Ovarian Pathology

Physiologic cysts: Functional cysts

Pathology: A simple cyst is a sac containing fluid or semi-solid material. Physiologic cysts are generic types of hormonally active cysts that result from the stimulation of the ovary by hormones. They present as the most common type of ovarian enlargement on young women. The general appearance of a functional cyst may change over the course of the menstrual cycle.

Clinical considerations:
- Most cysts are small and clinically unimportant; however, each cyst potentially represents an early manifestation of a benign or malignant neoplasm.
- Simple cysts in the pre-menopausal woman are common; however, clinical follow up is necessary to rule out malignant changes.
- Simple, functional cysts measuring <3cm are considered normal and usually spontaneously resolve over the course of one or two menstrual cycles. Persistence of a cyst for more than 60 days in a patient with normal menstrual cycles is probably NOT a functional cyst and must be considered neoplastic.
- Any ovarian cystic mass measuring >3cm should be re-evaluated sonographically 6-8 weeks later. Persistence, enlargement or change in appearance of the lesion is usually an indication for further work-up and treatment such as laparoscopy or surgical excision.

Clinical signs and symptoms:
- Frequently asymptomatic
- Presence of a palpable adnexal mass
- Usually unilateral
- Bleeding into cyst may produce acute pelvic pain.

Sonographic appearance: Simple ovarian cysts exhibit classic sonographic cystic findings:
- Anechoic lumen
- Smooth borders
- Posterior acoustic enhancement

Types of physiologic cysts

* Follicular cyst: Occur when the dominant follicle fails to rupture or when the fluid in an incompletely developed follicle fails to be reabsorbed. They are typically larger than normal follicles and measure ≈3-8cm. Simple
Cystic structures in the ovary measuring <3cm are consistent with normal follicles.

**Clinical signs and symptoms:**
- Typically asymptomatic
- Large cysts may cause pelvic pain, dyspareunia and, occasionally vaginal bleeding.
- Differential diagnoses include: salpingitis, endometriosis, neoplastic cysts.

**Corpus luteum cyst**: Functional, non-neoplastic enlargement of the ovary caused by failure of the dominant follicle to extrude the ovum with the subsequent accumulation of blood in the central lumen of the follicle. Resorption of the blood and the persistence of serous fluid within the follicle results in a corpus luteum cyst.

**Clinical considerations:**
- Persistent corpus luteum cyst may cause local pain and tenderness, amenorrhea and/or delayed menstruation.
- If symptoms are present, diagnostic studies are indicated to rule out ectopic pregnancy.
- Hemorrhage into a corpus luteum cyst is common and complicates the sonographic evaluation.
- Corpora lutea are not considered to be corpus luteum cysts until they reach at least 3cm in size.

**Corpus luteum cyst of pregnancy**: Normal, cystic enlargement of the ruptured follicle in the presence of hCG. The corpus luteum is necessary for the production of progesterone and maintenance of the endometrium in normal pregnancy. The corpus luteum typically regresses by the 12th week of gestation.

**Theca lutein cyst**: Caused by cystic enlargement of atretic follicles, theca lutein cysts are typically found in association with conditions that hyperstimulate ovarian follicles.

**Clinical considerations**: Medical conditions associated with theca lutein cysts include:
- Choriocarcinoma
- Polycystic ovarian disease (PCO)
- Gestational trophoblastic disease
- Hyperstimulated ovaries inpatients on infertility drugs
**Sonographic appearance:**
- Large, multilocular, septated cystic mass in adnexa
- Bilateral
- Always check uterus for presence of trophoblastic disease or pregnancy

**Hemorrhagic cysts**
**Pathology:** Bleeding into the lumen of an ovarian cyst may occur spontaneously or may be the result of torsion that causes disruption of normal hemodynamic patterns. When this occurs, the sonographic appearance of the lesion become complex and diagnosis of a simple cyst is precluded.

**Clinical signs and symptoms**
- Sudden onset of pelvic pain
- Palpable adnexal mass

**Sonographic findings:**
- Typical cystic appearance as described
- Acute hemorrhagic cyst: hyperechoic mimicking a solid mass but with good posterior acoustic enhancement
- Subacute hemorrhagic cyst: complex appearance with internal echoes, strands and rarely a fluid-fluid level.

Hemorrhagic corpus luteum cyst in an ovary containing a smaller, normal follicle.

Large hemorrhagic cyst with a complex appearing mural thrombus.
Ovarian Neoplasia

Teratomas

**Incidene**: Cystic teratomas are the most common benign tumor of the ovary and usually occur in women aged 20 - 30. These masses are also frequently referred to as *dermoids* but a distinction between dermoids and teratomas exists. Dermoids are always benign, *teratomas* maintain a malignant potential. Histologically, benign cystic teratomas contain tissue from all three embryonic germ layers. As these tissues mature they may form teeth, hair and glandular tissue. Many teratomas are located superior to the fundus of the uterus rendering them impervious to sonographic diagnosis. Frequently these lesions are bilateral.

**Clinical Findings**:
- Pelvic pain
- Palpable adnexal mass

**Sonographic Findings**: A wide range of sonographic appearances exist including:
- An apparently simple cystic adnexal mass
- Complex cystic adnexal mass
- Calcifications present within an adnexal mass
- Fat/fluid level present in an adnexal mass
- Presence of a diffusely echogenic adnexal mass without acoustic shadowing
- “Tip of the iceberg” sign

Brenner Tumor

**Definition**: A solid ovarian tumor of epithelial origin. These lesions are typically found in women between 50 - 60 years old. Account for 1 - 2 % of all ovarian tumors.

**Clinical Findings**:
- Abnormal uterine/vaginal bleeding

**Sonographic Findings**:
- May cast an acoustic shadow
- Echogenic mass containing small cystic spaces
- Solid, hyperattenuative ovarian mass
- Size ranges between very small to 8 cm
Fibroma: A connective tissue tumor of the ovary.

Sonographic Findings:
- Average size = 6 cm
- Rarely bilateral (6 - 10%)
- Associated with ascites 50% of the time when tumor >5 cm
- Hypoechoic with posterior acoustic shadowing, similar to fibroid

Thecoma: A solid, benign estrogen-producing ovarian tumor. Accounts for 1% of all ovarian tumors. Thecomas occur most commonly in postmenopausal women, who present with vaginal bleeding.

Sonographic Findings:
- Virtually always unilateral
- Occurs most commonly in women over 35 years of age
- Postmenopausal bleeding

Malignant Ovarian Pathology
Incidence: Ovarian cancer is the fourth leading cause of cancer death and the fifth most frequent cancer in women. Because it is silent during its early stages, few malignancies are detected early enough to allow for successful therapeutic intervention. Ovarian cancer causes more deaths in American women than all other forms of primary pelvic cancers.

Histology:
There are three classifications of ovarian malignancies based on the cells from which each arises:
- Epithelial Tumors - Most common (90%)
  Serous cystadenocarcinoma
  Mucinous cystadenocarcinoma
  Others
- Germ Cell Tumors (8%)
  Dysgerminoma
  Malignant teratoma
  Embryonal carcinoma
- Sex Cord - Stromal Tumors (2%)
  Granulosa tumor
  Sertoli tumor
  Other, i.e. arrhenoblastoma
Metastatic Ovarian Carcinoma
Ovarian malignancy may also be METASTATIC in nature. These lesions are usually bilateral, firm and solid. They may result from primary tumors in the:
- Intestine
- Breast
- Thyroid
- Lymphatics

Krukenberg Tumor: Specific type of metastatic ovarian cancer that may produce endocrinologic abnormalities. More commonly arises from the gut (stomach, intestine or gallbladder). Displays distinctive pathologic and clinical features. Cannot be distinguished sonographically or by MRI from primary carcinoma or hemorrhagic cyst.

Screening:
Early diagnosis (Stage I) of ovarian malignancy increases the 5 year survival rate from approximately 25% to 80%. Protocols have recently been developed to screen for ovarian cancer and involve several components:
- **Risk**
  Average age = 50 - 59 years
  History of unsuccessful pregnancies
  Strong family history
  Women who have used oral contraceptives are at REDUCED risk
- **CA 125**
  A biological tumor marker found in the blood of most (75%) women with ovarian cancer. Elevation is suggestive of the presence of carcinoma but serum levels may also be elevated in women with benign GYN pathology, such as endometriosis and fibroids.
- **Sonography**
  The presence of an ovarian mass in a post menopausal woman with an elevated CA 125 is highly suggestive for carcinoma.
- **Doppler**
  Using endovaginal duplex sonography, the demonstration of a lowly resistive spectral waveform in a hypervascularized ovarian mass may help confirm the diagnosis of carcinoma. Confirmation of the diagnosis comes from the pathologist.

Metastatic Spread of Ovarian Carcinoma
Spread of ovarian malignancy may occur by any of the following four routes:
- **Direct invasion** of small intestine, colon, rectosigmoid, uterus, fallopian tubes, broad ligament
- **Peritoneal fluid** carries malignant cells to the omentum, posterior cul de sac, paracolic gutters, right hemidiaphragm and anywhere within the abdomino-pelvic cavity
- **Lymphatics** carry malignancy to the pelvic and/or para-aortic nodes
- **Hematogenous** or (blood borne) spread to distant sites in the liver, lungs and skin
Diagnosis

General considerations: Sonographic differentiation between histologically different tumors is usually impossible. With the exception of early detection of ovarian carcinoma as described earlier, any sonographically complex ovarian mass can be anything. As a rule of thumb, however, if an adnexal mass is highly complex and demonstrates multiple areas of solid components it is more suspicious of malignancy. The following criteria provide guidelines in differentiating types of tumors.

Epithelial Tumors: Cystadenocarcinomas are ovarian tumors of epithelial origin and are, by far, the most common type of ovarian malignancy. Two primary histologic types of tumor exist: Serous and mucinous. The clinical presentation is similar in both types and sonographic differentiation is impossible.

Clinical Findings:
- Abdominal pain
- Abdominal distention
- Vaginal bleeding
- Symptoms of abnormal endocrine activity such as:
  - Cushing’s syndrome
  - Hypoglycemia
  - Hypercalcemia
  - Hyperthyroidism

Germ Cell Tumors (Dysgerminoma)
- Occurs primarily in women < 30 years old
- Bilateral (15%)
- Solid ovarian mass
- May contain anechoic areas corresponding to focal necrosis
- Always malignant

Stromal Tumors
- Granulosa Tumor
  - Vary in size
  - Solid ovarian mass
  - Echogenicity similar to fibroids
  - Larger tumors may be multiloculated and cystic
- Sertoli Tumor
  - Similar in appearance to granulosa cell tumor
- Thecoma
  - Usually benign but possess malignant potential
  - Hypoechoic, adnexal mass
  - Posterior acoustic ATTENUATION
  - May demonstrate areas of necrotic degeneration
**Sonographic Scoring System:** Using two dimensional real-time sonography alone, high sensitivity in diagnosing ovarian malignancy can be obtained by using the following scoring system. When any ovarian mass scores >3, a 97% sensitivity and a 77% specificity results.

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