

Disorders of the Ovaries

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Benign conditions of the ovaries are among the most common problems encountered by obstetrician-gynecologists. Palpation alone is often inaccurate, with subsequent laparoscopy confirming preoperative diagnoses only half the time. Ultrasound examination, especially with greater experience with transvaginal scanning, represents a major advance in the sensitivity of detection and the specificity of preoperative diagnosis. Computed tomography is thought by many to be less helpful than ultrasound in evaluating the adnexa, whereas magnetic resonance imaging shows much more promise. Despite these technologic advances, it is the responsibility of the clinician to appreciate the variety of benign enlargements of the ovaries that can be treated conservatively. The nonneoplastic cysts and benign neoplasms found in the ovaries are listed below.

Nonneoplastic ovarian cysts

1. Follicular and luteinized cysts
 - a. Single follicular, corpus luteum, and corpus albicans cysts
 - b. Multiple follicular cysts
 - c. Theca-lutein cysts
 - d. Pregnancy luteoma
2. Ovarian stromal proliferative disorders
 - a. Corticostromal hyperplasia
 - b. Hyperthecosis
 - c. Hilus cell (Leydig cell) hyperplasia
3. Germinal epithelial cysts
4. Endometriosis

Benign ovarian neoplasms

1. Germinal epithelium
 - a. Serous cystoma and cystadenoma
 - b. Mucinous cystadenoma
 - c. Endometrioid cystadenoma
 - d. Clear cell (mesonephroid) tumors
 - e. Brenner tumors
2. Germ cell
 - a. Mature cystic and solid teratomas
 - b. Struma ovarii

Nonneoplastic Ovarian Cysts

The most frequent causes of ovarian enlargement in the pre- and perimenopause are physiologic cysts that are sensitive to sex steroid levels and gonadotropin stimulation. Included in this discussion are ovarian nonneoplastic

processes that may present as a noncystic ovarian mass (eg, endometriosis and hyperthecosis).

Follicular, Corpus Luteum, and Corpus Albicans Cysts

Cystic changes that occur during folliculogenesis and atresia are named according to their stage of maturation and their correlated histologic characteristics. Follicular cysts are usually clear and thin-walled, solitary, and lined by granulosa cells and range in size from 1–5 cm or larger. They may be associated with pelvic pain, menstrual disturbance, and occasionally, intraabdominal leakage or rupture. Corpus luteum cysts are notable for their yellow tinge caused by intramural cholesterol, for steroidogenesis, and for their prominent vasculature. Patients with a corpus luteum cyst present with pelvic pain or irregular bleeding. The cyst may be over 5 cm in diameter and at laparotomy may be difficult to differentiate from endometriotic cysts. Similarly, the corpus albicans cyst may be more than 5 cm in diameter, but it is pale and more fibrous in appearance than the follicular or corpus luteum cyst. Pelvic examination cannot distinguish between these three cyst types, since they present as mobile, tender, cystic masses. Knowing the patient's cycle day may help suggest one type over another. Diagnosis of these cysts and their distinction from neoplasia, however, are based on histologic criteria.

Ultrasound examination can usually distinguish between a simple unilocular cyst and a complex mass more suggestive of neoplasia; transvaginal ultrasound offers greater resolution in studying ovarian and intracystic architecture, while it allows greater patient comfort because of the nondistended urinary bladder. By either the transabdominal or the transvaginal route, hemorrhagic echoes may be found in cysts, benign neoplasias, and cancers. Typically, simple unilocular cysts with some hemorrhage and free peritoneal fluid can be expected to regress if they are 6 cm or less in diameter. Ultrasound criteria that suggest the need for active intervention include septa, solid components, fixation in the pelvis, and a large amount of peritoneal fluid. Expectant management or steroid suppression (eg, oral contraceptives or medroxyprogesterone acetate [Depo-Provera]) should be associated with ultrasound evidence of cyst resolution after 2–3 months.

Surgical intervention for a unilateral adnexal cyst is indicated when the following criteria are present:

- The patient is premenarchal or postmenopausal; however, a newborn infant may have a simple cyst in response to the mother's and/or her own androgens. The

infant should be managed expectantly until the cyst persists until the infant is age 1-2.

- The cyst has a concomitant solid component suggested by ultrasound, radiography, computed tomography, or magnetic resonance imaging.
- Symptoms and signs progress, prohibiting expectant management.
- The cyst fails to regress after two to three induced or natural menstrual cycles.
- The diameter of the cyst is greater than 8 cm at presentation. Investigators differ, however, with regard to the threshold size, with debate over a diameter of between 6-10 cm.

Culdocentesis may be performed if free fluid is noted during the ultrasound examination. The fluid of a ruptured cyst is typically thin and serosanguinous, with a hematocrit of 5% or less; the fluid associated with a ruptured ectopic pregnancy often has a hematocrit of over 30%. If the posterior cul-de-sac is bulging, culdocentesis produces blood 95% of the time, and this procedure should be supplanted by laparoscopic evaluation. Hemorrhagic cysts can be treated conservatively in almost all cases, and the ovary can be preserved. If cyst removal is necessary because of persistent, significant bleeding, a plastic closure of the ovary with a deep running hemostatic layer of no. 3-0 absorbable synthetic suture followed by a cortical layer of no. 5-0 or 6-0 monofilament synthetic absorbable suture is preferred by most reproductive surgeons.

Ovarian suspension may lessen the risk of adhesions to a concomitant bed of adhesions on the side wall. Intra-peritoneal solutions (eg, Hyskon and saline) may lessen adhesions by hydroflotation of the viscus; barrier membranes such as Interceed are even more likely to offer some hope of decreasing adhesion formation.

Careful inspection and palpation of the contralateral ovary is mandatory prior to closure. Wedge biopsy is contraindicated, unless a mass is seen, because of the high risk of subsequent adhesions to a wedge biopsy closure.

Multiple Luteinized Follicular Cysts (Theca-Lutein Cysts)

Multiple luteinized follicular cysts are often benign and associated with conditions that produce high levels of hCG: multiple gestation, ovarian hyperstimulation with clomiphene and menotropins and exogenous hCG, and gestational trophoblastic disease. Ovarian hyperstimulation syndrome typically follows ovulation induced by clomiphene or menotropins by 8-10 days. Ovarian hyperstimulation syndrome is characterized by ascites, abdominal distension, pain, and ovarian enlargement of between 6-20 cm in maximum diameter. Treatment is supportive, with optimization of intravenous fluid status, renal perfusion, and analgesia. Antihistamines such as chlorpheniramine may help limit ascites formation. Paracentesis is indicated in the presence of respiratory

compromise or severe abdominal distension. Surgical intervention is rarely required and is often complicated by bleeding to an extent requiring removal of one or both ovaries. Surgery is indicated, however, in cases of intra-abdominal hemorrhage due to cyst rupture.

Theca-lutein cysts are found in half of women with molar pregnancy and one-tenth of women with choriocarcinoma. These cysts may be seen in women with other conditions associated with compromised uteroplacental metabolism of hCG, including pregnancy-induced hypertension, diabetes mellitus, Rh blood group incompatibility, and multiple gestations. Management is expectant unless progressive findings suggest serious intraperitoneal bleeding.

Pregnancy Luteomas

Luteomas also form in response to placental hCG, but they differ from theca-lutein cysts in that they are more solid, enlarging the ovaries by up to 20 cm, and have tan-brown lobules. One-third of cases are bilateral. Luteomas produce excessive androgens (testosterone, dihydrotestosterone, and androstenedione) in 40% of cases, resulting in varying degrees of masculinization of mother or fetus. Management of these physiologic tumors is expectant, despite the often dramatic degree of hirsutism that is possible. Involution of the ovaries occurs several weeks postpartum.

Ovarian Stromal Proliferation

The cysts discussed above originate from the ovarian follicle; nonneoplastic proliferation of ovarian stromal cells results in corticostromal hyperplasia, hyperthecosis, or hilus cell hyperplasia.

Corticostromal hyperplasia may be histologically present in the ovaries of women in normal menopause without significant associated clinical problems; progressive hirsutism is possible, however, and merits treatment. Peripheral aromatization of androgens may produce a hyperestrogenic environment, resulting in uterine bleeding problems. Typically, gross findings include slightly enlarged ovaries with thick cortices and with cysts being evident only rarely. Older women are treated with bilateral oophorectomy; women who desire to retain their reproductive potential may be treated with wedge resection and ovulation induction.

Hyperthecosis is the term used if histology demonstrates large, pale, polygonal lutein cells seen in addition to stromal hyperplasia. Hilus cell (Leydig cell) hyperplasia is a distinct histologic entity that is associated with cellular response to increased luteinizing hormone (LH). Treatment with wedge resection or oophorectomy is possible.

Germinal Epithelial Cysts

Germinal epithelial cysts are thin and small. They are lined with a single layer of cuboidal epithelium and are

typically incidental findings in menopausal women. Synonyms include germinal inclusion cysts or müllerian or surface epithelium proliferative cysts.

Benign Ovarian Neoplasms

Three-fourths of ovarian neoplasms are benign. With a peak incidence during the reproductive years, 75% of benign ovarian neoplasms arise from the germinal epithelium, 15% arise from the stroma, and 10% arise from other ovarian elements. These tumors may be asymptomatic; may be detected on routine pelvic examination; or may be present with pelvic pain, menstrual irregularity, infertility, or an increase in abdominal girth. *More dramatic presentations include torsion, rupture, or hemorrhage into a neoplasm.*

Ovaries with benign neoplasms are typically mobile, but they are of variable size and tenderness. Ultrasound can delineate cystic versus solid components, septations, and increased peritoneal fluid. Laparoscopy can be used to differentiate simple cysts from complex masses, such as cystadenomas, and from tubal conditions, such as hydrosalpinges. The diagnosis of benign ovarian neoplasms, however, is dependent on careful review of numerous representative histologic sections. The contralateral ovary may be removed in perimenopausal and older patients. The visually and palpably normal ovary may be preserved in women of reproductive age; excisional biopsy is done only if an abnormality exists.

Benign Germinal Epithelial Neoplasms

Simple serous cysts, or serous cystomas, make up 15% of ovarian tumors. They are round, smooth, thin walled, and lined with a single layer of cuboidal or low cylindrical epithelium. Typically unilateral, they are often 7–8 cm in diameter at the time of excision. Serous cystomas are treated by cystectomy, when possible, or by unilateral oophorectomy.

Serous cystadenomas differ from cystomas by the adenomatous epithelial proliferations on their inner walls. They make up 30% of benign ovarian tumors, are bilateral in 15% of cases, and are unusual if they are larger than 10 cm in diameter. Oophorectomy of the involved ovary is indicated. Many investigators recommend contralateral oophorectomy as well because of the relatively frequent finding of bilateral tumors and an occasional concomitant malignant tumor. Nevertheless, a completely normal ovary can be preserved in a young woman if she provides informed consent.

A special type of serous cystadenoma is the papillary variety, which is bilateral in 50% of cases. It has a propensity for developing into adenocarcinoma over time. A further subdivision is the distinction between the more common endophytic type, which is often treated as a malignancy by bilateral oophorectomy, and the less common exophytic type, the natural history of which is less well defined. Some authorities recommend that these

cystadenomas be treated as ovarian carcinomas; others have advised intermittent laparoscopic observation and hysterectomy/bilateral salpingo-oophorectomy only if recurrence is seen.

Mucinous cystadenomas are often larger than serous tumors, with many weighing 5–10 kg. They are bilateral in 10% of cases and are associated with malignancies in 5–12% of cases. Their histologic landmark is the presence of mucin-producing epithelial cells in their cyst walls. This is thought to be a metaplastic change from the native germinal epithelium. Cystectomy or unilateral oophorectomy is appropriate in young women if the contralateral ovary is completely normal.

Pseudomyxoma peritonei is a rare condition in which the peritoneal mesothelium is transformed to mucin-secreting epithelium following rupture of a mucinous cystadenoma. Irrigation with ample hypotonic water has been reported to help prevent cyst rupture, a potentially lethal complication, when the cyst is removed.

Endometrioid cystadenomas account for 5% of all ovarian tumors. Because 25% of ovarian carcinomas are endometrioid, many endometrioid neoplasms are malignant. Endometriosis coexists in 10% of cases. Endometrioid cystadenomas are bilateral in 30% of cases and tend to occur in older women. Thus, bilateral oophorectomy is often performed as the treatment of choice.

Clear cell neoplasms, previously termed mesonephroid neoplasms, are only rarely benign. Less than 5% are bilateral. The typical "hobnail" cells are müllerian in origin and are probably derived from surface epithelium.

Brenner tumors resemble fibromas and are rarely bilateral. Histologic examination shows deep-lying epithelial nests interspersed in a fibrous stroma. Malignant change is very rare, and unilateral oophorectomy is the usual treatment in women of reproductive age.

Approximately 15% of ovarian epithelium tumors are undifferentiated and have histologically marked anaplasia. Unfortunately, these tumors are never benign, yet they have no characteristic gross appearance. The 10-year survival is about 10% for patients with these tumors.

Benign Germ Cell Neoplasms

Germ cell neoplasms make up 20–25% of ovarian neoplasms and are benign in 95% of cases. Of those ovarian neoplasms that occur in the first 20 years of life, 80% are of germ cell origin. They often present as an asymptomatic pelvic mass and may be present with pain or torsion.

Teratomas are neoplasms with elements derived from one or more of the three germ cell layers: endoderm, ectoderm, and mesoderm. Mature cystic teratomas (or dermoids) account for 20% of all ovarian neoplasms and are bilateral in 10–15% of cases. Their gross appearance is characteristic, with sebum and hair often identified through the cyst wall. There is no method short of surgery, however, to guarantee that a teratoma is benign. Mature solid teratomas are less common than cystic ones, but they are treated in the same way: by cystectomy. As

much oocyte-containing ovarian cortex should be preserved as possible. The contralateral ovary is palpated, and if it is normal, it is preserved without biopsy.

Struma ovarii is a rare teratoma with a histologic picture the same as that of thyroid tissue. Although this is usually benign, malignancy is suspected if a papillary or embryonal pattern is evident.

Ovarian Preservation at Time of Hysterectomy

Management of the adnexa at the time of hysterectomy for benign conditions is a subject of controversy in gynecology. Ovarian carcinoma is rarely diagnosed early, and screening techniques have proven unreliable. Premature removal of the ovaries without hormone replacement, however, produces significant risk of cardiovascular and osseous morbidity. Currently, with the patient's permission, prophylactic oophorectomy may be considered at the time of hysterectomy if the patient 1) is postmenopausal or over age 40, or 2) has a family history of ovarian malignancy. Unfortunately, bilateral oophorectomy does not

completely eliminate the risk of ovarian cancer. A few patients without ovaries have developed malignant mesotheliomas that are histologically indistinct from ovarian carcinomas.

Informed consent is particularly important in regard to prophylactic oophorectomy. Women should be apprised of the 1–2% prevalence of ovarian carcinoma and that the peak incidence is in women aged 50–60. Removal of one ovary does not seem to significantly lessen the risk of cancer. Women without ovaries are at increased risk of cardiovascular morbidity and osteoporosis, as well as problems with their genitourinary tracts; multiple forms of hormone replacement seem to offer a reasonable chance of correcting estrogen deficiency and its morbidity. The retained ovary in menopausal women does make estrogens, however, both directly and indirectly by peripheral aromatization of androgens. With the understanding of the pros and cons of prophylactic oophorectomy, the informed patient can then make a rational decision as to her willingness to accept hormone replacement indefinitely versus her willingness to preserve her ovaries.

Wound Healing: Techniques and Materials



Today's practicing gynecologists must be knowledgeable of the complexities of the wound healing process as well as the basic impact of their surgical manipulations on it. The surgeon must give careful consideration to the many factors that are involved when choosing incisions, employing surgical instruments, or selecting the appropriate sutures and devices required to close the surgical wound. Knowing the advantage of each method of closure as well as choosing the patient in whom those advantages will be most useful are likewise important. The choice of surgical textiles, the knotting properties of these textiles, and the absorption rates and infection-potentiating properties of each suture material are essential data. These basic considerations should be mastered by gynecologic surgeons so that surgical procedures can be performed successfully with the greatest technical ease, the lowest surgical morbidity, and the best long-term results. Today's aging population further emphasizes the need for successful long-term results, as the reconstructive procedures gynecologists perform today may need to hold for 40 years or more.

Wound Healing

In the normal healing process, healthy tissue responds to injury with an inflammatory phase, a fibroblastic phase, and a remodeling phase. Cellular and biochemical messages initiate the healing response, regulate its magnitude and length, and stop the reparative process when it is complete. The pathophysiologic changes that occur during each stage of wound healing are delineated in Table 3-2.

In the inflammatory phase, from incision to day 4, blood is released in the area of injury, vessels constrict and then dilate, and leukocytes adhere to the endothelium. Red cells form rouleaux, fluid leaks into tissues and spaces, and the body responds with increased hemostasis. Prostaglandins E_1 and E_2 , serotonin, kinins, and histamines are active. Platelets have an active and newly expanded role in wound healing. Cellular infiltrates include polymorphonuclear leukocytes, lymphocytes, macrophages, and monocytes. The wound has practically no inherent strength without sutures during this early phase.