor.[9]

Once the diagnosis of a fetal ovarian cyst is made, it is important to perform serial ultrasonographic examinations to detect any structural changes in size or appearance or complications, such as hydramnios, ascites, or torsion.[14]

Of these complications, ovarian torsion is the most serious complication of a fetal ovarian cyst and may manifest as fetal tachycardia due to peritoneal irritation.

Proper management includes serial ultrasonography to look for signs of regression or postnatal surgery if the cyst is complicated or larger than 5 cm in diameter.[9]

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Ovarian Cysts in Pregnancy

The corpus luteum is responsible for progesterone production during pregnancy and normally regresses at around 8 weeks' gestation.[6]

Most pregnancy-associated cysts, such as corpus luteal and follicular cysts, resolve by gestational age 14-16 weeks and are hormonally responsive, allowing conservative management.[6] By gestational age 16-20 weeks, up to 96% of masses resolve spontaneously. Resolution of cysts are less likely when larger than 5cm or of complex morphology.[1] Simple cysts smaller than 6 cm in diameter have a risk of malignancy of less than 1%.[21]

Corpus luteal cysts tend to be larger and more symptomatic than follicular cysts and are more prone to hemorrhage and rupture. Follicular cysts are usually smaller, with internal hemorrhage being relatively uncommon.

Masses that persist longer may warrant further workup for potential neoplastic disease based on clinical findings and radiologic evidence.[6] Serum CA125 studies are not recommended in pregnancy, as levels can fluctuate widely in normal pregnancy, particularly in the first and second trimesters, and can be elevated in many benign conditions. One group suggests observation, with postpartum surgery in select patients who have large, persistent adnexal masses in whom ultrasonographic findings are not highly suggestive of malignancy.[8] However, in situations in which cysts are symptomatic, including causing pain and discomfort, or with rapid growth on serial ultrasound, surgical removal should be considered.

If malignancy is a possibility and peripartum surgery is warranted, the risk of harming the pregnancy is weighed against a delay in treatment, but surgery is generally delayed until the mid-second trimester, when most cysts have resolved.[21]

Some ovarian conditions unique to pregnancy include the hyperstimulated ovary, ovarian hyperstimulation syndrome, hyperreactio luteinalis, theca-lutein cysts, and luteoma of pregnancy. Hyperstimulated ovaries represent a normal ovarian response to circulating hCG levels and are typically seen in women who have undergone ovulation induction.

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Postmenopausal Ovarian Cysts

Most studies estimate the prevalence of simple, unilocular adnexal cysts in asymptomatic, postmenopausal women at 3-18%, with most of these cysts being smaller than 5cm in diameter.

Early studies indicated the risk of malignancy for these asymptomatic adnexal cysts in postmenopausal patients to be as high as 7%, but subsequent studies showed the prevalence to be less than 1% in small cysts.[28]

In these patients, repeat ultrasonography at 4-6 weeks can be performed along with CA125 studies in an outpatient setting. Half of asymptomatic cysts smaller than 5 cm resolve in 2 months, but rising CA125 levels or increasing cyst size or complexity may warrant surgery.

Follow-up care is important, as the risk of an ovarian neoplasm being malignant rises from 13% in premenopausal patients to 45% in postmenopausal patients.[23]

Bilateral oophorectomy

Bilateral oophorectomy and, often, hysterectomy are performed in many postmenopausal women with ovarian cysts because of the increased incidence of neoplasms in this population.

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Transfer

When a female patient presents in the emergency department (ED) with abdominal pain and signs or symptoms of an intraperitoneal process of unclear etiology, transfer is indicated if any of the following conditions are met:

- Backup surgical, obstetric, or gynecologic support is not available to the ED
- Operative capacity is not available at the health-care delivery site
- Imaging capacity is not available at the facility

Unstable patients should not be transferred unless the facility is truly unable to provide appropriate treatment or evaluation. The patient is the responsibility of the transferring physician until her arrival at the next hospital.

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Laparotomy and Laparoscopy

Persistent simple ovarian cysts larger than 5-10 cm, especially if symptomatic, and complex ovarian cysts should be considered for surgical removal.

The surgical approaches include an open incisional technique (laparotomy) and a minimally invasive technique (laparoscopy) with very small incisions. Whichever method is used, the goals remain the same; they include the following:

- To confirm the diagnosis of an ovarian cyst
- To assess whether the cyst appears to be malignant
- To obtain fluid from peritoneal washings for cytologic assessment
- To remove the entire cyst intact for pathologic analysis - This may mean removing the entire ovary
- To assess the opposite ovary and other abdominal organs
- To perform additional surgery as indicated

The use of laparoscopic techniques is becoming widespread, and the indications are extending. Laparoscopy is preferred to laparotomy when indicated because it has less adverse effects for the patient and leads to faster recovery.[46] However, it is essential that the disease outcome for the patient not be inferior to that achieved with laparotomy.[47]

Some patients, including those with chronic lung disease who are unable to tolerate a high intra-abdominal pressure or a steep head-down position, are unsuitable for laparoscopy. Others are unsuitable because of previous surgeries causing severe adhesions. For many situations the most important factor is the skill and experience of the surgeon.

With benign cysts there is no absolute contraindication to the use of laparoscopy. Such patients include those considered to have a dermoid cyst or endometrioma, those with functional or simple cysts that are causing symptoms and have not resolved with conservative management, and those presenting with acute symptoms. The aim should be to remove all cysts intact,[48,49] but if this is not possible, the cyst and/or affected ovary may be placed in a protective bag that allows the cyst to be ruptured and drained without contamination prior to removal.

Malignant ovarian cysts associated with widespread disease are usually managed by laparotomy.

Some controversy surrounds the surgical approach for very large, benign-appearing ovarian cysts. The traditional approach for both was a long, midline incision in order to allow removal of the intact cyst and ovary. Some now promote a laparoscopic approach with drainage of the cyst, allowing the ovary to be removed through a small incision.[50] The down side to this is the potential for the cyst to spill cancer cells into the abdominal cavity. Laparoscopy is now used to remove small to medium-sized cancerous ovarian cysts (up to about 12 cm) and to stage ovarian cancer.

Excision of a benign cyst alone—such as a dermoid or functional cyst or an endometrioma—with conservation of the ovary may be performed in patients who desire retention of their ovaries for future fertility or for other reasons.

If the ovarian cyst is benign, removal of the opposite ovary should be considered in postmenopausal, perimenopausal, and premenopausal women older than 35 years who have completed their family and are considered at increased genetic risk for subsequent development of ovarian carcinoma. These indications are all relative, and the issues should be discussed with the patient prior to any surgery.

A gynecologic cancer specialist should be available to help with any patient who undergoes surgery for a potentially malignant ovarian cyst. Whenever possible, the patient should consult with the specialist prior to the surgery to allow all issues to be addressed. This will allow the appropriate surgery to be performed on patients found to have cancer.

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Deterrence and Prevention

The current use of oral contraceptive pills (OCPs) may protect against the development of functional ovarian cysts. As previously mentioned, however, existing functional cysts do not regress more quickly when treated with combined oral contraceptives than they do with expectant management, so OCPs should not be used for that purpose.[51]

Current and previous use of OCPs within 15 years reduces the risk of epithelial ovarian cystadenocarcinoma.

There is no established consensus for recommending annual gynecologic examination, and its role is questionable in asymptomatic women older than 21 years.[52,53]

No generalized screening test is available for ovarian cystadenocarcinoma, but women at high risk based on family history or a previous history of breast cancer should undergo an annual ultrasonographic examination and CA125 test. Referral for genetic counseling should be considered.

Women at high risk for ovarian cystadenocarcinoma may be offered prophylactic oophorectomy, which will prevent the development of ovarian cancer but not peritoneal carcinoma.

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Consultations

The following consultations should be made:

- Infertility and reproductive endocrinologist - For endometrioma and polycystic ovarian syndrome
- Gynecologic oncologist - Postmenopausal patients with elevated CA125 and imaging findings concerning for malignancy, premenopausal patients with very elevated CA125 and concerning imaging studies, patients with an elevated risk assessment or those with a strong family history/genetic risk factors for malignancy

- General surgeon - Consult a general surgeon in the ED when the clinical presentation indicates an intraperitoneal process that is not clearly obstetric or gynecologic
- Obstetrician/gynecologist - When an ovarian-, uterine-, or pregnancy-related emergency is suspected

It is imperative to expedite hemodynamically unstable patients to the operating room, with consulting services mobilized, while the initial resuscitation in the ED is in progress.

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Long-Term Monitoring

The timing of outpatient care for patients with ovarian cysts depends on the specific patient's age and pregnancy status. In pregnant patients, most ovarian cysts resolve at 16-20 weeks' gestation.

Patients with benign-appearing ovarian cysts that are unilocular and smaller than 5-6 cm in diameter require no further follow-up for the cyst during pregnancy and require only routine prenatal visits. In nonpregnant patients and in patients following pregnancy, such cysts can be followed with serial ultrasound.

If the cyst is larger than 5-6 cm or is multicystic, the patient should undergo follow-up ultrasonography at 16 weeks' gestation to allow time for cyst resolution. Persistent complex masses may be further characterized by MRI, either during or after pregnancy, to search for distinctive features that would guide diagnosis.[6]

Ovarian cysts that are strongly suggestive of malignancy or that are larger than 8-10 cm in diameter, are symptomatic, or are at an increased risk for torsion, rupture, or obstruction of labor are more likely to require surgical intervention[54]; they necessitate more urgent follow-up with an obstetrician and, possibly, a multidisciplinary approach in a timely fashion.

If surgery is required, it is most advantageous to perform it in the early second trimester, as the risk of spontaneous abortion during this period is lower than in the first trimester. It is better to avoid surgical intervention during the third trimester, if possible, to prevent inducing preterm delivery and to avoid technical issues in dealing with a larger uterus.

In postpartum patients, the size and complexity of the ovarian cyst and the CA125 level are used to determine management. Unilocular cysts that are smaller than 5 cm in diameter should be monitored with transvaginal ultrasonography and CA125 studies at 6-month intervals. Complex ovarian cysts that are smaller than 5 cm in diameter in the presence of normal CA125 levels (defined as < 35 U/mL) should be monitored in 4 weeks with repeat ultrasonography and CA125 studies. Surgery may be indicated for complex ovarian tumors that are smaller than 5 cm in diameter when CA125 levels are elevated (>35 U/mL) and for complex tumors larger than 5 cm in diameter.[23]

Studies have used various timeframes as indices for cyst resolution in nonpregnant, premenopausal patients. Most of these studies showed cyst resolution by 2-3 months, dictating ultrasonography with or without gynecologic follow-up in these patients. [45]

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Guidelines

Guidelines Summary

The following organizations have released guidelines for the management of ovarian cysts. Key diagnostic and treatment recommendations have been reviewed and integrated throughout the article.

- 2024. American College of Radiology. ACR Appropriateness Criteria® Clinically Suspected Adnexal Mass, No Acute Symptoms: 2023 Update[29]
- 2020. Society of Obstetricians and Gynaecologists of Canada. Guideline No. 404: Initial Investigation and Management of Benign Ovarian Masses[19]
- 2016. American College of Obstetricians and Gynecologists' Committee on Practice Bulletins—Gynecology.;Practice Bulletin No. 174: Evaluation and Management of Adnexal Masses[1]

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Medication

Medication Summary

Narcotic analgesics and nonsteroidal anti-inflammatory drugs (NSAIDs) can be used for pain relief in patients with ovarian cysts. NSAIDs, including ibuprofen and ketorolac, can be used to treat mild to moderate pain, while narcotic medications, such as morphine sulfate and oxycodone, are useful against moderate to severe pain.

As previously discussed, oral contraceptive pills (OCPs) protect against the development of functional ovarian cysts but cannot be used to resolve existing ones.

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Opioid Analgesics

Class Summary

These agents are used to relieve moderate to severe pain. Pain relief is of paramount concern, but it must be remedied with agents chosen for the given clinical situation.

A review of opioid equivalents and conversions may be found in the following reference article:

https://emedicine.medscape.com/article/2138678-overview

Morphine (Astramorph, Depodur, Duramorph)

Morphine sulfate is the drug of choice (DOC) for analgesia, owing to the drug's reliable and predictable effects, safety profile, and ease of reversibility with naloxone. Various intravenous (IV) doses are used; the drug is commonly titrated until the desired effect is obtained.

For chronic severe pain unremitting to alternative therapy, oral immediate–release and extended-release morphine sulfate may be warranted. Arymo ER is a morphine sulfate abuse-deterrent derivative.

Oxycodone (Oxaydo, OxyContin, Roxicodone)

Oxycodone is indicated for the relief of moderate to severe pain. It inhibits ascending pain pathways by binding to the opiate receptor. It alters the response to and perception of pain. It produces generalized CNS depression.

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Analgesic Nonsteroidal Anti-inflammatory Drugs (NSAIDs)

Class Summary

These agents are used for the relief of mild to moderate pain. They inhibit inflammatory reactions and pain by decreasing the activity of cyclo-oxygenase (COX), which results in decreased prostaglandin synthesis.

Diclofenac (Cambia, Cataflam (DSC), Dyloject (DSC))

Diclofenac inhibits prostaglandin synthesis by decreasing COX activity, which, in turn, decreases formation of prostaglandin precursors.

Ibuprofen (Advil, Motrin, PediaCare Children's Pain Reliever/Fever Reducer IB)

Ibuprofen is the DOC for patients with mild to moderate pain. It inhibits inflammatory reactions and pain by decreasing prostaglandin synthesis.

Indomethacin (Indocin, Indocin SR (DSC), Tivorbex (DSC))

It is used for relief of mild to moderate pain; it inhibits inflammatory reactions and pain by decreasing the activity of COX, which results in a decrease of prostaglandin synthesis.

Ketoprofen (Nexcede (DSC))

Ketoprofen is used for relief of mild to moderate pain and inflammation. Small dosages are indicated initially in small patients, elderly patients, and patients with renal or liver disease. Doses higher than 75 mg do not increase the therapeutic effects. Administer high doses with caution, and closely observe the patient's response.

Ketorolac (Toradol)

Ketorolac inhibits prostaglandin synthesis by decreasing the activity of COX, which results in decreased formation of prostaglandin precursors.

Naproxen (Aleve, Anaprox, Anaprox DS)

Naproxen is used for relief of mild to moderate pain; it inhibits inflammatory reactions and pain by decreasing the activity of COX, which results in a decrease of prostaglandin synthesis.

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Questions & Answers

Overview

What follow-up is required for patients with small benign-appearing ovarian cysts?

What follow-up is required if an ovarian cyst is larger than 5-6 cm or is multicystic?

Which ovarian cysts are more likely to require surgical intervention?

When is it most advantageous to perform surgery in the treatment of ovarian cysts during pregnancy?

What should be considered prior to selection of treatment for ovarian cysts in postpartum patients?

How quickly do ovarian cysts resolve in premenopausal patients?

Medications

Which medications are used for pain relief in patients with ovarian cysts?

Which medication may protect against the development of functional ovarian cysts?

Which medications in the drug class Analgesic Nonsteroidal Anti-inflammatory Drugs (NSAIDs) are used in the treatment of Ovarian Cysts?

Which medications in the drug class Opioid Analgesics are used in the treatment of Ovarian Cysts?

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