Two Women with Ovarian Cancer: Mystery Metastasis vs. Primary Tumor

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Ovarian Cancer

- 5th most common cause of female cancer death

- 5 year survival rate < 35%

- Mortality has only decreased slightly in 30 yrs

- Most diagnosis made at advanced disease
Ovarian Tumors

- Majority derive from epithelial cells

- Benign ovarian tumors more common in women ages 20-45

- Malignant ovarian tumors more common in women ages 40-65
Ovarian Tumors

Risk Factors
- Nulliparity
- Family History
- Heritable Mutations (BRCA1, BRCA2)

Protective Factors
- Oral Contraceptives
- Tubal Ligation

Presenting Symptoms
- Lower abdominal pain
- Abdominal enlargement
- GI complaints
- Dysuria
- Back pain
- Fatigue
- Cramping
- Vaginal Bleeding
Ovarian Neoplasm Classification

OVARIAN TUMORS

EPITHELIAL
- Serous
- Mucinous
- Endometroid

GERM CELL
- Teratoma
- Yolk Sac Tumor
- Dysgerminoma
- Mixed

SEX CORD
- Granulosa Cell

5% of ovarian tumors arise from metastases
Our Patient: Ms. X

- 36 year old woman
- Increasing pelvic mass for last 2 months
- Abdominal distension
- Early satiety
Ms. X: Ultrasound Findings

**Uterus:**
- Normal size
- No masses
- Endometrial thickness 0.88 cm (within nl)

**Ovary:**
- Ovarian enlargement
- Relationship to uterus unclear

PACS, BIDMC
Ms. X: Ultrasound Findings

Ovarian enlargement: 12.79 cm

Another view shows bilateral enlargement with left ovary measuring 7.89 cm

=> Patient diagnosed with ovarian cysts
Ms. X: CT Findings

- The patient’s symptoms worsen over the course of 2 months.
- CT shows massive ascites.
CT: Normal compared to Ms. X

Normal Female Pelvis

Ms. X

PACS, BIDMC
Ms. X: CT Findings
Bilateral ovarian masses – variable attenuation, solid and cystic components
Ms. X up to this point:

- Bilateral ovarian masses
- Worsening symptoms
- Her age makes these more likely to be benign:
  - benign: 20-45 yrs
  - malignant: 40-65 yrs
- However, the massive ascites on CT looks ominous
- Ddx is extensive at this point as these images cannot even determine benign vs. malignant status with any certainty
- Does the WHO Classification System help to further characterize Ms. X’s condition?
## Ovarian Neoplasms

<table>
<thead>
<tr>
<th></th>
<th>Epithelial</th>
<th>Germ Cell</th>
<th>Sex Cord</th>
<th>Mets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>65-70%</td>
<td>15-20%</td>
<td>5-10%</td>
<td>5%</td>
</tr>
<tr>
<td>Percent of Tumors</td>
<td>90%</td>
<td>3-5%</td>
<td>2-3%</td>
<td>5%</td>
</tr>
<tr>
<td>Age group affected</td>
<td>20+</td>
<td>0-25</td>
<td>All ages</td>
<td>Variable</td>
</tr>
<tr>
<td>Types</td>
<td>Serous</td>
<td>Teratoma</td>
<td>Granulosa Cell</td>
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<tr>
<td></td>
<td>Mucinous</td>
<td>Dysgerminoma</td>
<td>Sertoli-Leydig</td>
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<tr>
<td></td>
<td>Endometroid</td>
<td>Choriocarcinoma</td>
<td>Fibroma</td>
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**KRUKENBERG TUMOR**
Another look at the CT for Ms. X

- This coronal CT shows gastric thickening
- It becomes apparent on a second look at the axial images also...
Another look at the CT for Ms. X

The original axial CT image that demonstrated ascites also shows gastric thickening on a second look.
Could this be a Krukenberg Tumor?

Profile of patients with Krukenberg:

- Young, premenopausal women
- Abdominal pain that is vague early in the disease, but more severe as the disease progresses
- Abdominal swelling
- Menstrual regularity still maintained
- Ovarian tumors are large, bilateral and associated with ascites
The next step for Ms. X

- **Endoscopy!**
- A single biopsy has 70% sensitivity for diagnosing gastric cancer
- Seven biopsies increase the sensitivity to 98%
- Ms. X undergoes endoscopy, which shows an ulcerated, fungating, infiltrative mass with recent bleeding in the body and cardia; duodenum determined to be normal
Ms. X: Endoscopy

Dx: gastric adenocarcinoma, predominantly signet ring cell
Ms. X

- Imaging modalities used: US, CT, endoscopy
- Dx: gastric adenocarcinoma with mets to ovaries (Krukenberg tumor)
- Other findings: elevated CEA and CA-125; anemia; met in cul-de-sac
- Surgery: ovarian resection, gastric resection
- Currently: chemotherapy

Signet Ring Cells:
mucin filled cells with nuclear displacement. Characteristic of Krukenberg Tumor.

Ruhul Quddus, MD: [www.brown.edu/...female/krukenberg2.html](http://www.brown.edu/...female/krukenberg2.html)
Primary vs. Metastatic Ovarian Tumor

The Case of Ms. D

- 56 year old woman w 4 months abdominal pain, chronic constipation
- PMH: GERD, HTN
- Physical Exam: pelvic masses felt bilaterally, cervix described as wrinkled but not erythematous
- normal colonoscopy 2 years ago

Her presentation is similar to Ms. X

What does CT reveal?
Ms. D: CT Findings

CT shows bilaterally enlarged ovaries with cystic and solid components
Ms. D: CT Findings

CT shows omental caking, peritoneal studding, and free pelvic fluid
CT shows complications from the ovarian tumors: obstructive renal failure and large bowel dilatation.
Ms. D

- Exploratory surgery found studding of the small and large bowel, omentum, and peritoneum.

- It was determined that Ms. D had a primary mucin producing tumor that had spread throughout her abdomen.
These women illustrate two examples of ovarian tumors
- Ms. X: stomach → ovary (Met)
- Ms. D: ovary → abdomen (Primary)

Their presenting symptoms and radiographic findings are similar.

The findings alone cannot establish whether the malignancies are primary or metastatic.
Ms. X and Ms. D

- Surgery and histology are critical in diagnosis, staging and developing a treatment plan.

- Both were advanced in their disease at diagnosis. Could their tumors be detected earlier?
Could screening have helped these women?

- **Possible screening tests**
  - Pelvic Exam
  - Serum markers: CEA, CA-125
  - Ultrasound
  - CT
Could screening have helped these women?

**Possible screening tests**

- **Pelvic Exam**
  - Early stage tumors rarely found due to deep anatomic location of the ovary
- **Serum markers: CEA, CA-125**
  - Nonspecific – these markers can be elevated in a number of conditions
- **Ultrasound**
- **CT**
Radiographic characteristics that help differentiate benign and malignant adnexal masses

<table>
<thead>
<tr>
<th>Benign</th>
<th>Malignant</th>
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<tr>
<td>Simple cyst, &lt; 10 cm</td>
<td>Solid, or solid and cystic</td>
</tr>
<tr>
<td>Septations &lt; 3mm</td>
<td>Multiple septations &gt; 3mm</td>
</tr>
<tr>
<td>Unilateral</td>
<td>Bilateral</td>
</tr>
<tr>
<td>Calcificiation (especially teeth)</td>
<td>Ascites</td>
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<tr>
<td>Gravity dependent layering of cyst contents</td>
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Ultrasound as a Screening Tool

- **US Findings**
  - Suggesting Malignancy
    - Solid component, often nodular/papillary
    - Septations (>2-3 mm)
    - Doppler demonstrates flow in solid component
    - Presence of ascites
    - Enlarged peritoneal nodes

- **US Screening Studies**
  - Sensitivity has ranged from 80-100%
  - Specificity has ranged from 94-99%
  - US has performed poorly in detecting early stage ovarian cancer in high risk women
Could screening have helped these women?

- **Possible screening tests**
  - Pelvic Exam
  - Serum markers: CEA, CA-125
  - Ultrasound

  - **CT**
    - Most useful for evaluating *metastatic* disease (M Stage)
    - Cannot rely on it for T or N Staging
    - CT is used to monitor recurrence

- **Screening Risks**
  - Unnecessary surgery as follow-up to positive tests
Summary

- Case examples of metastatic and primary ovarian tumors
- Pelvic and abdominal anatomy
- Radiographic imaging is essential in diagnosis.
  - Menu of Tests for these patients: US, CT, endoscopy.
Summary

- **Ovarian tumor classification**
  - System organized by cell of origin:
    - epithelial, germ cell,
    - sex cord, metastasis

- **Radiographic features can help differentiate**
  - benign vs. malignant:
    - evaluation of cystic/solid components
    - unilateral/bilateral
    - septations, number and thickness
Summary

- **Ovarian cancer**
  - 5th most common cause of female cancer death
  - Low survival rate

- **Screening**
  - Screening Modalities
    - Imaging: Ultrasound, CT
    - Other: Physical exam, biomarkers
  - Screening Studies
    - Current screening ineffective at detecting malignancies early
    - Screening could pose risk of unnecessary procedures
References

- Carlson, Karen J. Screening for ovarian cancer. Up-to-Date, March 2006.
- Schroy, Paul C. Clinical features and diagnosis of gastric cancer. Up-to-Date, April 2006.
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