Imaging
Ovarian Endometriomas

Tina Marie George
Harvard Medical School Year III
Gillian Lieberman, MD

November 2008
Objectives

- Clinical Presentation of Endometrioma
- Brief Review of Pathophysiology
- Menu of Tests
- Typical Imaging Findings
- Differential Diagnosis of Imaging Findings
Index Patient: Clinical Presentation

22yo woman presenting w/ abdominal discomfort that progressed to sharp, stabbing periumbilical pain within hours

- Multiple episodes of bilious vomiting
- Unable to have a bowel movement in 24hrs
- On ROS: currently menstruating. In the past few months, she’s been having irregular, heavy periods lasting >10 days

Because of the high clinical suspicion for SBO, a CT was ordered.....
Our Index Patient: Pelvic CT

Transition Point

Lumenal Dilation 3.2mm
And on CT just a few slices below...
Our Index Patient: Pelvic CT Findings of Bilateral Multiloculated Adnexal Cysts

Bilateral Large Cystic Masses with loculations
To further evaluate these large cystic, adnexal masses, a transvaginal ultrasound was performed....
Our Index Patient: Transvaginal US

Left adnexa on transverse view transvaginal US

Homogeneous low-level echoes and thickened wall

Right adnexa on transverse view transvaginal US

Large lesion with loculations
Differential Diagnosis of Cystic Mass in the Pelvis Based on CT/US

**COMMON**
- Dermoid Cyst
- Ectopic Pregnancy
- Endometrioma
- Hydropsalpinx
- Physiologic Ovarian Cyst
- Ovarian serous or mucinous tumor
- Paraovarian Cyst
- Urinary Trace Mass (e.g. urachal cyst)

**UNCOMMON**
- Tubo-ovarian abscess
- Loculated ascites
- Hematoma
- Hydatid Cyst
- Lymphocele
- Mesenteric Cyst
- Peritoneal Inclusion Cyst
- Polycystic Ovary

From: REEDER AND FELSON’S GAMUTS IN RADIOLOGY
Endometrioma: Definitions

- Endometrioma ("chocolate cyst"): Blood-containing pseudocyst resulting from ovarian endometriosis with hemorrhage. Characteristically adherent to surrounding structures, such as the peritoneum, fallopian tubes, and bowel.
  - Definitive diagnosis based on histopathology (endometrial tissue and hemosiderin laden macrophages)
  - US/imaging evidence is supportive
Typical Clinical Presentation of Endometrioma

- Chronic or acute pelvic pain
- Dysmenorrhea
- Dyspareunia
- Infertility
- Diagnosed in patients with or without h/o diagnosed endometriosis. N.B. Endometrioma is the most common manifestation of endometriosis and the longest lasting.
Pathophysiology: Implantation and Retrograde Menstruation

- Shedding endometrium transported through the fallopian tubes into the pelvis during menstruation. Invagination of ovarian cortex over endometrial deposits creates endometrioma.
Menu of Tests

- Transvaginal Ultrasound
- Doppler Ultrasound
- CT
- MRI
Menu of Tests

1. Transvaginal Ultrasound: **Test of Choice**
   - Low level internal echoes
   - Thick walled
   - Homogeneous “ground glass” appearance
   - Unilocular or Multilocular
   - Often solid-appearing or cystic
   - Can show varying degrees echogenicity (even anechoic) in locules with fluid levels
   - Can show punctate echogenic foci (wall or central calcification) with distal shadowing
   - Round Shape
   - Regular Margins
Importance of Accurate Diagnosis

“An adnexal mass with diffuse low-level internal echoes and absence of particular neoplastic features is highly likely to be an endometrioma if multilocularity or hyperechoic wall foci are present”


Accurate diagnosis is imperative since endometriomas are often surgically removed because of the risk for malignant transformation
Our Index Patient: Ultrasound of Left Adnexa

Homogeneous low-level echoes and thickened wall

Post-cyst enhancement

Hyperechoic Focus

Left Adnexa, transverse view on transvaginal ultrasound
Our Index Patient: Ultrasound of Right Adnexa

Index Patient Right Adnexal Mass with Multiple Loculations

Free Fluid

Distal Enhancement

Right Adnexa transverse view on transvaginal ultrasound
Companion Patient 1: Ultrasound

24 yo w/ pelvic pain

Cystic lesion with coarse internal echoes accompanied by thin-walled cystic lesions

Border of Ovary (arrows)

Right Adnexa sagital view on trasvaginal ultrasound
Companion Patient 1: Multiple Cysts on Ultrasound

- Multiple thin-walled accompanying cystic lesions
- Possibly represent polycystic ovary syndrome or simple follicles
- Border of ovary

Right Adnexa transverse view on transvaginal ultrasound
Thin-walled, anechoic cysts can be easily differentiated from endometriomas, as we’ll see on the next images.
Companion Patients 2 and 3: Comparison of Ovarian Cysts in Normal and PCOS Ovaries

Note the thin-walls and anechoic appearance of these cysts on companion patients 2 and 3.

This is notably different from the coarse texture and thick walls of endometriomas

[Transvaginal Ultrasounds]

www.massgeneral.org/pcos/pcos_whatis.html
Endometriomas don’t always demonstrate “classical” appearance. Let’s look at some variant appearances.
Companion Patients 4 & 5: Endometrioma Variants

Companion Patient 4
Endometrioma:
Diffuse low-level internal echoes w/ punctate peripheral echogenic foci (arrows) and distal shadowing (circle)  Patel et al

Companion Patient 5
Endometrioma:
Diffuse low-level echoes and focal wall nodularity (arrow)  Patel et al
It’s also important to differentiate endometriomas from common mimics. Endometriomas are most commonly misdiagnosed as dermoid or hemorrhagic cysts. Each image is accompanied by a description of the features that differentiate this lesion from endometrioma.
Companion Patients 6 & 7: Differentiating Endometrioma from Other Common Ovarian Lesions

Follicular cyst
Differentiating Features
• Thin walls
• Anechoic echogenicity
• Multiple, separate lesions

Corpus luteum cyst w/ Central Blood Clot
Differentiating Features
• Complexity
• Heterogeneity
• Irregular Borders
• Unusual shape
Companion Patients 7 & 8: Dermoids and Hemorrhagic Cysts

**Hemorrhagic cyst**
This lesion shows low-level internal echoes, clean margins, and rounded shape that could be confused with endometrioma.

**Dermoid cyst**
Differentiating Features:
- Mixed hypoechoic and hyperechoic areas
- Irregular Borders
- Unusual Shape

Hoffman, UpToDate
Distal shadowing

- Calcific foci in endometriomas tend to show distal shadowing

- Echogenic foci in dermoids can be composed of calcium or fat. Calcific foci will demonstrate distal shadowing, but foci of fat will not.
Ovarian Cancer:
Differentiating Features:
• Heterogeneity echo-texture
• Irregular border and shape
• Multiple scattered, heterogeneous foci

Polycystic Ovary
Differentiating Features:
• Multiple ovarian cysts of similar size
• Cysts in ring formation
• Cysts have thin walls
• Cysts are anechoic
Menu of Tests

2. Doppler Ultrasound: Gives information about the blood flow and resistance to flow present in a lesion. Lower resistive indices (RI) are concerning for malignancy. Generally, it is reassuring when endometriomas show no internal vascularity.
Let’s first take a look at a doppler that is reassuring for a benign endometrioma as opposed to a malignant neoplasm.
This doppler shows a lack of blood flow centrally in the lesion. This is reassuring.
Companion Patient 11: Doppler Ultrasound Concerning for Malignant Neoplasm

This lesion is more concerning for neoplasm because of the level of blood flow within the lesion. There’s also another consideration.

This lesion has a Resistive index of 0.4, which is a low-resistance waveform concerning for ovarian neoplasm. The RI is a measure to the ease of blood flow. Lower numbers are correlated with malignant lesions.

Daly,
Companion Patient 12: Doppler Ultrasound Showing Vascularized Septations in Endometrioma Suggestive of Neoplasm

This is a benign endometrioma with a misleading finding: A solid, vascularized areas that arise from the lesion wall and extend into the cyst. This pattern is suggestive of neoplasm.

Asch, AB and D. Levine, 2007
Again, transvaginal ultrasound is the test of choice for identifying endometriomas, but other modalities can be helpful. Let’s move on to CT.
Menu of Tests:

3. CT

- Not typically used b/c findings are nonspecific
- Endometriomas appear as cystic masses
- Can show high attenuation lesion with dependent fluid
- Good for complications of endometrioma like bowel and ureteral obstruction
Our Index Patient: Pelvic CT Finding of Obstruction

Transition Point

Lumenal Dilation 3.2mm
Our Index Patient: Pelvic CT Findings of **Bilateral Multiloculated Adnexal Cysts**

- **Loculations**
- **Thick Wall**
- **Enhancement**
  - 46 HU
  - 4.6 x 5.3cm
Now, we’ll move on to MRI.
Menu of Tests

4. MRI

- Cystic mass with very high signal intensity on T1 and very low signal intensity on T2
- T2 images shows shading that can occur in a graded shadowing pattern
- Shadowing pattern results from blood degradation products (protein and iron)
- Again, complications seen well
Companion Patient 13: T2 Weighted MRI of Right Adnexal Mass (white arrow)

Findings:
- Hypointensity
- Graded shadowing

Bladder
Uterus

T2 Weighted MRI with contrast

Daly, http://www.emedicine.com/radio/TOPI250.HTM#Multimedia5
Companion Patient 14: T1 Weighted MRI of Right Adnexal Mass (arrow)

- Bladder
- Uterus

Note: Hypointensity of Lesion

T1 Weighted MRI with contrast
Now that we have a general idea of the appearance of endometriomas on ultrasound, let’s take a look at a slightly more complicated patient.
This patient is a 42 yo woman with chronic pelvic pain and a h/o endometriosis who presented with worsening SOB.

FINDING: Right Pneumothorax

Because of suspicion for catamenial pneumothorax, and MRI of the pelvis was performed...
Companion Patient 15: T2 MRI

Fluid-Fluid Level

Graded Texture

T2 Weighted MRI with contrast

Thickened Wall
We have reviewed the ultrasound, doppler, CT, and MRI findings for endometriomas. Let’s now briefly discuss treatment options and followup on our index patient.
When these lesions are asymptomatic and found incidentally, they are typically monitored by transvaginal ultrasound every 3-6 months.

Endometriomas are managed in the same manner as endometriosis.

Initial management is OCPs with NSAIDS for pain as needed.

More refractory disease merits other hormonal treatments such as GnRH, Progestins, Aromatase Inhibitors, or Danazol.

Laparoscopic ablation/resection is recommended in patients with severe symptoms and disease unresponsive to medical therapy.
Followup for Our Index Patient

- Our Index Patient underwent exploratory laparotomy and had a left partial ovarian cystectomy with drainage of the right cyst.
- Confirmed diagnosis on tissue pathology
- She was ultimately lost to GYN followup.

General Info on Recurrence:
- 30% recurrent endometrioma within 3-5yrs after laproscopic intervention
Routine followup is very important for endometriomas because of risk for many complications, including rupture. Let’s look at the imaging findings in ruptured endometrioma.
Companion Patient 16: Ruptured Endometrioma

Patient presented w/ fever and increased WBC:
• Heterogeneous complex fluid with multiple septations
• On Doppler, septations show blood flow.

Asch and Levine 2007
Review

- Endometrioma can present with pelvic pain, infertility, or, in severe cases, symptoms from mass effect on surrounding structures.
- Endometrioma possibly due to retrograde menstruation.
- Accurate diagnosis is imperative, and definitive diagnosis is based on histopathology.
- Supportive imaging usually US, but can include MR and CT.
- Remember, on US, “An adnexal mass with diffuse low-level internal echoes and absence of particular neoplastic features is highly likely to be an endometrioma if multilocularity or hyperechoic wall foci are present.”
Acknowledgements

- Larry Barbaras
- Gillian Lieberman, MD
- Maria Levantakis
- David Li, MD
- Rich Rana, MD
- Jay Pahade, MD
References

- Levy, B.S., Barbieri, R.L. Diagnosis and management of ovarian endometriomas. *UpToDate.* May 2008