Gynecological Aspects of Chronic Pelvic Pain
The Role of Imaging

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Chronic pelvic pain

- Non-cyclic pelvic pain that lasts 6 months or longer
- Causes functional disability or the need for medical care

Chronic pelvic pain

- Disabling condition which may have more than one cause
- Often goes undiagnosed (up to 60%)
- Identified abnormality may or may not be the cause
- Gyn, GI, GU, vascular and MSK abnormalities involved

Common etiologies with imaging findings

- Endometriosis
- Adenomyosis
- Pelvic varices
- Malpositioned IUD’s
- Ovarian remnant

Endometriosis

- Most common benign gynecological disorder
- Functional endometrial tissue outside of the uterine cavity and musculature
- Cysts (endometriomas), plaques, implants or nodules (consisting of glands and stroma)

Endometriosis: Sites involved

- Ovary
- Uterine ligaments
- Pouch of Douglas
- Pelvic peritoneum
- Abdominal scars
### Symptoms of endometriosis
- Dysmenorrhea
- Dyspareunia
- Abnormal bleeding

Severity of pain may not correlate with the extent of disease!

### Diagnosis of Endometriosis
#### Role of ultrasound
- Historically the most recognized and readily diagnosed appearance of disease has been the endometrioma.
- Confirmation obtained with time.
- Visualize implants of deep penetrating endometriosis using targeted sonography

### Sonographic features of endometriomas
- Walled cystic masses with diffuse low level homogeneous echoes
- Hyperechoic foci adjacent to the wall are commonly demonstrated
- Associated vascularity only with decidualization of pregnancy

### Diagnosis of Endometriosis
#### Role of ultrasound
- Can be used to evaluate implants found in dependent areas of the pelvis including the cul-de-sac, the uterosacral ligaments, the bladder and bowel wall and the rectovaginal septum.
- 90% found in posterior compartment
- Targeted study correlates findings with areas of pain

### Sonographic features of implants
- Usually solid and hypoechoic
- In the bowel wall, the implant takes the form of a nodular or fusiform swelling
- May be a small rounded solid structure adherent to the posterior cervix
Sonographic techniques

- Compression of rectum
- Sliding cervix

Extensive endometriosis of the posterior pelvic compartment.

Cervical implant of endometriosis s/p supracervical hysterectomy

Endometriotic implant in posterior cul de sac

Hemorrhagic cyst or endometrioma?

Hemorrhagic cyst or endometrioma? 8 week followup
Endometriosis and MRI

A problem solving tool

The role of MRI as a problem solving tool

- Nodular endometriosis in addition to cystic type
- Can evaluate multiple sites simultaneously, within and outside of the pelvis, on the same study.
- Accuracy of TVS in the detection of deep endometriotic lesions may vary depending on the location of the lesions and the experience of the operator.
- Plaque-like (<5mm depth) lesions and adhesions may go undetected until laparoscopy

20 yo female G0 with dysmenorrhea

Hemorrhagic cyst or endometrioma?

MRI interpretation of cystic endometriosis

MRI interpretation of cystic endometriosis

- T1 increased signal intensity relative to muscle due to subacute hemorrhage
MRI interpretation of cystic endometriosis

- T2 lower SI than normal cyst fluid (shading) or heterogeneous, or homogeneous increased signal
- High sensitivity
- Moderately high specificity (83%)

Images courtesy of Dr. Susanna Lee, Massachusetts General Hospital, Boston, Mass.

MRI and cystic endometriosis

46 year old female presenting to ED with acute RLQ pain

Images courtesy of Dr. Susanna Lee, Massachusetts General Hospital, Boston, Mass.

MRI and cystic endometriosis

- T1 fat sat with gadolinium
- Wall enhancement of the left ovarian endometrioma

Images courtesy of Dr. Susanna Lee, Dept of Radiology, Massachusetts General Hospital, Boston, Mass.
24 year old pregnant female
16 weeks EGA

Decidualized endometrioma

MRI interpretation of deep infiltrating (nodular endometriosis)

Glandular tissue
Bloody foci
- T1 weighted sequences sensitive for high intensity subacute hemorrhage within glands
- T2 weighted sequences sensitive for high intensity glandular tissue - less common than predominance of stromal/fibrotic tissue

MRI interpretation of deep infiltrating (nodular endometriosis)

Muscular hyperplasia surrounding glandular tissue
Stroma and fibrotic tissue
- Poorly marginated masses with intermediate signal intensity and minimal contrast enhancement on T1 weighted images
- Low signal intensity on T2 weighted images

44 yo female s/p TLH with cyclic bleeding

Nodular endometriosis of recto-vaginal septum
40 yo female with BMI of 41 presenting with severe progressive pelvic pain radiating to her back

Cystic & nodular endometriosis

MRI Features
Cystic & nodular endometriosis

T1 fat sat

MRI Features
Cystic & nodular endometriosis

T2 transverse
T2 sagital

The Tender Uterus
Adenomyosis
Pelvic congestion

Adenomyosis
- A gynecological condition characterized by the presence of ectopic endometrial glands and hyperplastic stroma in the myometrium
- Commonly incorrectly labeled as fibroids
- Usually in the older reproductive age group
- Ultrasound reported sensitivity of 80-87% and specificity of 94-98%
**Symptoms**

- Uterine tenderness
- Dysmenorrhea
- Menorrhagia

**Sonographic signs**

- Globular configuration
- Abnormal myometrial echogenicity
- Heterogeneous myometrial echotexture often with associated linear shadowing
- Poor definition of endometrial myometrial junction
- Pseudowidening of the endometrium
- Elliptical myometrial abnormality but relative absence of a discrete mass
- Color Doppler signal present or increased

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**Globular Configuration**

- Hypoechoic areas corresponding to smooth muscle hyperplasia
- Echogenic heterotopic endometrial tissue

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**Abnormal myometrial echogenicity**

- Myometrial cysts corresponding to dilated glands or hemorrhagic foci

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**Abnormal Myometrial Echogenicity**

- Myometrial cysts
- Echogenic nodules

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**Abnormal Myometrial Echogenicity**

- Ectopic glands
Focal or diffuse

Linear shadowing
Associated with smooth muscle hypertrophy on pathological examination

Globular, enlarged uterus
Subendometrial linear striations (most specific feature)
Myometrial cysts

MRI as a problem solving tool in the diagnosis of adenomyosis

**MR Imaging of Adenomyosis**

- Highly accurate with sensitivity and specificity of 86-100% and an overall accuracy of 85-90.5%
- Accuracies of sonography and MRI similar
- Sonography is the first study usually obtained in the patient with pelvic symptoms
- MR may give additional information in those cases which are indeterminate by transvaginal sonography

**MR Imaging Signs**

- Best seen on T2 weighted images
- Abnormal myometrial signal intensity
  - low signal intensity (hyperplastic smooth muscle)
  - areas of high signal intensity (heterotopic glands)

**MR Imaging of the Endometrium**

- Thickening of the junctional zone >11mm
- Linear striations of high signal intensity (associated with pseudo widening of the endometrium)
- Poor definition of the endometrial-myometrial junction

**The Coronal Plane**

**Endometrial-myometrial evaluation**

- Like MRI there is accurate evaluation and measurement of the inner myometrium or Junctional Zone(JZ).
- Alteration has good diagnostic accuracy for adenomyosis.
  - Thickening of JZ (> 8 mm)
  - Extension of endometrial tissue into myometrium

*EXACOUSTOS, et.al., Ultrasound Obstet Gynecol 2011; 37.*
Ultrasound Signs of Adenomyosis
Mass Effect

- Relative absence of a discrete mass
- An elliptical myometrial abnormality or adenomyoma may be seen but will not change the uterine or endometrial contour

Mass Effect

- Abnormality
- Uterine contour unchanged

Mass Effect with Leiomyomas

Color Doppler

- Is not present peripherally as with leiomyomas
- May be present or increased throughout the area in question
- Optimized for low flow may be the most valuable technique for differentiation of the two processes.
Adenomyomas and Leiomyomas

- High reported sensitivity (80-87%) and specificity (94-98%) distinguishing between the two
- Majority of patients with adenomyosis also have fibroids (Bromley et al. J Ultrasound Med, 2000)
- Relationship between heterogeneity of uterus and severe disease only when fibroids are not present (Hulka et al. AJR, 2002)
- 6/16 false negative studies in one series attributed to limited myometrial evaluation due to fibroids (Bazot M, Ultrasound Obstet Gynecol, 2002)

Pelvic congestion syndrome

- Chronic pelvic pain that is associated with dilatation of pelvic veins (i.e. pelvic varices) and reduced venous return
- Dull chronic pain exacerbated by prolonged standing and relieved by lying down and elevating the legs

Sonography and pelvic congestion

- Used in the initial assessment to rule out other pelvic etiologies with similar symptoms
- Shown to be of value in the diagnosis

Pelvic congestion: sonographic criteria

- Presence of tortuous and dilated pelvic venous plexuses
- May see dilated arcuate veins crossing the myometrium

Pelvic congestion: other sonographic signs

- Dilatation of ovarian veins >6-10 mm in diameter with reversed caudal flow
- Polycystic-like changes of the ovary
- Variable spectral Doppler waveforms in the veins during the Valsalva maneuver
47-year-old woman with pelvic congestion syndrome

- Remains the gold standard
- >10 mm ovarian vein diameter with reflux

Other causes of chronic pelvic pain

- Uncommon condition occurring after unilateral or bilateral oophorectomy, with or without a hysterectomy
- A fragment of ovarian tissue is left behind encased in adhesions and becomes functional and/or cystic often causing chronic pelvic pain

Ovarian remnant syndrome

Imaging findings
- Cystic or multiseptated ovarian masses
- Masses contain a rim of ovarian tissue

Intrauterine contraceptive devices
- Easily visualized by transvaginal sonography due to their increased echogenicity and marked attenuation of the sound beam
- Abnormal position usually due to IUD embedded in myometrium may cause chronic pain
**IUD visualization**

- TVS can confirm the position of the IUD in the uterus and when abnormally located, may show that part of the IUD is imbedded in the myometrium.
- 3D US using reconstructions in the coronal plane has been used successfully to improve visualization of the entire IUD on a single image.

**Satisfactory IUD location**

**Unsatisfactory IUD location**

**Approach to Pelvic Pain**

- Chronic pain
- US
- MRI
**Dysmenorrhea**

- Cyclic pain during menstruation
- Primary dysmenorrhea if there is no underlying pelvic pathology and no direct imaging findings but imaging may be useful to exclude other causes
- Secondary dysmenorrhea due to underlying pelvic pathology

**Cyclic pain**

**Dysmenorrhea**

**Secondary dysmenorrhea**

- **Common causes**
  - Endometriosis
  - Adenomyosis
  - Intrauterine devices
- **Less common causes**
  - Mullerian anomalies of the uterus or vagina with obstruction of menstrual flow
  - Intrauterine synechia
  - Fibroids
  - Pelvic congestion syndrome

**Uterus didelphys with an obstructing vaginal septum**

Longitudinal vaginal septum (class II vaginal septum anomaly).


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**Uterus didelphys with hematocolpos due to an obstructing vaginal septum**

Sonography is the initial imaging modality of choice for the evaluation of suspected gynecological etiologies of pelvic pain.

Sonography is an effective substitute to CT for evaluation of non-gynecological causes in patients in the reproductive age group, especially pregnant patients!

- Uses of MRI
  - As a problem solving tool when the US exam is equivocal or indeterminant
  - In place of computed tomography in pregnant patients with suspected appendicitis
Chronic pain
US or MRI

Acute pain
US

Suspect Ob or gen cause
US

Suspect non-gen cause
US or MRI

Chronic pain
US

Primary dysmenorrhea
β-hCG
CT or US

Secondary dysmenorrhea
US but no imaging findings

Cyclic Pain
US

Thank you!