Pathology of the Ovary

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Ovarian Neoplasms

- Epithelial
- Sex-cord Stromal
- Germ Cell
- Other
  - lipid/steroid cell
  - mixed

Distribution of *Benign* Ovarian Neoplasms

- Germ cell — Epithelial — Stromal

Ovarian Cysts & Masses

- epithelial inclusions - up to 1 cm
- cystic follicle < 2 cm
- follicle cyst > 2 cm
- corpus luteum cyst = luteinized f.c.
- simple cyst
  - no recognizable lining, or
  - 1-2 cells: non-specific or low cuboidal
- cystadenoma > 2.5 cm

Ovarian Torsion

- Can occur with any ovarian mass
  - functioning cysts
  - benign neoplasms
  - malignant tumors
    - cystic
    - solid
Ovarian Epithelial Tumors

Recapitulation of Coelomic Epithelium

- serous ➔ tubal lining
- mucinous
  - intestinal ➔ gastrointestinal mucosa
  - Müllerian ➔ endocervix
- endometrioid ➔ endometrial glands
- Brenner/transitional ➔ bladder (urothelium)
- clear cell ➔ mesonephric (renal cell)

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Ovarian Epithelial Neoplasms

- Benign

- Intermediate Risk of Recurrence
  - borderline
  - low malignant potential (LMP)

- Malignant
  - carcinoma

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Epithelial Ovarian Neoplasms:
Serous Prototype

- endophytic
  - cyst (<2.5cm)
  - cystadenoma
  - cystadenofibroma
  - adenofibroma
- exophytic
  - surface papillary tumors
Serous Tumor of LMP

Serous Tumors of Low Malignant Potential
- architectural complexity (atypia)
- cytologic atypia
- lack of destructive stromal invasion

Psammoma Body

Defining Stromal Invasion
- destructive, infiltrative growth
- altered epithelial-stromal interface
  - dense fibrous
  - myxoid
  - hyaline
Serous Carcinoma

Implants of Serous Ovarian Carcinoma

Serous Ovarian Neoplasms*

<table>
<thead>
<tr>
<th></th>
<th>Benign</th>
<th>LMP</th>
<th>Carcinoma</th>
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<tbody>
<tr>
<td>% of serous</td>
<td>70%</td>
<td>10-15%</td>
<td>20-30%</td>
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<td>age median</td>
<td>40’s</td>
<td>50’s</td>
<td>40’s-70’s</td>
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<tr>
<td>psammoma</td>
<td>25%</td>
<td>50%</td>
<td>70%</td>
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<tr>
<td>stage I survival</td>
<td>—</td>
<td>95%</td>
<td>60%</td>
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<tr>
<td>bilaterality</td>
<td>20%</td>
<td>35%</td>
<td>60%</td>
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*Elevated CA-125
Krukenberg Tumor — Metastatic GI Tract Carcinoma to the Ovaries

Sex-Cord, Stromal Ovarian Neoplasms

Epithelial (70%)
Germ cell (20%)
Sex cord-stromal (6%)
Other (4%)

Sex Cord - Stromal Tumors

- Granulosa Cell
- Adult
- Juvenile
- Thecoma-Fibroma
  - thecoma
  - fibroma
  - fibrosarcoma
- Sertoli-Leydig
Adult Granulosa Cell Tumor

Clinical
- 95% of all Granulosa
- 1-2% of all ovarian
- post-menopausal
- 10% present with acute abdomen
- <5% bilateral
- 90% Stage I
- slow growth
- late recurrences

- Estrogen production
  - 25% - endometrial hyperplasia
  - 5% - endometrial carcinoma

- Micro
  - Call-Exner Bodies
  - Coffee Bean nuclei
  - nuclear grooves

- Tumor Marker
  - Inhibin

Granulosa Cell Tumor: Histologic Patterns

- follicular
  - microfollicular: numerous Call-Exner bodies
  - macrofollicular: large “Graafian follicles”

- trabecular
  - chains or chords surrounded by connective tissue

- moiré (gyriform)
  - whirs or zig-zag chords

Ovarian Fibroma-Thecoma

Thecoma-Fibroma Spectrum
- typical thecoma
- luteinized thecoma
- fibroma
- cellular fibroma
- fibrosarcoma
**Ovarian Fibroma-Thecoma**

- 4% of all ovarian tumors
- <10% bilateral
- A Histologic spectrum
- Associations
  - Meigs Syndrome
    - ovarian fibroma
    - pleural effusion
    - ascites

**Sertoli-Leydig Cell Tumors**

- Sertoli Cell
- Sertoli-Leydig
  - well differentiated
  - intermediate
  - poorly differentiated
  - heterologous
- Retiform Sertoli
  - younger ages, more aggressive

- All ages
  - 75% <30yo
  - 10% >50yo

- Virilization may occur
Frequency of Ovarian Neoplasms

- Germ cell (20%)
- Sex cord-stromal (6%)
- Other (4%)
- Epithelial (70%)

Teilum’s Histogenesis of Germ Cell Tumors

Germ Cell Tumors
- teratomas
- dysgerminoma
- yolk sac tumor (endodermal sinus tumor)
- embryonal carcinoma
- polyembryoma
- choriocarcinoma (non-gestational)
- mixed germ cell
- mixed germ cell–sex cord stromal tumors (gonadoblastoma)
Teratomas

- Mature
  - cystic
    - mature cystic teratoma = dermoid
  - solid
- Monodermal
  - struma ovarii
  - carcinoid
- Immature teratoma
- Teratoma with malignant transformation

Mature Teratomas

- germ cell origin – parthenogenesis
  - all ovarian – Barr body positive
- ectoderm, mesoderm, and/or endodermal
  - at least two, often three elements
  - skin, hair, adipose, bone, cartilage, etc.
  - Homunculus
    - the “ultimate” teratoma

Mature Cystic Teratomas

- dermoid, dermoid cyst, benign cystic teratoma
- bilaterality: 20%
- clinical presentation:
  - asymptomatic
  - abdominal distention
  - torsion
- treatment
  - cystectomy

*adapted from Cancer 30: 713, 1972 & Obstet Gynecol 74: 921, 1989*
Benign Cystic Teratoma

Rokitansky’s Tubercle

Malignant Germ Cell Tumors: Clinical Presentation

- Symptoms
  - short duration
  - pelvic or abdominal pain
- Exam
  - very large, predominantly solid, pelvic mass
  - rapid growth (weeks)
- CT Scan*

Dysgerminoma

- most common malignant ovarian germ cell tumor
  - children
  - adolescence
  - pregnancy
  - dysgenetic gonads
**Dysgerminoma**

- **gross**
  - pink–tan
  - solid, lobulated
  - foci of necrosis & hemorrhage
- **micro**
  - prominent nucleus with large nucleolus

**Dysgerminoma**

- age range: 10–30 years (median 20 yrs)
- clinical presentation:
  - asymptomatic → abdominal pain
  - amenorrhea/precocious puberty
  - elevated β-hcg (5%)
- treatment
  - TAH vs. adnexectomy/staging laparotomy
  - radiation
  - chemotherapy for advanced disease

80-100% survival

**Endodermal Sinus Tumor (Yolk Sac Tumor)**

- usually < 30 years old
  - range 16 mo. to 46 yrs.
- rapidly enlarging abdominal mass (>10 cm)
  - abdominal pain
  - 30% rupture before surgery
  - symptoms avg. 7 days
- elevated serum α-fetoprotein
- treatment
  - conservative vs. aggressive surgery
  - chemotherapy
- prognosis
  - pre-chemo ~10%
  - modern Rx ~85%
Endodermal Sinus Tumor – Histologic Keys

- Histologic Key
  - Schiller-Duval Bodies
    - capillary lined by cuboidal or low columnar embryonal epithelial-like cells

- Tumor Marker
  - α-fetoprotein
**Choriocarcinoma**

*Gestational Choriocarcinoma*
- always associated with an antecedent gestation
  - normal gestation
  - spontaneous AB
  - molar gestation

*Non-gestational Choriocarcinoma*
- Germ Cell Tumor
- only seen in combination with other malignant Germ Cell elements

Similar Histology: biphasic admixture of malignant trophoblast

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**Mixed Germ Cell Tumor**

Dysgerminoma and Choriocarcinoma

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**Ovarian Germ Cell Tumors — Conclusions**
- benign tumors are common
- malignant tumors are uncommon
- tumor markers aid in diagnosis and follow-up of therapy
- modern chemo- & radiation therapy have had a positive impact on survival in malignant germ cell tumors
## Markers in Germ Cell Tumors

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<thead>
<tr>
<th>Tumor</th>
<th>AFP</th>
<th>hCG</th>
<th>LDH</th>
<th>PLAP</th>
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<tbody>
<tr>
<td>Dysgerminoma</td>
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<td>−/+</td>
<td>+</td>
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<tr>
<td>Endodermal sinus tumor</td>
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<td>−</td>
<td>−</td>
<td>−</td>
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<td>Immature teratoma</td>
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<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>Choriocarcinoma</td>
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Multiple Series