Objectives:

- Pelvic mass differential
- Characteristics of the normal ovary
- Standard terminology for ovarian masses
- Benign vs. malignant features
- Cases
Non-Gynecologic Etiologies of Pelvic Masses

- Diverticular abscess
- Appendiceal abscess, mucoceal
- Schwannoma, Tarlov or perineural cyst
- Ureteral or bladder diverticulum
- Peritoneal inclusion cysts
- Pelvic kidney
Non Gynecologic Etiologies of Pelvic Masses - Malignant

- GI cancers
- Retroperitoneal sarcomas
- Metastases from distant primaries (Breast, Uterine, colorectal, gastric)
Gynecologic Non Ovarian Etiologies of Pelvic Masses

- Hydrosalpinx/pyosalpinx
- Paratubal cysts
- Leiomyoma - broad ligament, degenerating
- Hematometra
- Nabothian cysts
- Cervical cancer
- Ectopic pregnancy
- Adnexal torsion
Ovarian Etiologies of Pelvic Masses - Benign

- Functional cysts/ hemorrhagic corpus luteum
- Mature Teratoma or Dermoid
- Tubo-ovarian abscess
- Serous or Mucinous cystadenoma
- Endometrioma
- Brenner tumor (transitional cell)
Ovarian Etiologies of Pelvic Masses - Malignant potential

- **Epithelial**
  - Serous, Mucinous, (Brenner- transitional cell)

- **Sex cord/ Stromal**
  - Granulosa cell tumors, thecoma, fibroma

- **Germ cell**
  - immature teratoma, dysgerminoma, embryonal/yolk sac, and non gestational choriocarcinoma
Goals of GYN US - Ovary

- Appropriately identify normal physiologic changes
- Describe abnormal findings with standard terminology
- Alert provider for high suspicion of malignancy or medical emergency
The Normal Ovary

- Located lateral to transverse fundus.
- Use pelvic sidewall and iliac arteries as landmarks.
- Can be difficult to locate with pelvic adhesions or with h/o hysterectomy
- Pressing on the lower abdomen or asking the patient to valsalva can aid visualization
## The Normal Ovary

<table>
<thead>
<tr>
<th>Age</th>
<th>Size cm³</th>
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<tbody>
<tr>
<td>&lt;30y</td>
<td>6.6</td>
</tr>
<tr>
<td>30-39</td>
<td>6.1</td>
</tr>
<tr>
<td>40-49</td>
<td>4.8</td>
</tr>
<tr>
<td>50-59</td>
<td>2.6</td>
</tr>
<tr>
<td>60-69</td>
<td>2.1</td>
</tr>
<tr>
<td>&gt;70</td>
<td>1.8</td>
</tr>
</tbody>
</table>
The Normal Ovary - Cycling

- Ovarian size should be < 10 cm³ (0.5x Wx Lx D)
- Cycling women should have normal follicular development up to 3.0 cm.
- Follicles or “clear cysts” - unilocular, smooth, thin walled, no internal debris or solid components.
The Normal Ovary - Cycling

- In a cycling patient, follicles up to 3 cm in maximum diameter should not be identified as “cysts” on ultrasound reports.

- Can be reported as dominant follicles or physiologic changes.

- Referring to normal function as a “Cyst” can promote unnecessary anxiety for patients.
The Normal Ovary - Corpus Luteum

- The result of ovulation
- Usually 2-3 cm in size
- Functional - produces progesterone
- Unilocular thick irregular wall with internal debris/echogenic material
- Doppler: Intense circular vascular pattern - “ring of fire”
The Normal Ovary - Hemorrhagic Corpus Luteum

- Can enlarge - up to 5 cm or more
- Sometimes incidental finding, but often cause of pain
- Usually takes 1-3 months to regress
- Varied in appearance - “the great imitator”
- Fine reticular or “fish net” internal pattern
- Solid appearing areas are organized clot
- No internal doppler flow - just circumferential
The Normal Ovary - Menopausal

- Smaller and inactive without evidence of follicular development
- Unilocular smooth walled cyst ≤ 1cm is not significant
- Does not need be included in report.
Features of Ovarian Tumors

- Size
- Type
- Solid components
- Echogenicity of fluid
- Septa
- Ascites
- Doppler Flow - pattern and strength
- Papillary projections
IOTA - 5 types of ovarian tumors:

- Unilocular
- Unilocular Solid
- Multilocular
- Multilocular Solid
- Solid
Echogenicity

- Anechoic - “Clear cyst”
- Reticular pattern of internal echoes “fishnet,” “lacy”
- Homogeneous low level echoes - “Ground glass”
- Heterogeneous lines and dots with a focal or diffuse hyperechoic component
Solid component

- Hyperechoic, usually homogeneous
- Must ensure the solid component is solid and not blood clot or mucus lump
- Use movement - does the lesion stay adhered to the cyst wall or does it move freely?
- Apply doppler - a blood clot or mucus lump does not have internal blood flow.
Papillary Projections:

- Papillary projections - $\geq 3$mm
- If Less than 3 mm = “wall irregularity”
- Must inspect entire unilocular lesion - if larger than 7 cm may recommend MRI
- Consider 3-D for better visualization
Septa

- Septae - thin membrane stretching from one side of lesion to the other (complete vs incomplete)
- Septae should be characterized as thin, thick, irregular, with or without doppler flow
Ovarian Lesion Applications

- Doppler
- Slide sign, movement
- 3-D
- Streaming
IOTA Simple Rules

**Benign Features:**
- Unilocular
- Solid areas <7mm
- Acoustic shadow
- Smooth borders
  - multilocular <10cm
- No color flow

**Malignant Features:**
- Irregular solid areas
- >4 papillary projections
- Strong color flow
- >10cm irregular
  - multiloculated solid tumor
- Ascites
5 Simple Rules:

- \( > \) or \( \geq 1 \) Malignant Feature and no benign features - Most likely cancer

- \( > \) or \( \geq 1 \) Benign feature and no malignant features - most likely benign

- Benign and malignant features in the same mass - inconclusive.
Simple Cyst / Clear cyst

- Unilocular
- Smooth, thin walled
- No solid areas
- No wall thickening
- No papillary projections
- Must carefully scrutinize the entire cyst (doppler or 3D may be helpful)
Ovarian Cancer: Ultrasound “Malignant Features”

- Complex appearance (multicystic or multilocular with solid components, septations)
- Presence/absence of papillary projections (echogenic structures protruding into the mass)
- Characteristic of cyst walls and/or septa (irregular, thickened, with doppler flow)
- Echogenicity (tissue characterization)
- Doppler flow (malignant tumors have central flow, low resistance to flow, branching)
PCOS - Ultrasound Criteria

Either one:

- 12 or more follicles measuring 2-9 mm in diameter
- Ovarian volume >10cm³ (.5xWxLxD)

• Does not apply to patients on OCPs
• Cannot meet criteria if there is a dominant follicle or corpus luteum cyst.
PCOS - Ultrasound Criteria

- Polycystic ovaries - occur in 16 - 25 % of US
- Only 4-6 % of women have PCOS
- Adolescent women have polycystic appearing ovaries because of the immature hypothalamic pituitary axis.
- If ovaries appear normal but a patient has clinical evidence of PCOS, still consider the diagnosis.
Endometrioma

- Endometrioma: round unilocular cyst with low level echoes "ground glass" appearance. No flow when doppler is applied
- Endometrioid carcinoma - looks like an endometrioma but with solid components with abundant color flow or thickened walls.
- Decidualized endometrioma - in pregnancy - can look just like malignancy.
- Can be multilocular or septate with thickened walls making differential not as straightforward.
Endometrioma vs. Mucinous Cystadenoma

- Presence of streaming - cystadenoma
- Absence of streaming - endometrioma