Adnexal mass in pregnancy

Authors: Carolyn D Runowicz, MD, Molly Brewer, DVM, MD, MS
Section Editor: Barbara Goff, MD
Deputy Editor: Sandy J Falk, MD, FACOG

All topics are updated as new evidence becomes available and our peer review process is complete.

Literature review current through: Apr 2019. | **This topic last updated:** Nov 07, 2018.

INTRODUCTION

The liberal use of prenatal ultrasound for evaluation of the fetus has also resulted in increased detection of asymptomatic adnexal masses during pregnancy. Although the vast majority of these masses are benign, the possibility of cancer must be considered.

This topic will discuss management of the adnexal mass in pregnancy, with an emphasis on women with suspected malignancy. Detailed reviews on the evaluation and management of the nonpregnant woman with an adnexal mass can be found separately:

- (See "Approach to the patient with an adnexal mass".)
- (See "Management of an adnexal mass".)
- (See "Differential diagnosis of the adnexal mass".)

PREVALENCE

The incidence of adnexal masses complicating pregnancy varies from 0.1 to 2.4 percent, and approximately 1 to 6 percent of these masses are malignant [1-4]. A review of publications on ovarian cancer during pregnancy from 1958 to 2007 included 41 cases [5]. The mean age at presentation was 32.6 years (range 23 to 46 years); stage at diagnosis was recorded in 39 cases: International Federation of Gynecology and Obstetrics (FIGO) I (59 percent), FIGO II (5 percent), FIGO III (26 percent), and FIGO IV (10 percent). It is important to remember that the use of obstetric ultrasound and cesarean delivery were much less common in the initial decades of this interval, thus there was less opportunity for incidental detection of asymptomatic adnexal masses.

In a population-based hospital registry series of malignancies identified during pregnancy using birth records linked to hospital discharge data (1992 to 1997), ovarian cancer was the fifth most

common cancer diagnosed during pregnancy after breast, thyroid, cervical cancer, and Hodgkin lymphoma [2,6]. There was also a high proportion of tumors of low malignant potential (n = 115) reported separately, with the majority in early stage and associated with favorable maternal and neonatal outcomes. A retrospective review reported that ovarian cancer was the sixth most common cancer in an Asian population [6].

PATIENT PRESENTATION

Prior to the widespread use of ultrasound, most adnexal masses in pregnant women remained unrecognized until cesarean delivery or until they became symptomatic, usually in the postpartum period. Now many asymptomatic masses are recognized in the first half of pregnancy when they are identified incidentally during an antenatal ultrasound performed for obstetrical indications [1,5,7,8]. Adnexal masses that have not been diagnosed antepartum may be identified at cesarean delivery. In a retrospective study of over 46,500 term cesarean deliveries performed for obstetrical indications, 151 women (0.3 percent) underwent concurrent surgery of an adnexal mass, which was an incidental finding at surgery in just over half of the women (83 of 151; 55 percent) [9].

Other clinical presentations include:

- **Nonspecific symptoms** – Symptoms and signs that precede the diagnosis of ovarian cancer include abdominal or back pain, constipation, abdominal swelling, and urinary symptoms [10,11]. Since these symptoms are almost universally present in normal pregnancies, their presence is unlikely to trigger a diagnostic evaluation.

- **Palpable mass** – In some women, a suspicious finding, such as a palpable adnexal mass or posterior cul-de-sac mass or nodularity, may be identified during a routine antenatal physical examination and subsequently evaluated by ultrasound.

- **Acute abdominal pain** – In a few patients, acute abdominal pain due to torsion of the adnexa prompts the diagnostic evaluation. Adnexal torsion occurs in approximately 5 percent of pregnant women with an adnexal mass (benign or malignant) [1]. In one review, adnexal masses between 6 and 8 cm in diameter had a significantly higher rate of torsion (22 percent) than either smaller or larger masses [12]. Sixty percent of the torsions occurred between the 10th and 17th week of gestation; only 6 percent occurred after 20 weeks. (See "Ovarian and fallopian tube torsion".)

- **Elevated maternal analytes** – Many germ cell and sex cord-stromal tumors of the ovary produce hormonal tumor markers, some of which are measured in prenatal screening programs for fetal abnormalities (eg, alpha-fetoprotein [AFP], inhibin A) (table 1) [13]. An unexplained elevation in these maternal serum analytes, obtained while screening for neural

tube defects or Down syndrome, may be the first sign of one of these tumors [13]. (See 'Tumor markers in ovarian malignancy' below.)

TYPES OF ADNEXAL MASSES IN PREGNANT WOMEN

In a review of seven studies, there were 563 adnexal masses in 557 women. Of these, 48 percent were classified as simple and 53 percent as complex. Among the simple masses, 1 percent were malignant whereas in the complex masses, 9 percent were malignant [3]. In another retrospective study of 151 women who underwent surgery of an adnexal mass at cesarean delivery, the adnexal mass was benign in 148 cases. Histopathologies accounting for over 4 percent of cases in the series included dermoid (24 percent), paratubal/paraovarian (19 percent), simple serous (15 percent), mucinous cystadenoma (11 percent), serous cystadenoma (7 percent), corpus luteum (5 percent), endometrioma (5 percent), and fibroma (5 percent) [9]. The three malignancies in the series consisted of two granulosa cell tumors and one mucinous carcinoma.

Benign neoplasms — Most adnexal masses identified in pregnant women are benign simple cysts less than 5 cm in diameter. Most of these are functional ovarian cysts, either follicular or corpus luteum cysts, that occur as part of the normal physiological function of the ovary. Approximately 70 percent of all adnexal cystic masses detected in the first trimester spontaneously resolve by the early part of the second trimester, which is consistent with the natural history of functional cysts [7]. The majority of persistent adnexal masses 5 cm or greater in diameter are mature teratomas [1].

The differential diagnosis of the adnexal mass is reviewed in detail separately (see "Differential diagnosis of the adnexal mass"). Briefly, benign adnexal masses are characterized by their ultrasonographic appearance and, in some cases, associated clinical findings (see "Ultrasound differentiation of benign versus malignant adnexal masses"):

- Benign masses without complex features on ultrasound are generally physiologic/functional cysts (eg, follicular cysts), but may be unilocular serous or mucinous cystadenoma or hydrosalpinx.

- Benign masses with complex features on ultrasound include corpus luteum, mature teratomas, hydrosalpinx with septation, theca lutein cysts, endometriomas, multilocular cystadenomas, as well as extrauterine pregnancies [14]. The corpus luteum persists longer during pregnancy and thus is likely to reach a larger size and may become hemorrhagic, rupture, or undergo torsion.

  Theca lutein cysts (also called lutein cysts, hyperreactio luteinalis) are luteinized follicle cysts that form as a result of overstimulation from high human chorionic gonadotropin (hCG) levels or hypersensitivity to hCG. Bilateral multiseptated cystic adnexal masses in a woman with

gestational trophoblastic disease, multiple gestation, ovulation induction, or a pregnancy complicated by fetal hydrops are likely to represent theca lutein cysts.

- A luteoma is an uncommon solid benign lesion specific to pregnancy. It is a non-neoplastic ovarian change associated with pregnancy that can simulate a neoplasm on clinical, gross, or microscopic examination. The diagnosis should be suspected when a solid adnexal mass is associated with maternal hirsutism or virilization.

- Uncomplicated pedunculated leiomyomas are usually hypoechoic compared with normal myometrium, but may have a complex appearance when there is necrosis or degeneration.

The presence of pain should suggest the possibility of heterotopic pregnancy, torsion or rupture of an ovarian neoplasm, or degeneration of a leiomyoma. (See "Abdominal pregnancy, cesarean scar pregnancy, and heterotopic pregnancy", section on 'Heterotopic pregnancy' and "Ovarian and fallopian tube torsion" and "Evaluation and management of ruptured ovarian cyst" and "Uterine leiomyomas (fibroids): Epidemiology, clinical features, diagnosis, and natural history", section on 'Fibroid degeneration or torsion'.)

Malignant neoplasms — Epithelial ovarian tumors comprise approximately one-half of all ovarian malignancies in pregnant women, germ cell ovarian malignancies make up approximately one-third, and stromal tumors and a variety of other tumor types (eg, sarcomas, metastatic tumors) account for the remainder (figure 1).

Epithelial ovarian tumors — Approximately 50 percent of epithelial ovarian tumors detected in pregnancy are of low malignant potential (formerly called "borderline"), and the other 50 percent are invasive. Epithelial ovarian tumors of low malignant potential diagnosed in pregnancy may exhibit atypical characteristics suggestive of invasive cancer such as nuclear enlargement, anisocytosis, and multifocal microinvasion. (See "Borderline ovarian tumors" and "Epithelial carcinoma of the ovary, fallopian tube, and peritoneum: Clinical features and diagnosis".)

Germ cell tumors — Approximately three-fourths of malignant ovarian germ cell tumors in pregnancy are dysgerminomas; endodermal sinus tumors, immature teratomas, and mixed germ cell tumors comprise the remainder [15]. Most germ cell tumors are grossly limited to one adnexa, but lymphatic spread to pelvic or para-aortic nodes occurs, most commonly in dysgerminoma [16]. Dysgerminomas are bilateral in 10 to 15 percent of cases; other germ cell tumors are almost always unilateral. (See "Ovarian germ cell tumors: Pathology, clinical manifestations, and diagnosis".)

Sex cord-stromal tumors — Approximately half of all pregnancy-associated stromal tumors are granulosa cell tumors, one-third are Sertoli-Leydig cell tumors, and the remainder are unclassified stromal tumors [17]. Most of these tumors are limited to one ovary at the time of diagnosis. Prior to the routine use of prenatal ultrasound, approximately 20 percent of these

lesions presented with intraperitoneal hemorrhage and/or hemorrhagic shock, but this has become less common with earlier diagnosis.

Between 10 and 15 percent of stromal tumors secrete androgens and produce virilization. Although estrogen secretion also occurs, symptoms of a hyperestrogenic state are masked by the already high estrogen concentration associated with pregnancy.

Pregnancy-related histologic changes in these tumors include a disorderly arrangement of cells, increased edema, and unusually large numbers of lutein or Leydig cells [17]. (See "Sex cord-stromal tumors of the ovary: Granulosa-stromal cell tumors".)

DIAGNOSIS

Definitive diagnosis can only be made by resecting the ovarian neoplasm for pathologic examination. However, some benign ovarian masses, including follicular or corpus luteal cysts, endometriomas, and mature teratomas (dermoid), have characteristic sonographic features, and the diagnosis is reasonably certain without surgical exploration.

It is important that ovarian tissue is examined by a pathologist skilled in interpretation of histologic findings in the context of an ongoing pregnancy and that the pathologist is informed of the coexistent pregnancy. Pregnancy-related changes in the histologic appearance of tumors of low malignant potential can result in atypical characteristics suggestive of invasive cancer. In one series, 8 of 10 serous neoplasms diagnosed in pregnancy had microscopic and clinical features suggesting aggressive behavior; however, all of these features regressed postpartum in this small series, confirming that the neoplasms were of low malignant potential [18].

DIAGNOSTIC EVALUATION

Patient selection for surgery — The general consensus regarding management of adnexal masses in pregnancy is to surgically resect asymptomatic masses that are present after the first trimester and (1) are >10 cm in diameter or (2) are solid or contain solid and cystic areas or have papillary areas or septae [1,4,12,19-22]. The rationale for this approach is that these findings increase the likelihood of malignancy, and it is desirable to diagnose malignancy, if present, at an early stage. In addition, resection of large adnexal masses (benign or malignant) reduces the risk of complications such as adnexal torsion, rupture, or obstruction of labor. Emergency surgery during pregnancy for management of a torsed or ruptured adnexal mass is uncommon (<5 percent of cases [1,23]) and can lead to preterm delivery [19,20,24].

Adnexal masses that do not have concerning features (eg, persistence into the second trimester, large size, or solid components) are likely to be physiologic cysts and can be managed expectantly [1,25-31], and often resolve during pregnancy. Expectant management is also

appropriate for cysts with these features if the sonographer is reasonably certain that the neoplasm is a follicular or corpus luteal cyst, endometrioma, or mature teratoma. Surgical treatment of endometriomas depends upon whether the patient is symptomatic. Most mature teratomas are benign, but surgery may be indicated postpartum to prevent torsion (see "Ovarian germ cell tumors: Pathology, clinical manifestations, and diagnosis", section on 'Mature teratoma (dermoid)'). For any ovarian mass, if the diagnosis is uncertain, further evaluation is required. Up to 10 percent of adnexal masses that persist during pregnancy are malignant [4,26,32]. A substantial portion of these are epithelial low malignant potential tumors or germ cell tumors, both tumors with a typically favorable prognosis. (See "Management of an adnexal mass", section on 'Suspected malignancy or uncertain etiology'.)

Timing — The optimal time for semi-elective surgery during pregnancy is after the first trimester for a number of reasons:

- Almost all functional cysts will have resolved by this time.
- Organogenesis is mostly complete, thus minimizing the risk of drug-induced teratogenesis.
- The hormonal function of the corpus luteum has been replaced by the placenta, so reduction in progesterone secretion from oophorectomy or cystectomy does not result in loss of the pregnancy if not replaced.
- Spontaneous pregnancy losses due to intrinsic fetal abnormalities are likely to have already occurred and will not be erroneously attributed to the surgery.

Preoperative assessment — In most cases, the preoperative workup for a pregnant woman with a pelvic mass can be limited to ultrasound imaging. If the ultrasound findings cannot distinguish between a possible pedunculated or degenerating leiomyoma and an ovarian neoplasm, we suggest obtaining magnetic resonance imaging (MRI). The more precise diagnosis afforded by MRI may be useful in opting for expectant management until delivery [33]. (See "Ultrasound differentiation of benign versus malignant adnexal masses".)

A routine preoperative chest radiograph is unnecessary; however, if the history and physical examination suggest pulmonary disease, then a chest radiograph should be obtained with shielding of the abdomen/pelvis.

Secondary imaging — In most cases, ultrasound examination provides sufficient information to guide a decision for exploratory surgery versus conservative, expectant management, but occasionally, further radiologic evaluation is required. MRI has excellent resolution for soft tissue pathology and does not expose the patient (or fetus) to ionizing radiation. Therefore, MRI is particularly useful in characterizing a pedunculated leiomyoma, red degeneration of leiomyomas, endometriomas, decidualized endometriomas, and massive ovarian edema and distinguishing these lesions from ovarian cancer [33,34]. Gadolinium-based contrast material should generally

be avoided in pregnancy because fetal safety has not been established. (See "Diagnostic imaging in pregnant and nursing women", section on 'Use of iodinated contrast materials'.)

Computed tomography (CT) is avoided in pregnant women if other imaging methods can provide the needed information. The fetal ionizing radiation dose for a single CT through the pelvis is 0.035 Gy. Although fetal radiation exposure of less than 0.05 Gy has not been associated with an increased risk of abortion, congenital anomalies, growth restriction, or perinatal mortality, there remain concerns regarding a possible increase in the risk of developing childhood cancer [35,36]. In addition, the use of iodinated contrast agents with CT carries a risk of transient suppression of the fetal thyroid. (See "Diagnostic imaging in pregnant and nursing women".)

Tumor markers in ovarian malignancy — Although serum tumor markers are routinely drawn preoperatively when planning a laparotomy for management of a pelvic mass in nonpregnant women, we do not suggest this approach during pregnancy. Pregnancy-associated pelvic masses are infrequently malignant, and the interpretation of these tumor markers varies with gestational age and comorbid conditions. If a malignancy is proven, then appropriate tumor markers may be drawn in the immediate postoperative period.

Several of the tumor markers used to follow epithelial and nonepithelial ovarian cancers in nonpregnant women (table 1) are difficult to interpret in pregnancy because oncofetal antigens (eg, alpha-fetoprotein [AFP], human chorionic gonadotropin [hCG], carcinoembryonic antigen [CEA], cancer antigen 125 [CA 125]) are involved in biological functions associated with fetal development, differentiation, and maturation. The levels are normally elevated during gestation and fluctuate with gestational age, or they may be abnormally elevated due to abnormal placentation or fetal abnormalities (eg, preeclampsia, Down syndrome, open neural tube defect) [13].

Serum CA 125 — Serum levels of CA 125 are elevated in most cases of epithelial ovarian cancer (EOC). CA 125 is also produced by normal tissues, including endometrium, and may be elevated during early gestation and immediately following delivery (table 2) [13]. However, CA 125 may be helpful as a tumor marker of EOC between 15 weeks of gestation and delivery, as serum values at this time are unlikely to be markedly elevated solely as a consequence of pregnancy. A CA 125 in the range of 1000 to 10,000 is likely (but not invariably) related to cancer, but values in the range of 75 to 150 could be either pregnancy-related or due to an ovarian cancer that does not demonstrate high expression of CA 125.

Alpha-fetoprotein — Maternal serum levels of AFP (MSAFP) normally rise during pregnancy; serum levels are routinely assayed as part of the screen for fetal neural tube defects and Down syndrome. High MSAFP levels are seen in some types of ovarian germ cell tumors (eg, endodermal sinus tumor, embryonal carcinoma, and mixed tumors). These levels are often >1000 ng/mL, especially with pure endodermal sinus (yolk sac) tumors, which can be associated with levels >10,000 ng/mL [37,38]. By comparison, MSAFP levels are typically <500 ng/mL in

pregnancies complicated by neural tube defects. (See "Ovarian germ cell tumors: Pathology, clinical manifestations, and diagnosis".)

During pregnancy, AFP results are typically expressed as multiples of the median (MoM) for each gestational week because these values are easy to derive, more stable, and allow for inter-laboratory variation. MSAFP levels that are above 2.0 to 2.5 MoMs are considered abnormal. The AFP levels associated with ovarian cancer typically translate into much higher MoM values than seen with neural tube defects. In one case report, a MSAFP of 26,300 ng/mL translated into a MoM value of 24 [39]; in another, a level of 477.8 int. unit/mL (370 ng/mL) translated into a MoM of 12.5 [40]. Some authors suggest that a MSAFP level above 9 MoM should prompt concern for germ cell tumors of either gonadal or nongonadal origin in the absence of fetal abdominal wall defects or anencephaly [39]. (See "Open neural tube defects: Risk factors, prenatal screening and diagnosis, and pregnancy management" and "Laboratory issues related to maternal serum screening for Down syndrome".)

Lactate dehydrogenase — Serum lactate dehydrogenase (LDH) is elevated in the serum of women with ovarian dysgerminomas and is a reliable marker for diagnosis and follow-up of these tumors in pregnant women [41]. LDH is not elevated in normal pregnancy, although elevations can occur in some pregnancy-related disorders such as preeclampsia and HELLP syndrome (Hemolysis, Elevated Liver function tests, Low Platelets) [42]. (See "Ovarian germ cell tumors: Pathology, clinical manifestations, and diagnosis", section on 'Dysgerminoma' and "Preeclampsia: Clinical features and diagnosis" and "HELLP syndrome".)

Inhibin A — Although serum inhibin A is a useful tumor marker for following the course of treatment for ovarian granulosa cell tumors in nonpregnant women, inhibin A is made in the developing placenta, and serum levels are elevated in early gestation [43,44]. This limits the value of inhibin A as a tumor marker during pregnancy. Like AFP, inhibin A levels may be measured as a component of screening for Down syndrome. Inhibin A concentrations are, on average, twofold higher in pregnancies complicated by Down syndrome than in unaffected pregnancies. (See "Sex cord-stromal tumors of the ovary: Granulosa-stromal cell tumors", section on 'Granulosa cell tumor' and "Laboratory issues related to maternal serum screening for Down syndrome".)

Human chorionic gonadotropin — The beta subunit of hCG is a useful marker for some germ cell neoplasms (particularly choriocarcinoma, (table 1)). However, it cannot be used as a tumor marker during pregnancy due to the large physiologic increase in this hormone. (See "Human chorionic gonadotropin: Testing in pregnancy and gestational trophoblastic disease and causes of low persistent levels".)

Human epididymis protein 4 (HE4) — Human epididymis protein 4 (HE4) is the product of the *WFDC 2* (HE4) gene that is overexpressed in ovarian cancer. Assessment of the HE4 level is approved for monitoring women with ovarian cancer for disease recurrence or progression, but not for screening. In a study of serum samples from 67 pregnant women without ovarian cancer,

median HE4 values were significantly lower in pregnant women than in healthy, nonpregnant, premenopausal women (30.5 versus 46.6 pmol/L) [45]. The 95th percentiles for HE4 in pregnant women in the first, second, and third trimesters were 49.6, 35.1, and 50.2 pmol/L, respectively. Levels were measured using an enzyme immunometric assay (EIA) assay kit from Fujirebio Diagnostics Inc. In another series, higher concentrations of HE4 were detected in pregnant versus nonpregnant serum, but were not statistically significant. The authors concluded that HE4 serum biomarkers are unaffected by pregnancy [46], and therefore may be helpful in the evaluation of pelvic masses in pregnancy.

SURGERY

Issues related to preparation of the pregnant patient for nonobstetric surgery and management of anesthesia in pregnant women are reviewed separately. (See "Management of the pregnant patient undergoing nonobstetric surgery".)

A meta-analysis of four studies (one was a randomized trial) evaluated laparoscopic and open surgery for adnexal masses during the second trimester of pregnancy in 240 patients [47]; the laparoscopic group had smaller ovarian cysts. Laparoscopy was associated with a longer operative duration but better surgical outcomes than the laparotomy group in the surgical management of adnexal masses during the second trimester of pregnancy. Based on this meta-analysis and a review of the literature, laparoscopy is an option in the surgical management of adnexal masses in the second trimester.

If a malignancy is suspected, a laparotomy should be performed. A Pfannenstiel incision should be avoided, as it would not provide sufficient exposure. The vertical midline incision should be adequate to minimize the need to manipulate the gravid uterus while obtaining exposure to the adnexal mass.

Immediately after entry into the peritoneal cavity, peritoneal washings should be obtained for staging purposes in case the mass is malignant. The opposite adnexa should be carefully inspected and palpated for a contralateral adnexal mass. Contralateral ovarian biopsy is recommended if the ovary appears to be involved, but routine biopsy or wedge resection of a normal-appearing contralateral ovary is unwarranted.

The most common findings at surgery are persistent corpus luteal functional cysts, benign dermoid cysts, and serous or mucinous cystadenomas. If the preoperative imaging and intraoperative gross findings are both consistent with a benign diagnosis, it is reasonable to attempt a cystectomy rather than perform a salpingo-oophorectomy. If the mass is larger than 10 cm, it may not be technically feasible to perform an ovarian cystectomy. If the mass is solid, has surface excrescences, is associated with ascites, or has other features suggesting malignancy, then ipsilateral salpingo-oophorectomy is appropriate. The mass should be sent for frozen section

and the pathologist informed of the concurrent pregnancy. Resection of the contralateral ovary should not be performed unless bilateral disease is identified; this decision must await the frozen section analysis. All suspicious lesions should be biopsied.

If the pathologist confirms a malignant tumor at frozen section, the surgeon should be prepared to complete an adequate surgical staging procedure, and a gynecologic oncologist should be consulted. The general principles of the staging procedure for a malignant ovarian tumor are described in the table (table 3) and in detail separately. Obviously, hysterectomy is not performed if preservation of the pregnancy is desired, and the surgeon must individualize each case, weighing the pros and cons of staging versus potential risk to the mother and fetus. In certain malignant germ cell tumors of the ovary (eg, endodermal sinus tumors), lymph node dissection may be omitted, as the patient will require chemotherapy based on the histopathology alone. (See "Cancer of the ovary, fallopian tube, and peritoneum: Staging and surgical management".)

Adequate surgical staging is of particular importance for stage I cancers (ie, those that are limited to the ovary (table 4)), as many, but not all, of these neoplasms are adequately treated with surgery alone. In such cases, the need for postoperative adjuvant chemotherapy is determined by the histologic tumor type. Surgical staging (eg, sampling of lymph nodes) is less critical in the setting of obvious advanced disease (eg, stage IIIB/C disease), as these tumors (with the exception of tumors of low malignant potential) will require chemotherapy. (See "Chemotherapy of ovarian cancer in pregnancy" and "Treatment of malignant germ cell tumors of the ovary" and "Sex cord-stromal tumors of the ovary: Granulosa-stromal cell tumors".)

If a metastatic ovarian cancer is identified, cytoreduction should be attempted. The extent of surgical cytoreduction involves individual judgment, balancing the extent of surgery with the expected benefit. It is rare that removal of the gravid uterus is required for maximal cytoreductive surgery at the initial surgery because it is possible, if necessary, to return for secondary cytoreduction following chemotherapy and successful completion of the pregnancy. This management strategy is not thought to adversely impact survival, although as a general rule, survival is poor for women who have late-stage disease.

Despite the importance of early surgical debulking to outcomes in ovarian cancer, the surgeon should keep in mind the sensitivity of these tumors to platinum-based chemotherapy when aggressive resection of metastatic disease is considered. With modern platinum-based adjuvant chemotherapy, approximately 70 percent of patients who present with advanced disease will respond to chemotherapy, even if they have residual disease remaining after cytoreductive surgery.

The hazard of overly aggressive surgery and delay in starting chemotherapy can be illustrated by a case report of a patient with a yolk sac tumor that was resected at 19 weeks of gestation [48]. Chemotherapy was delayed because of the pregnancy and at 32 weeks of gestation, tumor recurrence necessitated a cesarean-hysterectomy and bowel resection with colostomy. Three

weeks later, the colostomy was taken down and another suprahepatic tumor mass was resected. The patient was then given bleomycin, etoposide, and cisplatin (BEP) for four cycles, but the course was complicated by a fecal fistula that developed at the colostomy site. (See "Chemotherapy of ovarian cancer in pregnancy".)

For women with advanced-stage ovarian cancer diagnosed before delivery, hysterectomy and secondary cytoreductive surgery are reasonable postpartum to remove persistent disease. This surgery can be performed following vaginal delivery or in conjunction with cesarean delivery. This approach has been taken by a few investigators who reported managing advanced epithelial ovarian cancer (EOC) cases during pregnancy [49-52]. In four case reports, two patients had persistent disease involving the adnexa [49,50], two cases involved the bowel [50,51], and one case also involved the pelvic peritoneum, omentum, and appendix [50].

Management of corpus luteum — Removal of the corpus luteum should be avoided prior to eight weeks of gestation because the corpus luteum is primarily responsible for progesterone production and maintenance of the pregnancy at this time [53]. If the corpus luteum is removed prior to eight weeks, progesterone supplementation should be given as a 50 to 100 mg vaginal suppository every 8 to 12 hours or as a daily intramuscular injection of 1 mL (50 mg) progesterone in oil. After eight weeks, the ovary gradually shifts progesterone production to the placenta (called the luteal-placental shift) [54]. As of 10 weeks of gestation, the placenta is the primary provider of progesterone, so progesterone supplementation is no longer indicated. (See "Management of the pregnant patient undergoing nonobstetric surgery".)

Adnexal mass at cesarean delivery — At cesarean delivery, any adnexal mass that appears suspicious for malignancy should be removed and sent for frozen section. Complete surgical removal is preferred to aspiration and cytologic evaluation of cystic fluid, since malignancy could be missed with the latter. If the mass is an incidental finding at cesarean delivery, the patient typically will not have an appropriate incision for surgical staging. In these cases, if frozen section indicates malignancy, salpingo-oophorectomy is performed and postpartum, the patient is referred to a gynecologic oncologist for counseling, staging, and possible hysterectomy within the next one to two weeks.

If an adnexal mass suspicious for malignancy is detected antepartum, the patient should be counseled and consented appropriately. Cesarean delivery should be performed through a midline incision, and a gynecologic oncologist should be available, if required. After delivery of the infant and placenta and control of bleeding, the adnexal mass is resected and sent for frozen section. If positive for malignancy, full surgical staging can be performed. (See "Cancer of the ovary, fallopian tube, and peritoneum: Staging and surgical management".)

CHEMOTHERAPY

(See "Chemotherapy of ovarian cancer in pregnancy".)

PROGNOSIS

There is no evidence that pregnancy worsens the prognosis of ovarian tumors compared with nonpregnant patients matched for tumor histology, stage, and grade [55]. Approximately 75 percent of invasive ovarian malignancies in pregnant women are early-stage disease. Due to the favorable mix of stage, grade, and histology, the five-year survival rate for ovarian tumors associated with pregnancy is between 72 and 90 percent. The presence of ascites at diagnosis implies advanced disease and poor prognosis [56]. Although one cohort study found that postpartum lactating women diagnosed with ovarian cancer had a poorer prognosis than women diagnosed before or during pregnancy, the number of cases was small [57]. This finding needs to be confirmed in larger studies.

The decision to continue or terminate a pregnancy when ovarian cancer is diagnosed in the first trimester should be individualized and made by a fully informed woman in collaboration with her clinician. Early termination of pregnancy does not improve the outcome of ovarian cancer. In addition to the usual reasons for pregnancy termination, some factors that should be considered in women with ovarian cancer include:

- Whether she is willing to assume a possible risk of fetal toxicity or complications from ovarian cancer treatment during pregnancy.
- Her prognosis and ability to care for her offspring.
- The effect of ovarian cancer treatment on future fertility.

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Ovarian and fallopian tubal disease".)

SUMMARY AND RECOMMENDATIONS

- Approximately 0.2 to 2 percent of pregnancies are complicated by an adnexal mass, and approximately 1 to 6 percent of these masses are malignant. (See 'Prevalence' above.)
- The vast majority of adnexal masses in pregnant women are benign and asymptomatic and are discovered incidentally either on obstetrical ultrasound examination or at cesarean delivery. Symptoms and signs of ovarian cancer include abdominal or back pain, constipation,

abdominal swelling, and urinary symptoms, which are also almost universally present during normal pregnancies. (See 'Patient presentation' above.)

- An unexplained elevation in some maternal serum analytes (alpha-fetoprotein [AFP], inhibin A), obtained during screening for neural tube defects or Down syndrome, can be a sign of an ovarian germ cell tumor. (See 'Patient presentation' above and 'Tumor markers in ovarian malignancy' above.)

- Most adnexal masses identified in pregnant women are benign simple cysts less than 5 cm in diameter. Most of these are functional ovarian cysts, either follicular or corpus luteum cysts, that occur as part of the normal physiological function of the ovary. Approximately 70 percent of all adnexal cystic masses detected in the first trimester spontaneously resolve by the early part of the second trimester, which is consistent with the natural history of functional cysts. The majority of persistent adnexal masses 5 cm or greater in diameter are dermoids. Up to 10 percent of adnexal masses that persist during pregnancy are malignant. (See 'Types of adnexal masses in pregnant women' above.)

- Epithelial ovarian tumors comprise approximately one-half of all ovarian malignancies in pregnant women; germ cell ovarian malignancies make up approximately one-third. (See 'Malignant neoplasms' above.)

- Definitive diagnosis can only be made by resecting the ovarian neoplasm for pathologic examination. However, some benign ovarian masses, including follicular or corpus luteal cysts, endometriomas, and mature teratomas (dermoid), have characteristic sonographic features and the diagnosis is reasonably certain without surgical exploration. (See 'Diagnosis' above.)

- Pregnancy-associated ovarian tumors should be evaluated by a pathologist skilled in reading the pathologic findings in the context of the ongoing pregnancy, and the pathologist should be informed of the coexistent pregnancy. (See 'Diagnosis' above.)

- We suggest surgical resection rather than expectant management of asymptomatic masses present after the first trimester that are (1) >10 cm in diameter (**Grade 2C**) or (2) solid or containing solid and cystic areas or papillary areas or septae (**Grade 2B**). These findings increase the likelihood of malignancy, and it is desirable to diagnose malignancy, if present, at an early stage. In addition, resection of large adnexal masses reduces the risk of complications such as adnexal torsion, rupture, or obstruction of labor. However, we suggest expectant management of asymptomatic corpus luteal cysts, endometriomas, and mature teratomas (dermoid) during pregnancy if the diagnosis is reasonably certain based on the sonographic characteristics (**Grade 2C**). (See 'Patient selection for surgery' above.)

- In most cases, the preoperative staging workup for a pregnant woman with a pelvic mass can be limited to ultrasound imaging. (See 'Preoperative assessment' above.)

- If the preoperative imaging and intraoperative gross findings are both consistent with a benign diagnosis, we suggest cystectomy rather than salpingo-oophorectomy (**Grade 2C**). If the mass is larger than 10 cm, it may not be technically feasible to perform an ovarian cystectomy. If the mass is solid, has surface excrescences, is associated with ascites, or has other features suggesting malignancy, then ipsilateral salpingo-oophorectomy is appropriate. The mass should be sent for frozen section. Resection of the contralateral ovary should not be performed unless bilateral disease is identified. All suspicious lesions should be biopsied. (See 'Surgery' above.)

- Adequate surgical staging is important for stage I cancers, as many of these neoplasms are adequately treated with surgery alone. The need for postoperative adjuvant chemotherapy is determined by the histologic tumor type. Surgical staging (eg, sampling of lymph nodes) is less critical in advanced disease (eg, stage IIIB/C disease), as these tumors (with the exception of tumors of low malignant potential) will require chemotherapy. If a metastatic ovarian cancer is identified, the extent of surgical cytoreduction involves individual judgment, balancing the extent of surgery with the expected benefit. Before delivery, we leave as much of the reproductive tract in situ as possible, as women with advanced-stage epithelial ovarian cancer can undergo completion of debulking of the reproductive organs following delivery. (See 'Surgery' above.)

- Removal of the corpus luteum prior to eight weeks of gestation requires postoperative progesterone supplementation. (See 'Management of corpus luteum' above.)

REFERENCES

1. Schmeler KM, Mayo-Smith WW, Peipert JF, et al. Adnexal masses in pregnancy: surgery compared with observation. Obstet Gynecol 2005; 105:1098.

2. Smith LH, Dalrymple JL, Leiserowitz GS, et al. Obstetrical deliveries associated with maternal malignancy in California, 1992 through 1997. Am J Obstet Gynecol 2001; 184:1504.

3. Webb KE, Sakhel K, Chauhan SP, Abuhamad AZ. Adnexal mass during pregnancy: a review. Am J Perinatol 2015; 32:1010.

4. Aggarwal P, Kehoe S. Ovarian tumours in pregnancy: a literature review. Eur J Obstet Gynecol Reprod Biol 2011; 155:119.

5. Palmer J, Vatish M, Tidy J. Epithelial ovarian cancer in pregnancy: a review of the literature. BJOG 2009; 116:480.

6. Shim MH, Mok CW, Chang KH, et al. Clinical characteristics and outcome of cancer diagnosed during pregnancy. Obstet Gynecol Sci 2016; 59:1.

7. Giuntoli RL 2nd, Vang RS, Bristow RE. Evaluation and management of adnexal masses during pregnancy. Clin Obstet Gynecol 2006; 49:492.

8. Machado F, Vegas C, Leon J, et al. Ovarian cancer during pregnancy: analysis of 15 cases. Gynecol Oncol 2007; 105:446.

9. Baser E, Erkilinc S, Esin S, et al. Adnexal masses encountered during cesarean delivery. Int J Gynaecol Obstet 2013; 123:124.

10. Goff BA, Mandel LS, Melancon CH, Muntz HG. Frequency of symptoms of ovarian cancer in women presenting to primary care clinics. JAMA 2004; 291:2705.

11. Goff BA, Mandel LS, Drescher CW, et al. Development of an ovarian cancer symptom index: possibilities for earlier detection. Cancer 2007; 109:221.

12. Yen CF, Lin SL, Murk W, et al. Risk analysis of torsion and malignancy for adnexal masses during pregnancy. Fertil Steril 2009; 91:1895.

13. Sarandakou A, Protonotariou E, Rizos D. Tumor markers in biological fluids associated with pregnancy. Crit Rev Clin Lab Sci 2007; 44:151.

14. Chiang G, Levine D. Imaging of adnexal masses in pregnancy. J Ultrasound Med 2004; 23:805.

15. Bakri YN, Ezzat A, Akhtar, et al. Malignant germ cell tumors of the ovary. Pregnancy considerations. Eur J Obstet Gynecol Reprod Biol 2000; 90:87.

16. Kumar S, Shah JP, Bryant CS, et al. The prevalence and prognostic impact of lymph node metastasis in malignant germ cell tumors of the ovary. Gynecol Oncol 2008; 110:125.

17. Young RH, Dudley AG, Scully RE. Granulosa cell, Sertoli-Leydig cell, and unclassified sex cord-stromal tumors associated with pregnancy: a clinicopathological analysis of thirty-six cases. Gynecol Oncol 1984; 18:181.

18. Mooney J, Silva E, Tornos C, Gershenson D. Unusual features of serous neoplasms of low malignant potential during pregnancy. Gynecol Oncol 1997; 65:30.

19. Wang PH, Chao HT, Yuan CC, et al. Ovarian tumors complicating pregnancy. Emergency and elective surgery. J Reprod Med 1999; 44:279.

20. Lee GS, Hur SY, Shin JC, et al. Elective vs. conservative management of ovarian tumors in pregnancy. Int J Gynaecol Obstet 2004; 85:250.

21. Leiserowitz GS. Managing ovarian masses during pregnancy. Obstet Gynecol Surv 2006; 61:463.

22. Bernhard LM, Klebba PK, Gray DL, Mutch DG. Predictors of persistence of adnexal masses in pregnancy. Obstet Gynecol 1999; 93:585.

23. Whitecar MP, Turner S, Higby MK. Adnexal masses in pregnancy: a review of 130 cases undergoing surgical management. Am J Obstet Gynecol 1999; 181:19.

24. Yakasai IA, Bappa LA. Diagnosis and management of adnexal masses in pregnancy. J Surg Tech Case Rep 2012; 4:79.

25. American College of Obstetricians and Gynecologists. ACOG Practice Bulletin. Management of adnexal masses. Obstet Gynecol 2007; 110:201.

26. Hoffman MS, Sayer RA. Adnexal masses in pregnancy. OBG Management 2007; 19:27.

27. Zanetta G, Mariani E, Lissoni A, et al. A prospective study of the role of ultrasound in the management of adnexal masses in pregnancy. BJOG 2003; 110:578.

28. Sherard GB 3rd, Hodson CA, Williams HJ, et al. Adnexal masses and pregnancy: a 12-year experience. Am J Obstet Gynecol 2003; 189:358.

29. Agarwal N, Parul, Kriplani A, et al. Management and outcome of pregnancies complicated with adnexal masses. Arch Gynecol Obstet 2003; 267:148.

30. Caspi B, Levi R, Appelman Z, et al. Conservative management of ovarian cystic teratoma during pregnancy and labor. Am J Obstet Gynecol 2000; 182:503.

31. Perera DS, Prabhakar HB. Imaging of the adnexal mass. Clin Obstet Gynecol 2015; 58:28.

32. Hoffman MS. Primary ovarian carcinoma during pregnancy. Clin Consul Obstet Gynecol 1995; 7:237.

33. Thomassin-Naggara I, Fedida B, Sadowski E, et al. Complex US adnexal masses during pregnancy: Is pelvic MR imaging accurate for characterization? Eur J Radiol 2017; 93:200.

34. Telischak NA, Yeh BM, Joe BN, et al. MRI of adnexal masses in pregnancy. AJR Am J Roentgenol 2008; 191:364.

35. ACOG Committee on Obstetric Practice. ACOG Committee Opinion. Number 299, September 2004 (replaces No. 158, September 1995). Guidelines for diagnostic imaging during pregnancy. Obstet Gynecol 2004; 104:647.

36. Harvey EB, Boice JD Jr, Honeyman M, Flannery JT. Prenatal x-ray exposure and childhood cancer in twins. N Engl J Med 1985; 312:541.

37. Frederiksen MC, Casanova L, Schink JC. An elevated maternal serum alpha-fetoprotein leading to the diagnosis of an immature teratoma. Int J Gynaecol Obstet 1991; 35:343.

38. Nawa A, Obata N, Kikkawa F, et al. Prognostic factors of patients with yolk sac tumors of the ovary. Am J Obstet Gynecol 2001; 184:1182.

39. Elit L, Bocking A, Kenyon C, Natale R. An endodermal sinus tumor diagnosed in pregnancy: case report and review of the literature. Gynecol Oncol 1999; 72:123.

40. Horbelt D, Delmore J, Meisel R, et al. Mixed germ cell malignancy of the ovary concurrent with pregnancy. Obstet Gynecol 1994; 84:662.

41. Buller RE, Darrow V, Manetta A, et al. Conservative surgical management of dysgerminoma concomitant with pregnancy. Obstet Gynecol 1992; 79:887.

42. Demir SC, Evruke C, Ozgunen FT, et al. Factors that influence morbidity and mortality in severe preeclampsia, eclampsia and hemolysis, elevated liver enzymes, and low platelet count syndrome. Saudi Med J 2006; 27:1015.

43. Schumer ST, Cannistra SA. Granulosa cell tumor of the ovary. J Clin Oncol 2003; 21:1180.

44. Luisi S, Florio P, Reis FM, Petraglia F. Inhibins in female and male reproductive physiology: role in gametogenesis, conception, implantation and early pregnancy. Hum Reprod Update 2005; 11:123.

45. Moore RG, Miller MC, Eklund EE, et al. Serum levels of the ovarian cancer biomarker HE4 are decreased in pregnancy and increase with age. Am J Obstet Gynecol 2012; 206:349.e1.

46. Gucer F, Kiran G, Canaz E, et al. Serum human epididymis protein 4 can be a useful tumor marker in the differential diagnosis of adnexal masses during pregnancy: a pilot study. Eur J Gynaecol Oncol 2015; 36:406.

47. Liu YX, Zhang Y, Huang JF, Wang L. Meta-analysis comparing the safety of laparoscopic and open surgical approaches for suspected adnexal mass during the second trimester. Int J Gynaecol Obstet 2017; 136:272.

48. Rajendran S, Hollingworth J, Scudamore I. Endodermal sinus tumour of the ovary in pregnancy. Eur J Gynaecol Oncol 1999; 20:272.

49. Méndez LE, Mueller A, Salom E, González-Quintero VH. Paclitaxel and carboplatin chemotherapy administered during pregnancy for advanced epithelial ovarian cancer. Obstet

Gynecol 2003; 102:1200.

50. Picone O, Lhommé C, Tournaire M, et al. Preservation of pregnancy in a patient with a stage IIIB ovarian epithelial carcinoma diagnosed at 22 weeks of gestation and treated with initial chemotherapy: case report and literature review. Gynecol Oncol 2004; 94:600.

51. Sood AK, Shahin MS, Sorosky JI. Paclitaxel and platinum chemotherapy for ovarian carcinoma during pregnancy. Gynecol Oncol 2001; 83:599.

52. Ferrandina G, Distefano M, Testa A, et al. Management of an advanced ovarian cancer at 15 weeks of gestation: case report and literature review. Gynecol Oncol 2005; 97:693.

53. Csapo AI, Pulkkinen MO, Ruttner B, et al. The significance of the human corpus luteum in pregnancy maintenance. I. Preliminary studies. Am J Obstet Gynecol 1972; 112:1061.

54. Csapo AI, Pulkkinen MO, Wiest WG. Effects of luteectomy and progesterone replacement therapy in early pregnant patients. Am J Obstet Gynecol 1973; 115:759.

55. Grimm D, Woelber L, Trillsch F, et al. Clinical management of epithelial ovarian cancer during pregnancy. Eur J Cancer 2014; 50:963.

56. Zhao XY, Huang HF, Lian LJ, Lang JH. Ovarian cancer in pregnancy: a clinicopathologic analysis of 22 cases and review of the literature. Int J Gynecol Cancer 2006; 16:8.

57. Stensheim H, Møller B, van Dijk T, Fosså SD. Cause-specific survival for women diagnosed with cancer during pregnancy or lactation: a registry-based cohort study. J Clin Oncol 2009; 27:45.

Topic 3201 Version 16.0

GRAPHICS

Markers secreted by germ cell and sex cord-stromal tumors of the ovary

	AFP	hCG	LDH	E2	Inhibin	Testost	Andro	DHEA	AMH
Germ cell tumors									
Dysgerminoma	–*	±¶	+	±	–	–	–	–	–
Embryonal	±	+	±	±	–	–	–	–	–
Immature teratoma	±	–	±	±	–	–	–	±	–
Choriocarcinoma	–	+	±	–	–	–	–	–	–
Yolk sac tumor (endodermal sinus tumor)	+	–	+	–	–	–	–	–	–
Gonadoblastoma Δ	–	–	–	±	±	±	±	±	–
Polyembryona	±	+	–	–	–	–	–	–	–
Mixed germ cell	±	±	±	–	–	–	–	–	–
Sex cord-stromal tumors									
Thecoma-fibroma	–	–	–	–	–	–	–	–	–
Granulosa cell	–	–	–	±	+	±	–	–	+
Sertoli-Leydig	±	–	–	±	±	±	±	±	–

AFP: alpha-fetoprotein; hCG: human chorionic gonadotropin; LDH: lactate dehydrogenase; E2: estradiol; testost: testosterone; andro: androstenedione; DHEA: dehydroepiandrostenedione; AMH: anti-Müllerian hormone.

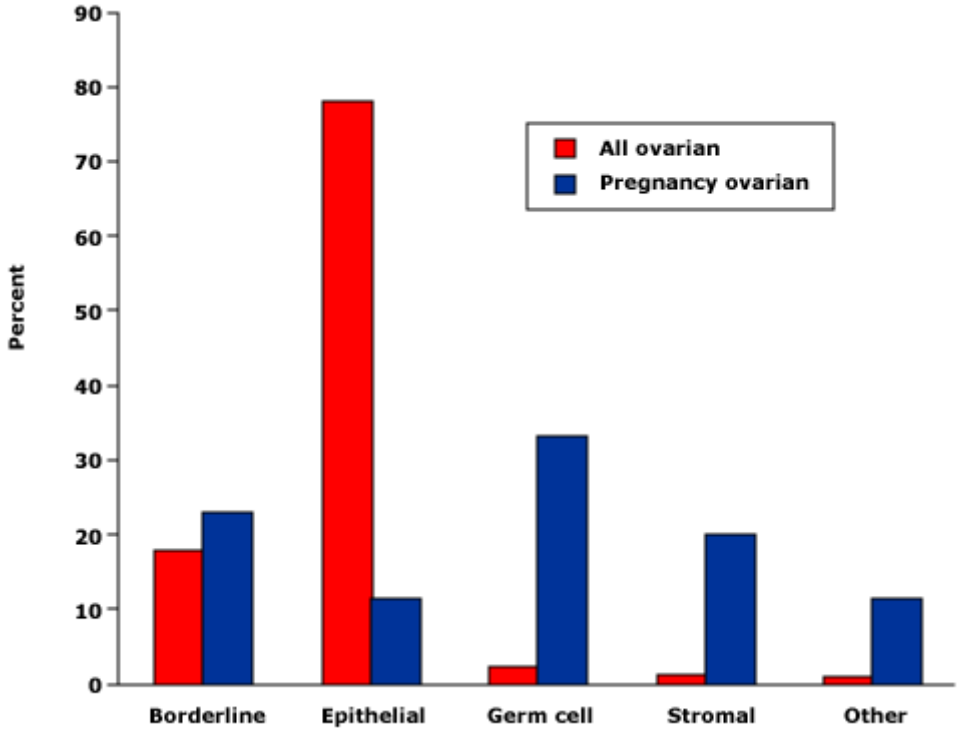
* Borderline elevations in case reports (<16 ng/mL).

¶ Low level seen in dysgerminomas with either nondysgerminomatous elements of syncytiotrophoblastic cells.

Δ Type of germ cell sex cord-stromal tumor consisting of neoplastic germ cells and sex cord-stromal derivatives.

Graphic 55817 Version 10.0

Proportion of histologic types of ovarian cancers among all patients compared with proportions in pregnant women



Graphic 57398 Version 2.0

Conditions associated with an elevated serum CA 125 concentration

Gynecologic malignancies
Epithelial ovarian, fallopian tube, and primary peritoneal cancers
Endometrial cancer
Benign gynecologic conditions
Benign ovarian neoplasms
Functional ovarian cysts
Endometriosis
Meig syndrome
Adenomyosis
Uterine leiomyomas
Pelvic inflammatory disease
Ovarian hyperstimulation
Pregnancy
Menstruation

Nongynecologic conditions
Cirrhosis and other liver disease
Ascites
Colitis
Diverticulitis
Appendicular abscess
Tuberculosis peritonitis
Pancreatitis
Pleural effusion
Pulmonary embolism
Pneumonia
Cystic fibrosis
Heart failure
Myocardiopathy
Myocardial infarction
Pericardial disease
Renal insufficiency
Urinary tract infection
Recent surgery
Systemic lupus erythematosus
Sarcoidosis
Nongynecologic cancers
Breast
Colon
Liver
Gallbladder
Pancreas
Lung
Hematologic malignancies

CA: cancer antigen.

Data from:

1. *Buamah P. Benign conditions associated with raised serum CA-125 concentration. J Surg Oncol 2000; 75:264.*
2. *Miralles C, Orea M, Espana P, et. al. Cancer antigen 125 associated with multiple benign and malignant pathologies. Ann Surg Oncol 2003; 10:150.*
3. *Moss EL, Hollingworth J, Reynolds TM. The role of CA125 in clinical practice. J Clin Pathol 2005; 58:308.*

Graphic 81621 Version 7.0

Steps in staging ovarian cancer

1. Obtain any free fluid for cytologic evaluation.
2. If no free fluid is present, obtain washings by instilling saline and recovering the fluid. The fluid should irrigate the cul-de-sac, paracolic gutters, and area beneath each diaphragm.
3. Systematically explore all intra-abdominal organs and surfaces: Bowel, liver, gallbladder, diaphragms, mesentery, omentum, and the entire peritoneum should be visualized and palpated, as indicated.
4. Suspicious areas or adhesions should be biopsied. If there are no suspicious areas, multiple biopsies should be obtained from the peritoneum of the cul-de-sac, paracolic gutters, bladder, and intestinal mesentery when the disease appears confined to the ovary. These biopsies are not needed if the patient has advanced disease.
5. The diaphragm should be biopsied or scraped for cytology. A laparoscope and biopsy instrument may be used.
6. The omentum should be resected from the transverse colon.
7. The retroperitoneum should be explored to evaluate pelvic nodes. Suspicious nodes should be removed and sent for frozen section examination.
8. The paraaortic nodes should be exposed and enlarged nodes removed. Nodes superior to the inferior mesenteric artery should also be resected.
9. In the absence of suspicious nodes, pelvic and paraaortic nodes should still be sampled to exclude the possibility of microscopic stage III disease.
10. A total abdominal hysterectomy and bilateral salpingo-oophorectomy is performed. (Fertility-conserving surgery may be an option for some women.)

Graphic 75194 Version 5.0

Ovary, fallopian tube, and primary peritoneal carcinoma TNM staging AJCC UICC 8th edition

Primary tumor (T)		
T category	**FIGO stage**	**T criteria**
TX		Primary tumor cannot be assessed
T0		No evidence of primary tumor
T1	I	Tumor limited to ovaries (one or both) or fallopian tube(s)
T1a	IA	Tumor limited to one ovary (capsule intact) or fallopian tube, no tumor on ovarian or fallopian tube surface; no malignant cells in ascites or peritoneal washings
T1b	IB	Tumor limited to both ovaries (capsules intact) or fallopian tubes; no tumor on ovarian or fallopian tube surface; no malignant cells in ascites or peritoneal washings
T1c	IC	Tumor limited to one or both ovaries or fallopian tubes, with any of the following:
T1c1	IC1	▪ Surgical spill
T1c2	IC2	▪ Capsule ruptured before surgery or tumor on ovarian or fallopian tube surface
T1c3	IC3	▪ Malignant cells in ascites or peritoneal washings
T2	II	Tumor involves one or both ovaries or fallopian tubes with pelvic extension below pelvic brim or primary peritoneal cancer
T2a	IIA	Extension and/or implants on the uterus and/or fallopian tube(s) and/or ovaries
T2b	IIB	Extension to and/or implants on other pelvic tissues
T3	III	Tumor involves one or both ovaries or fallopian tubes, or primary peritoneal cancer, with microscopically confirmed peritoneal metastasis outside the pelvis and/or metastasis to the retroperitoneal (pelvic and/or para-aortic) lymph nodes
T3a	IIIA2	Microscopic extrapelvic (above the pelvic brim) peritoneal involvement with or without positive retroperitoneal lymph nodes
T3b	IIIB	Macroscopic peritoneal metastasis beyond pelvis 2 cm or less in greatest dimension with or without metastasis to the retroperitoneal lymph nodes
T3c	IIIC	Macroscopic peritoneal metastasis beyond the pelvis more than 2 cm in greatest dimension with or without metastasis to the retroperitoneal lymph nodes (includes extension of tumor to capsule of liver and spleen without parenchymal involvement of either organ)

Regional lymph nodes (N)

N category	FIGO stage	N criteria
NX		Regional lymph nodes cannot be assessed
N0		No regional lymph node metastasis
N0(i+)		Isolated tumor cells in regional lymph node(s) no greater than 0.2 mm
N1	IIIA1	Positive retroperitoneal lymph nodes only (histologically confirmed)
N1a	IIIA1i	Metastasis up to and including 10 mm in greatest dimension
N1b	IIIA1ii	Metastasis more than 10 mm in greatest dimension

Distant metastasis (M)

M category	FIGO stage	M criteria
M0		No distant metastasis
M1	IV	Distant metastasis, including pleural effusion with positive cytology; liver or splenic parenchymal metastasis; metastasis to extra-abdominal organs (including inguinal lymph nodes and lymph nodes outside the abdominal cavity); and transmural involvement of intestine
M1a	IVA	Pleural effusion with positive cytology
M1b	IVB	Liver or splenic parenchymal metastases; metastases to extra-abdominal organs (including inguinal lymph nodes and lymph nodes outside the abdominal cavity); transmural involvement of intestine

Prognostic stage groups

When T is...	And N is...	And M is...	Then the stage group is...
T1	N0	M0	I
T1a	N0	M0	IA
T1b	N0	M0	IB
T1c	N0	M0	IC
T2	N0	M0	II
T2a	N0	M0	IIA
T2b	N0	M0	IIB
T1/T2	N1	M0	IIIA1
T3a	NX, N0, N1	M0	IIIA2
T3b	NX, N0, N1	M0	IIIB
T3c	NX, N0, N1	M0	IIIC
Any T	Any N	M1	IV
Any T	Any N	M1a	IVA
Any T	Any N	M1b	IVB

TNM: tumor, node, metastasis; AJCC: American Joint Committee on Cancer; UICC: Union for International Cancer Control.

Graphic 113545 Version 4.0

Contributor Disclosures

Carolyn D Runowicz, MD Nothing to disclose **Molly Brewer, DVM, MD, MS** Nothing to disclose **Barbara Goff, MD** Employment (Spouse): Lilly [General oncology (Gemcitabine, pemetrexed)] - No relevant conflict on topics. **Sandy J Falk, MD, FACOG** Nothing to disclose

Contributor disclosures are reviewed for conflicts of interest by the editorial group. When found, these are addressed by vetting through a multi-level review process, and through requirements for references to be provided to support the content. Appropriately referenced content is required of all authors and must conform to UpToDate standards of evidence.

Conflict of interest policy