My Female Patient Has Pelvic Pain

Mike Schmidling, MD

Why is imaging necessary?

Sometimes it’s not this obvious…

Imaging Options

- Radiography
- Ultrasound
  - Transabdominal
  - Transvaginal
- CT scan and CT angiography
- MRI, MRA, and MRV
- Angiography and venography
- Nuclear medicine
  - Bone scan
  - other

Which is best for my patient?

- Acute or chronic pain?
- Injury?
- Associated symptoms (i.e. vaginal bleeding or discharge, fever, etc.)?
- Is the pain cyclical?

Clinical work-up

- Focused history and physical and targeted labs will help generate a differential diagnosis list and therefore will help determine the appropriate test to order

- β-HCG is key!

Radiography

- Pros
  - Evaluates osseus structures
  - Limited evaluation of bowel gas pattern
- Cons
  - Radiation exposure
  - Does not evaluate soft tissues adequately

Radiography

- Useful in setting of trauma

Radiography

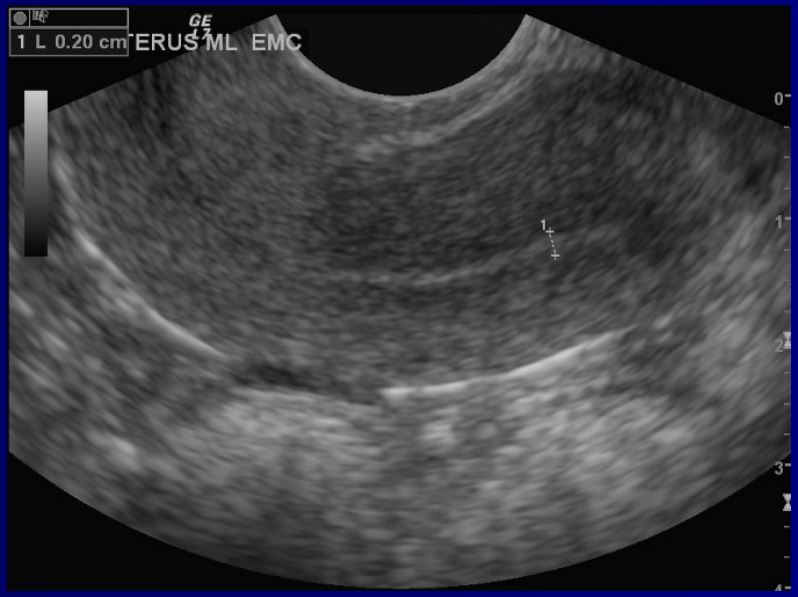
- Evaluate for foreign bodies

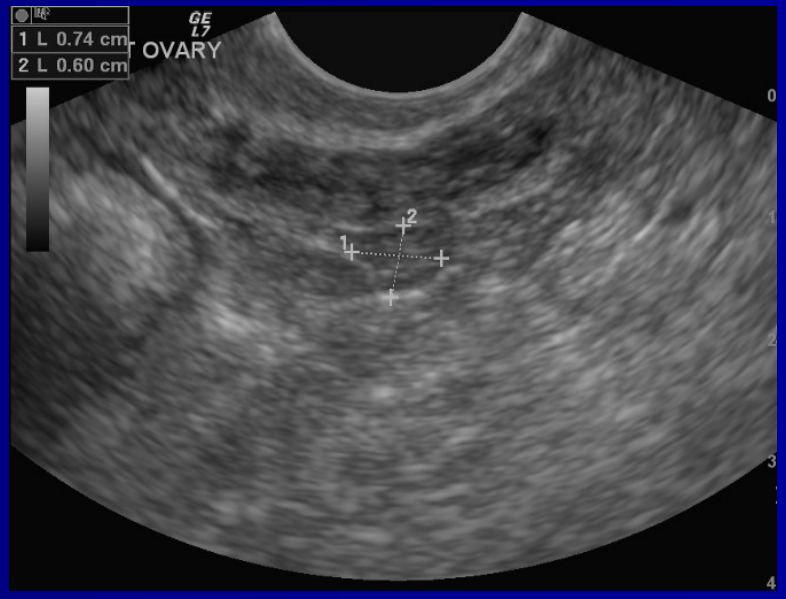
Ultrasound

- Pros
  - No radiation
  - Evaluate reproductive system
- Cons
  - Does not evaluate bowel
  - Limited evaluation of urinary tract
  - Operator dependent

Ultrasound

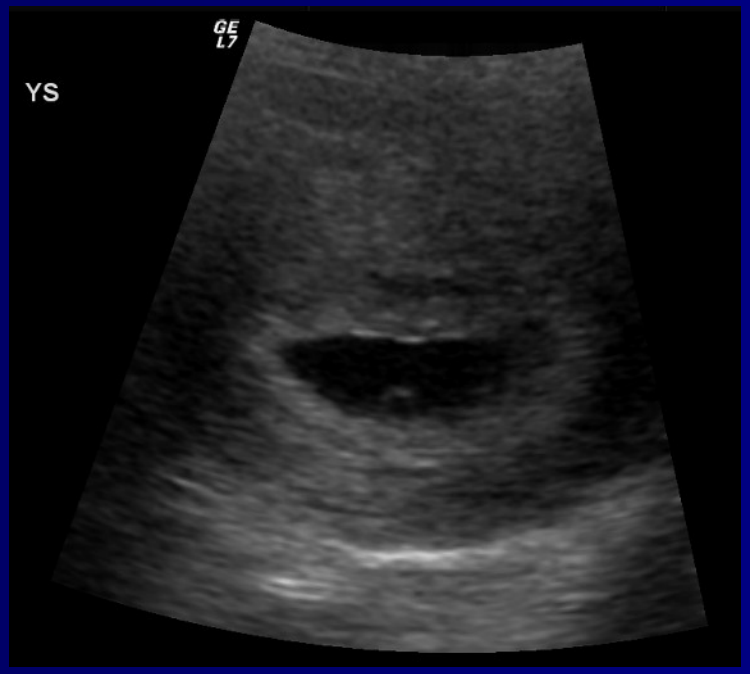
- Excellent evaluation of uterus and ovaries

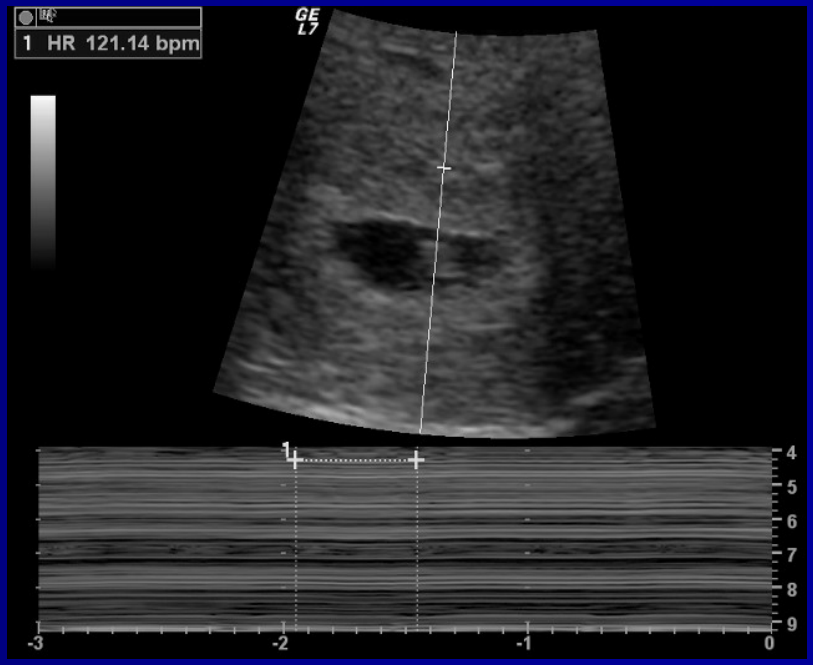




Ultrasound

- Best way to evaluate pregnant patient





CT Scan

- Pros
  - More complete evaluation of the pelvic organs including bowel
  - Quick
  - Less operator dependent
- Cons
  - Radiation
  - Often requires prep
  - Limited evaluation of reproductive system

CT Scan

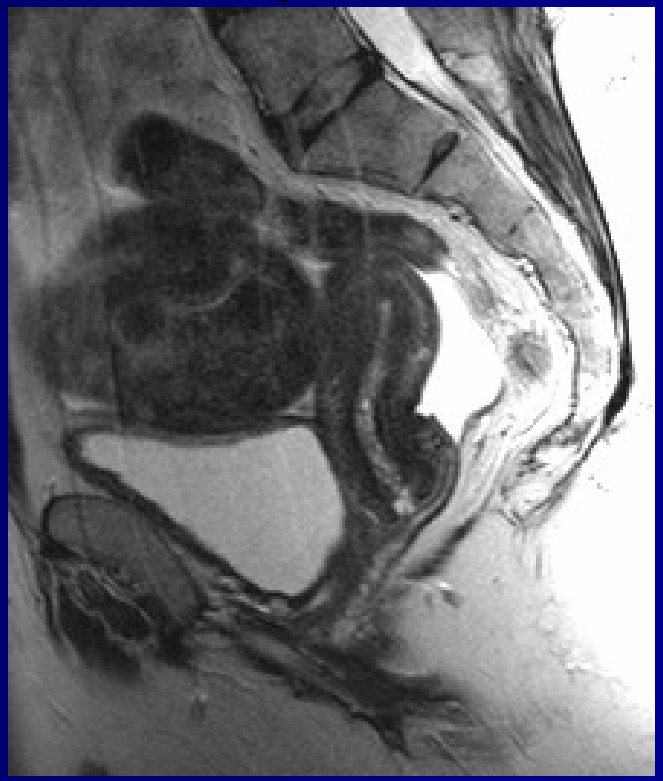
- Best way to evaluate bowel

MRI Scan

- Pros
  - Excellent tissue contrast to evaluate soft tissues
  - No radiation
- Cons
  - More susceptible to patient motion
  - Contraindication including pacemakers, metal, etc
  - NSF

MRI Scan

- More detailed evaluation of reproductive system



Nuclear Medicine – Bone Scan

- Pros
  - Very sensitive evaluation for skeletal abnormality
- Cons
  - Limited specificity
  - radiation

Nuclear Medicine – Bone Scan

Differential Diagnosis

- Differential diagnosis can be grouped by organ system

1. Reproductive system
2. Urinary tract
3. Gastrointestinal
4. Musculoskeletal

Reproductive system

- ectopic pregnancy
- PID/TOA
- fibroids
- adenomyosis
- pelvic congestion syndrome
- ovarian torsion
- endometriosis
- mittelschmerz

Ectopic Pregnancy

- Female patient of child bearing age who presents with pelvic pain - top three questions to ask
  1. Are you sexually active?
  2. Could you be pregnant?
  3. Disregard first two questions…Did we get the pregnancy test back yet?

Ectopic Pregnancy

- Differential diagnosis for pelvic pain with or without bleeding in the first trimester includes
  - normal early pregnancy with other cause for pain
  - spontaneous abortion
  - molar pregnancy
  - ectopic pregnancy

Ectopic Pregnancy

- Presence of an intrauterine pregnancy (IUP) makes diagnosis of ectopic pregnancy extremely unlikely (1 in 30,000)
- In general an IUP should be visualized when the quantitative β-HCG is greater than 1,000
- When the quantitative β-HCG is less than this and no IUP is seen – indeterminate
  - Early IUP not yet visualized
  - Ectopic pregnancy
  - Must follow with β-HCG and ultrasound
- Patients are evaluated for ectopic pregnancy with transabdominal and transvaginal pelvic ultrasound

Ectopic Pregnancy

- Signs of ectopic pregnancy on ultrasound
  - No IUP
  - Extra-uterine complex mass
  - Free fluid – often seen as complex
  - Pseudogestational sac
  - Rarely extrauterine pregnancy with FHR is seen

Ectopic Pregnancy

- Classic triad is seen in only 45% of patients
  - Pain
  - Bleeding
  - Adnexal mass

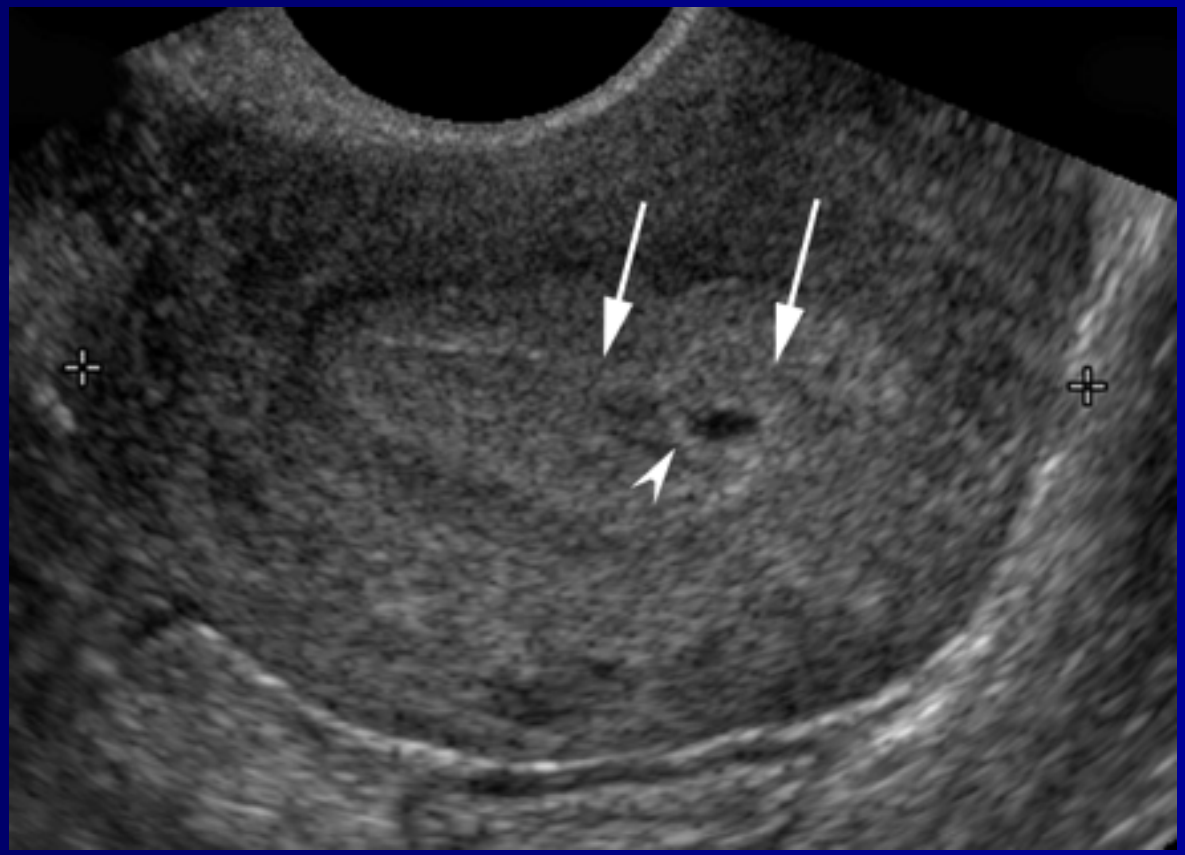
Normal Timeline on US

- 4 weeks

Intradecidual sign - small fluid collection surrounded by an echogenic ring that is eccentrically located within the endometrium, just beneath the uterine cavity line

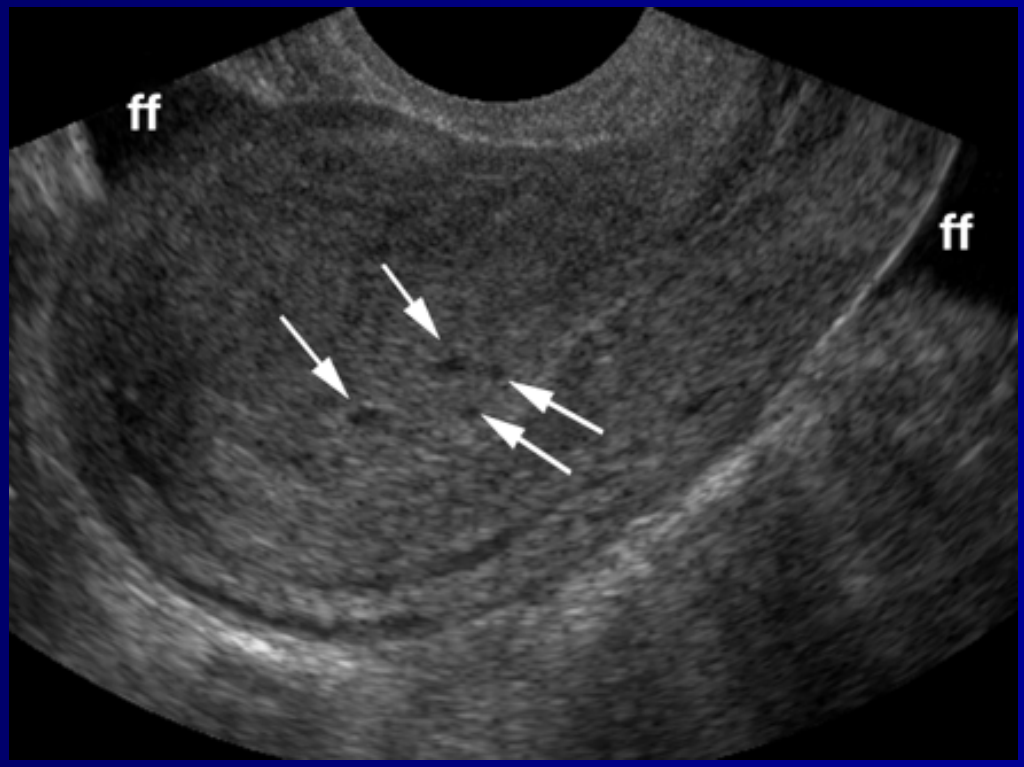
Normal Early IUP

- Intradecidual sign



Normal Early IUP vs. Ectopic

- Thickened endometrium with decidual cysts (note: there is no echogenic rim)



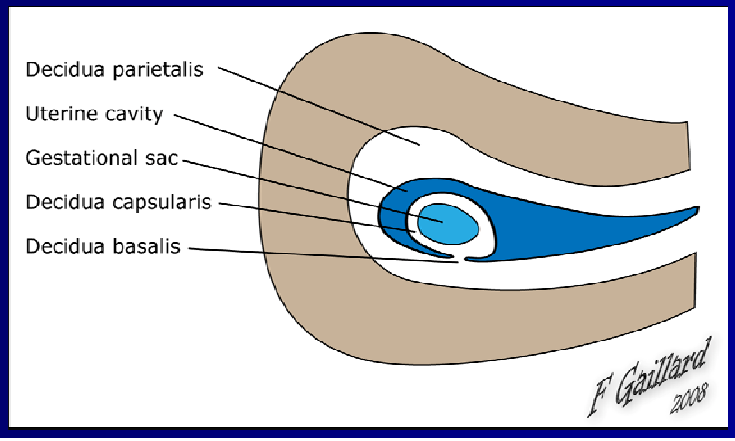
Normal Early IUP vs. Ectopic

- Intradecidual sign
  - Variable sensitivity and specificity
    - Sensitivity 48-68%
    - Specificity 66-100%
- Decidual cyst mistaken for intadecidual sign of IUP
- Important to follow-up (US and beta) to confirm IUP

Normal Timeline on US

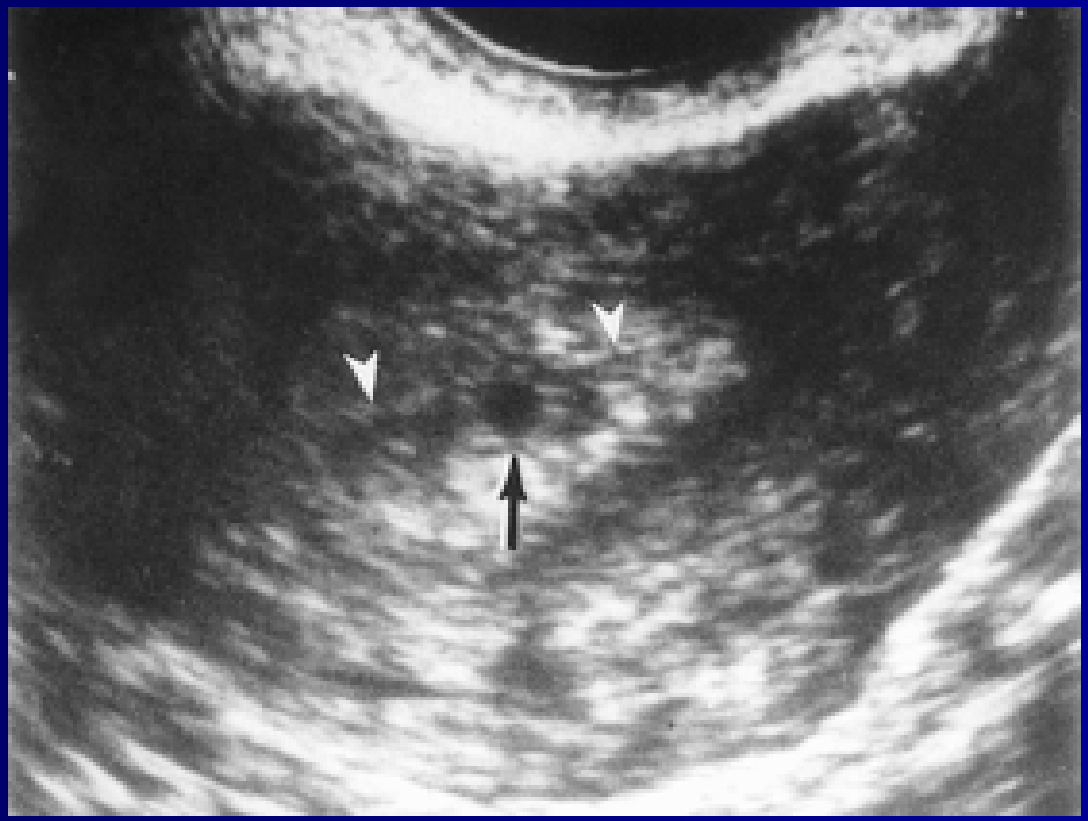
- 5 weeks

  double decidual sac sign - inner rim of decidua capsularis surrounded by a thin crescent of fluid in the endometrial cavity, which in turn is surrounded by the outer echogenic rim of the decidua basalis



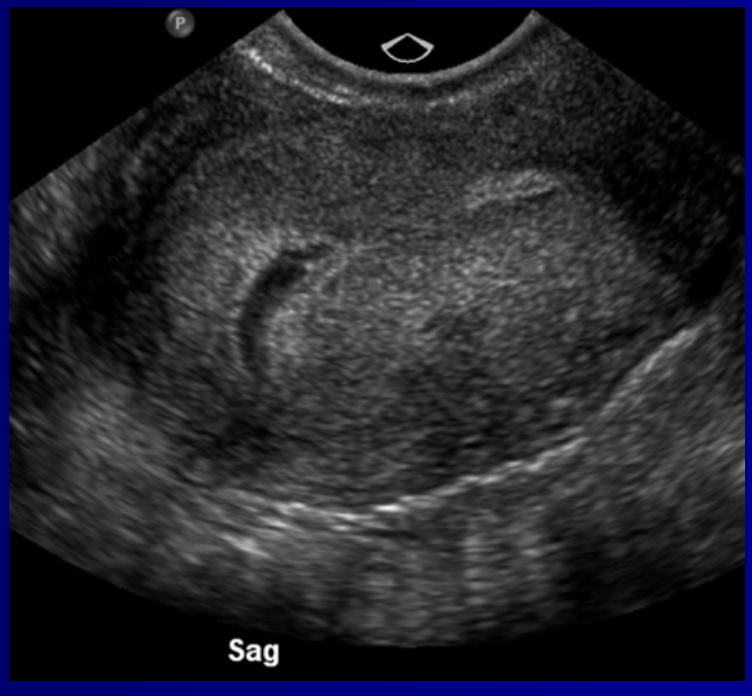
Normal Timeline on US

double decidual sac sign



Pseudosac Sign

- Fluid in the endometrial cavity
- Seen in up to 20% of ectopic pregnancies



Normal Timeline on US

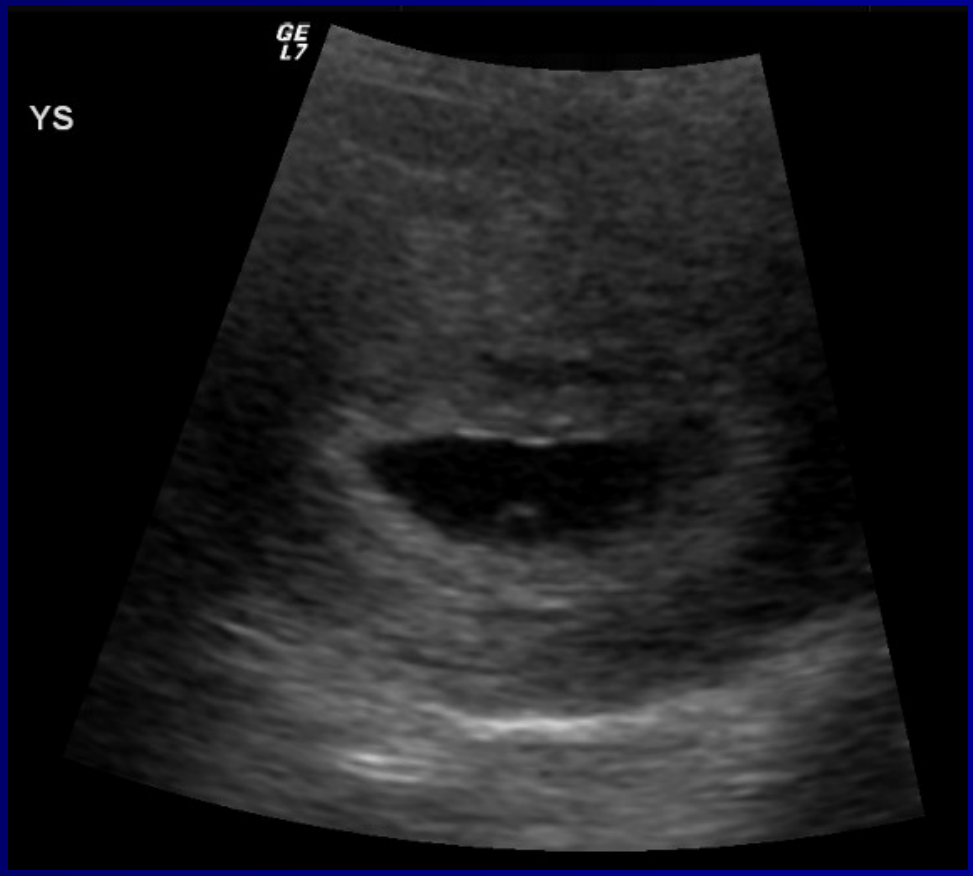
- 5 weeks

Yolk sac – normally seen at 5 weeks but doesn't confirm "normal" IUP

"blighted ovum" – anembryonic pregnancy, early spontaneous abortion in first 6-7 weeks, fetal pole never develops

Normal Timeline on US

Yolk sac

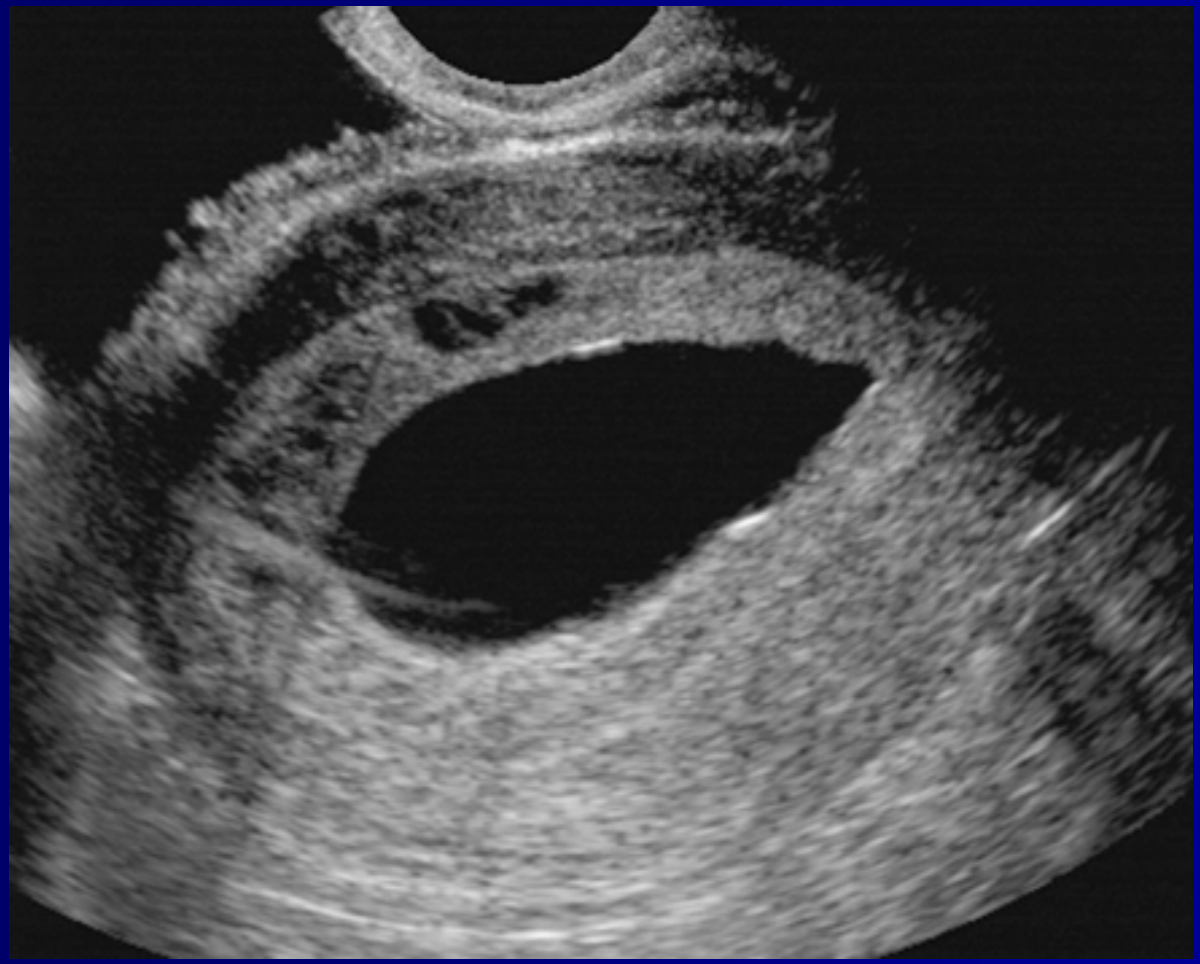


Non-viable Pregnancy

- Criteria for non-viable pregnancy (should be generous, if doubt can do follow-up exam)

1. Nonvisualization of a yolk sac by the time the mean sac diameter is 13 mm
2. Nonvisualization of an embryo by the time the mean sac diameter is 18 mm
3. Nonvisualization of cardiac activity by the time the embryo is 5 mm in length

Non-viable Pregnancy



Normal Timeline on US

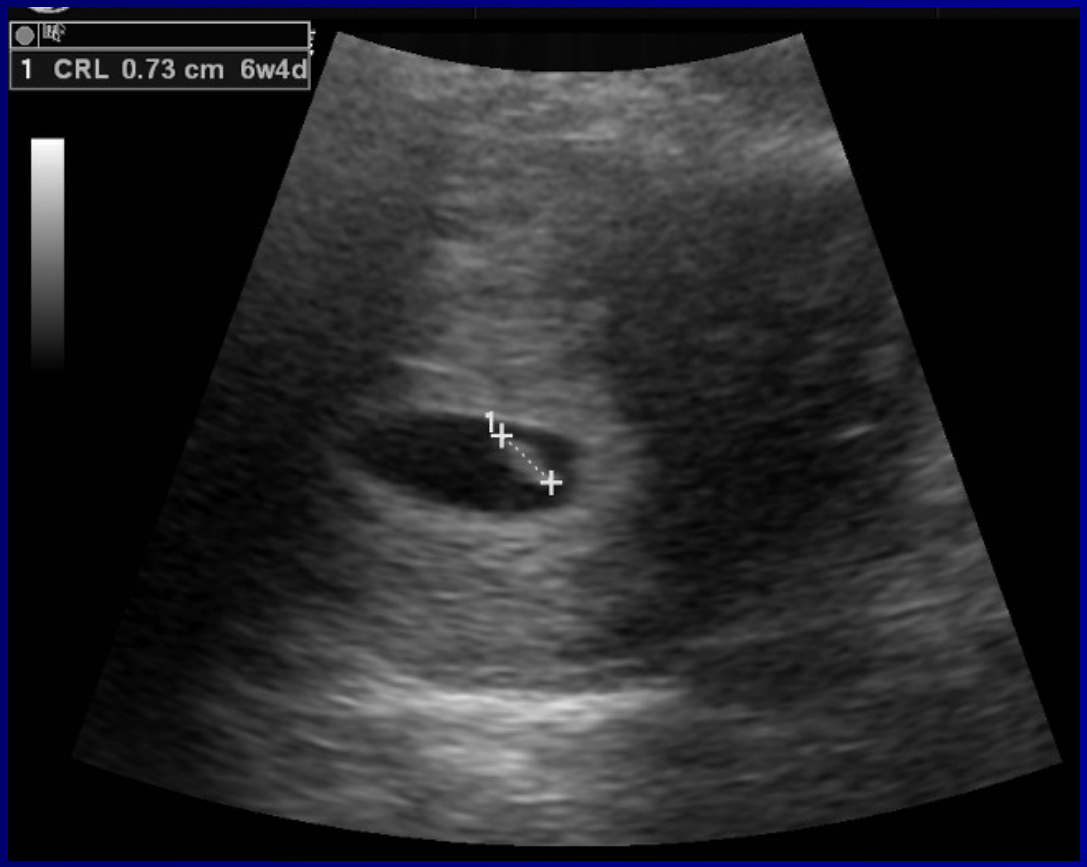
- 6 weeks

Fetal pole – typically seen around 6 weeks and may be visualized as small as 2 mm

Fetal heart beat – should be seen once fetal pole is 5 mm or greater

Normal Timeline on US

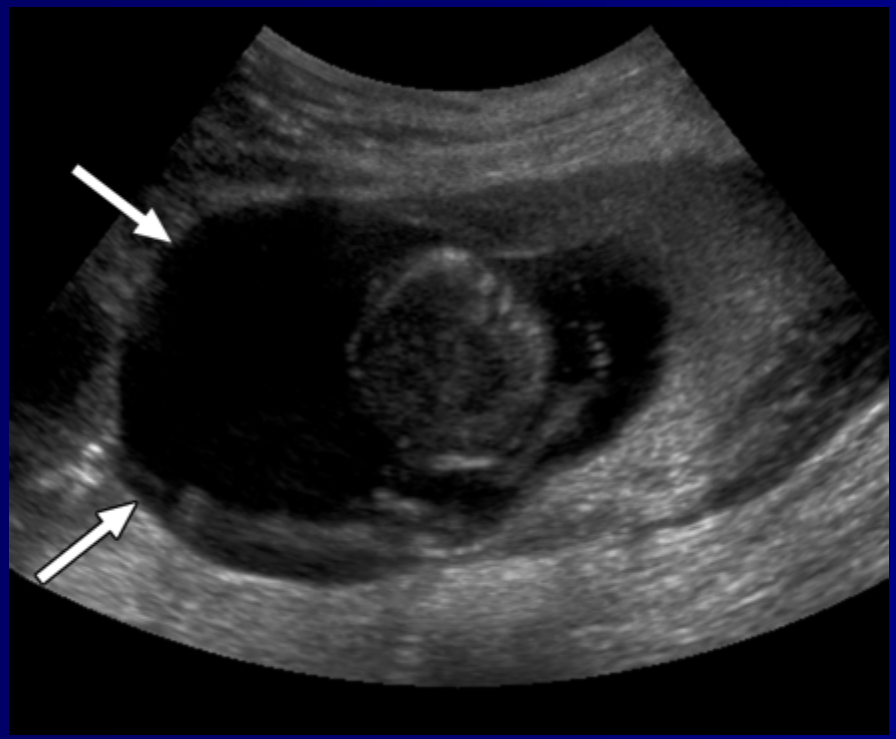
Fetal pole

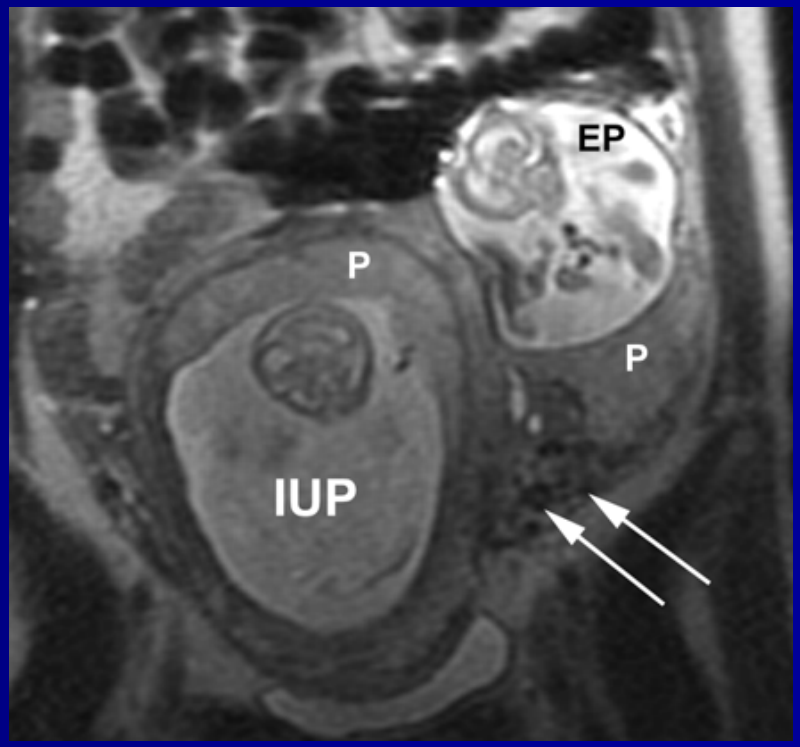


Heterotopic Pregnancies

- Combination of intra and extra-uterine pregnancies
- In general population very rare – approximately 1 in 30,000
- Some populations at increased risk – can be seen in up to 1-3% of patients undergoing ovulation induction
- Important to evaluate for other signs of ectopic even when IUP identified

Heterotopic Pregnancies

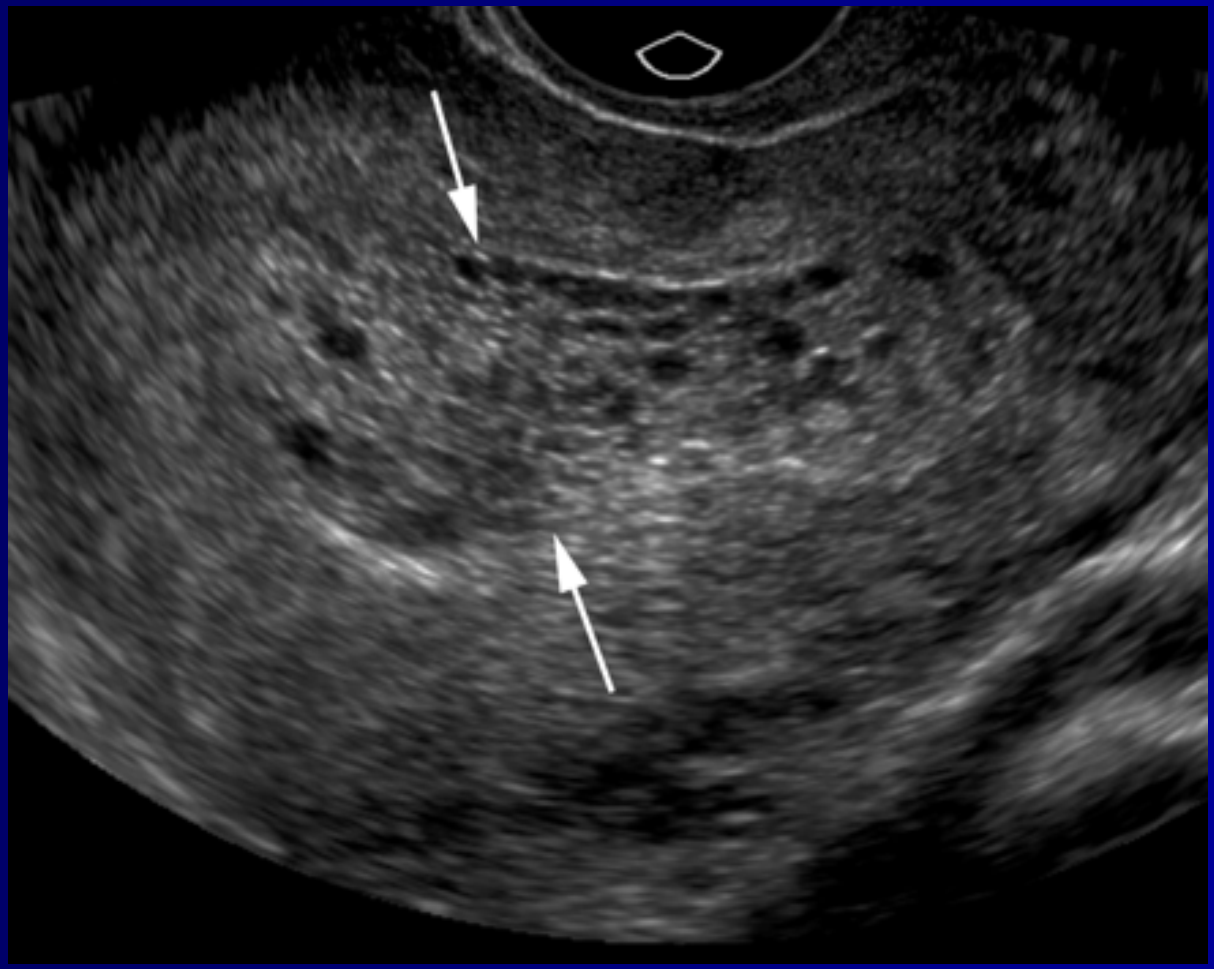




Molar Pregnancy

- Associated with very high β-HCG (typically over 100,000)
- Heterogeneous endometrium with cystic changes

Molar Pregnancy



Pelvic Inflammatory Disease

- Common condition
- Women of reproductive age
- Spectrum of infections typically caused by *Chlamydia trachomatis* and *Neisseria gonorrhoeae*
  - Endometritis
  - Salpingitis
  - Tubo-ovarian abscess
  - peritonitis

Pelvic Inflammatory Disease

- PID can lead to
  - infertility
  - ectopic pregnancy
  - chronic pelvic pain
- Clinical presentation is variable
  - lower abdominal pain
  - fever
  - elevated blood C-reactive protein level
  - adnexal tenderness

Pelvic Inflammatory Disease

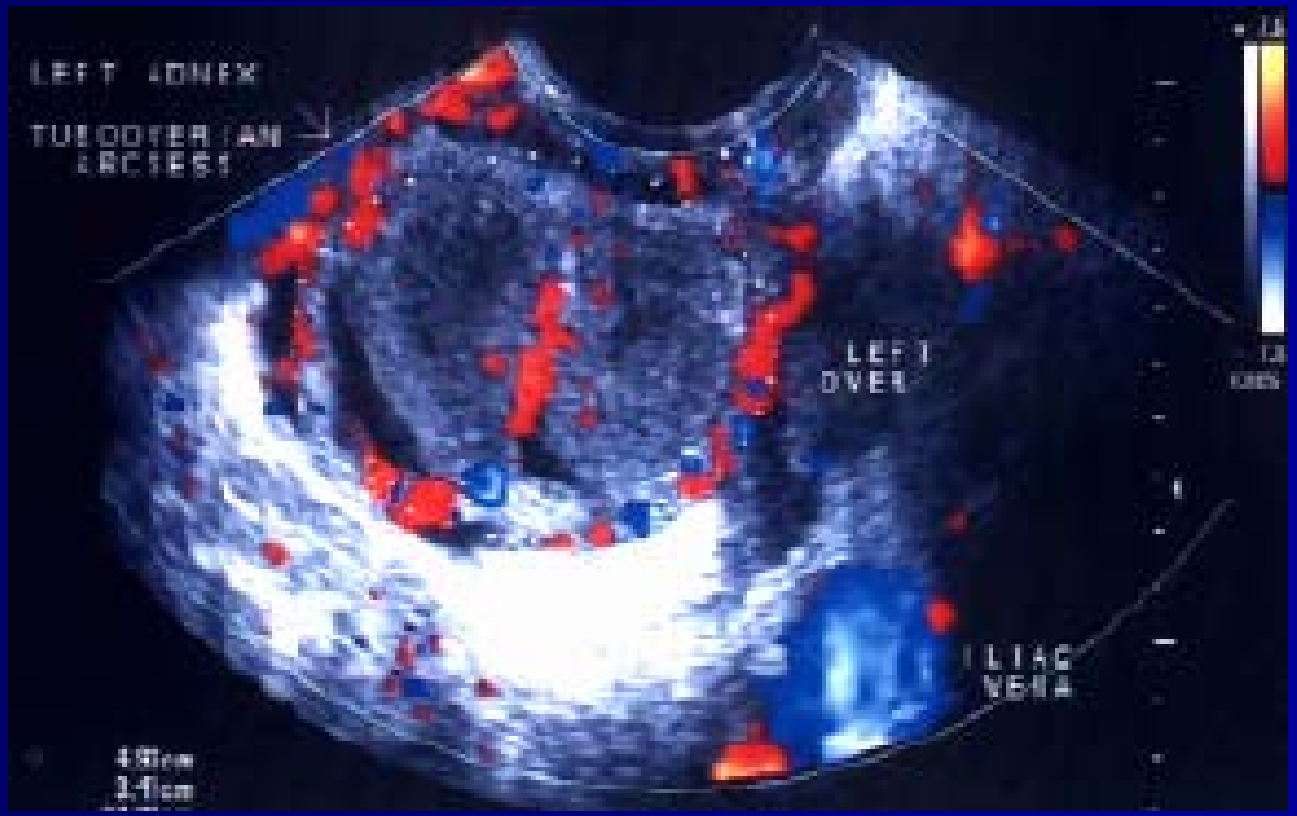
- Evaluation with US and MRI
  - Ultrasound
    - More readily available
    - First line imaging
  - MRI
    - Helps evaluate problem cases

Pelvic Inflammatory Disease

- Ultrasound
  - Endometrium
    - endometritis presents as echogenic and ill-defined endometrial stripe
  - Fallopian tubes
    - hydrosalpinx – fluid filled dilated tubes
    - pyosalpinx – fluid filled tubes with complex, echogenic fluid and thickening of the tube wall, associated free fluid
  - Ovaries
    - Oophoritis presents as ill-defined and enlarged ovaries
    - Tubo-ovarian abscess is a complex adnexal lesion with thick walls and complex fluid centrally

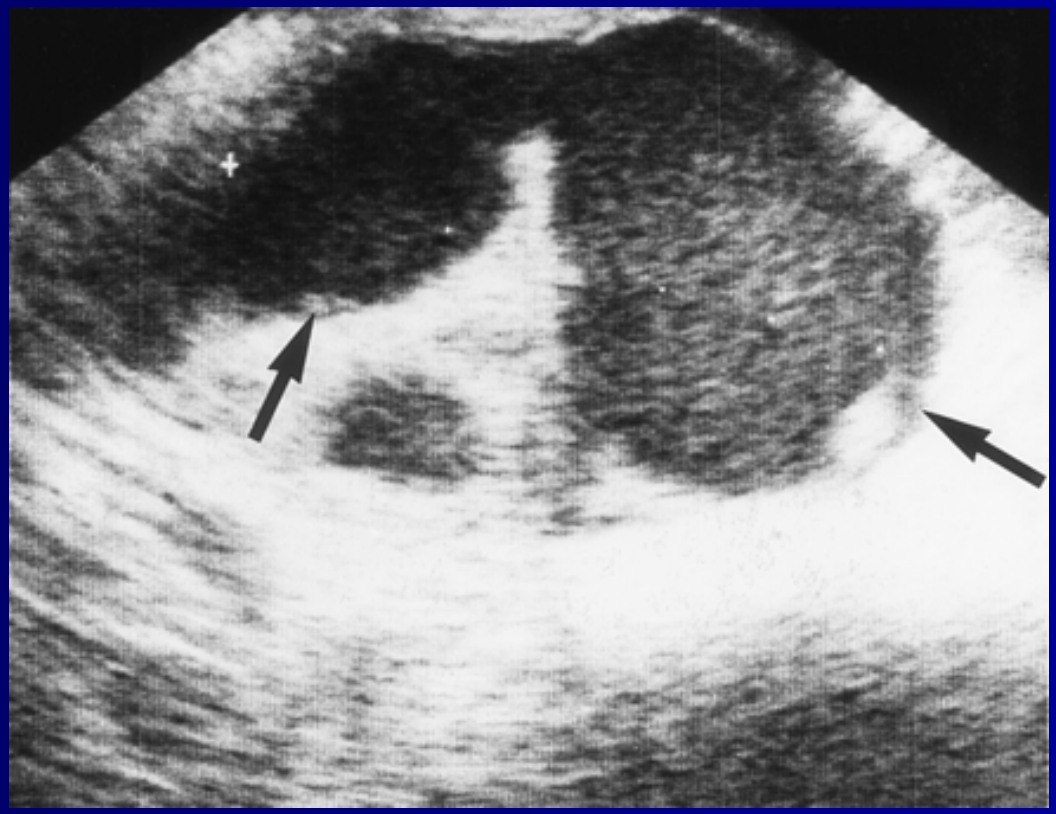
Pelvic Inflammatory Disease

- Tubo ovarian abscess



Pelvic Inflammatory Disease

- pyosalpinx

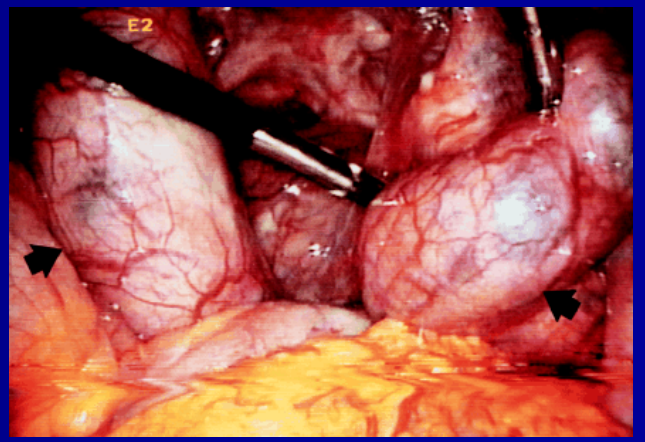


Pelvic Inflammatory Disease

- MRI
  - Fallopian tubes
    - Hydrosalpinx – fluid filled tubes bright on T2 and darker on T1 images
    - Pyosalpinx – consider when more complex fluid and with thickened, enhancing wall
  - Ovaries
    - Oophoritis - enlarged, polycystic-appearing ovaries with ill-defined margins and adjacent fluid
    - Tubo-ovarian abscess – thick walled adnexal masses with decreased T1 and increased and sometimes heterogeneous T2 signal, adjascent free fluid and enhancement

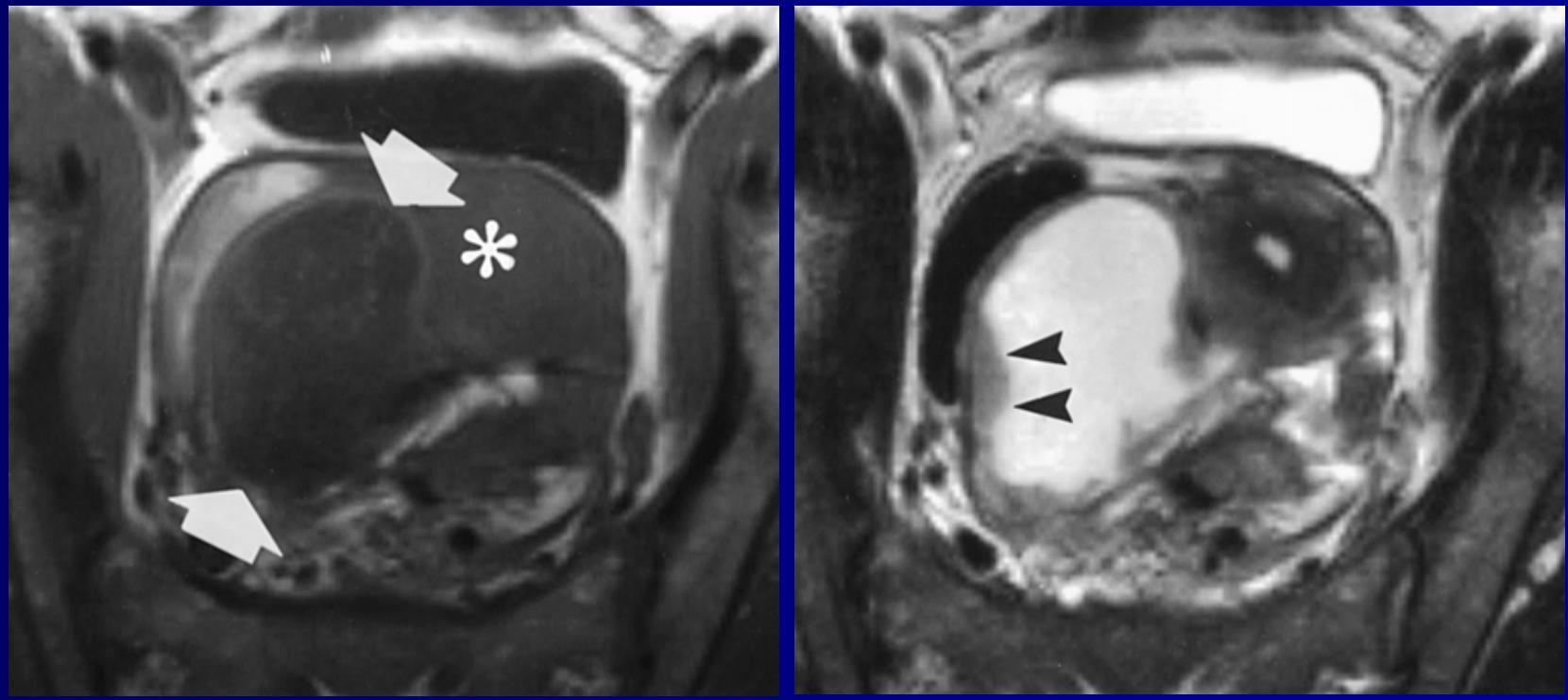
Pelvic Inflammatory Disease

- pyosalpinx



Pelvic Inflammatory Disease

- Tubo-ovarian abscess



Uterine Fibroids

- Very common source of pelvic pain in women
  - One million new cases diagnosed per year
  - Affect approximately 20-40% women over 35 years
  - More common in African Americans – up to 50%
  - Accounts for more than 1/3 of the approximately 600,000 hysterectomies performed each year

Uterine Fibroids

- Fibroid = leiomyoma = benign tumor
  - Overgrowth of smooth muscle and connective tissue
  - Genetic predisposition
  - Hormonal dependency
    - estrogen and progestin receptors
    - May shrink after menopause
  - Very rarely degenerate into malignant tumor (leiomyosarcoma) in about 0.2%

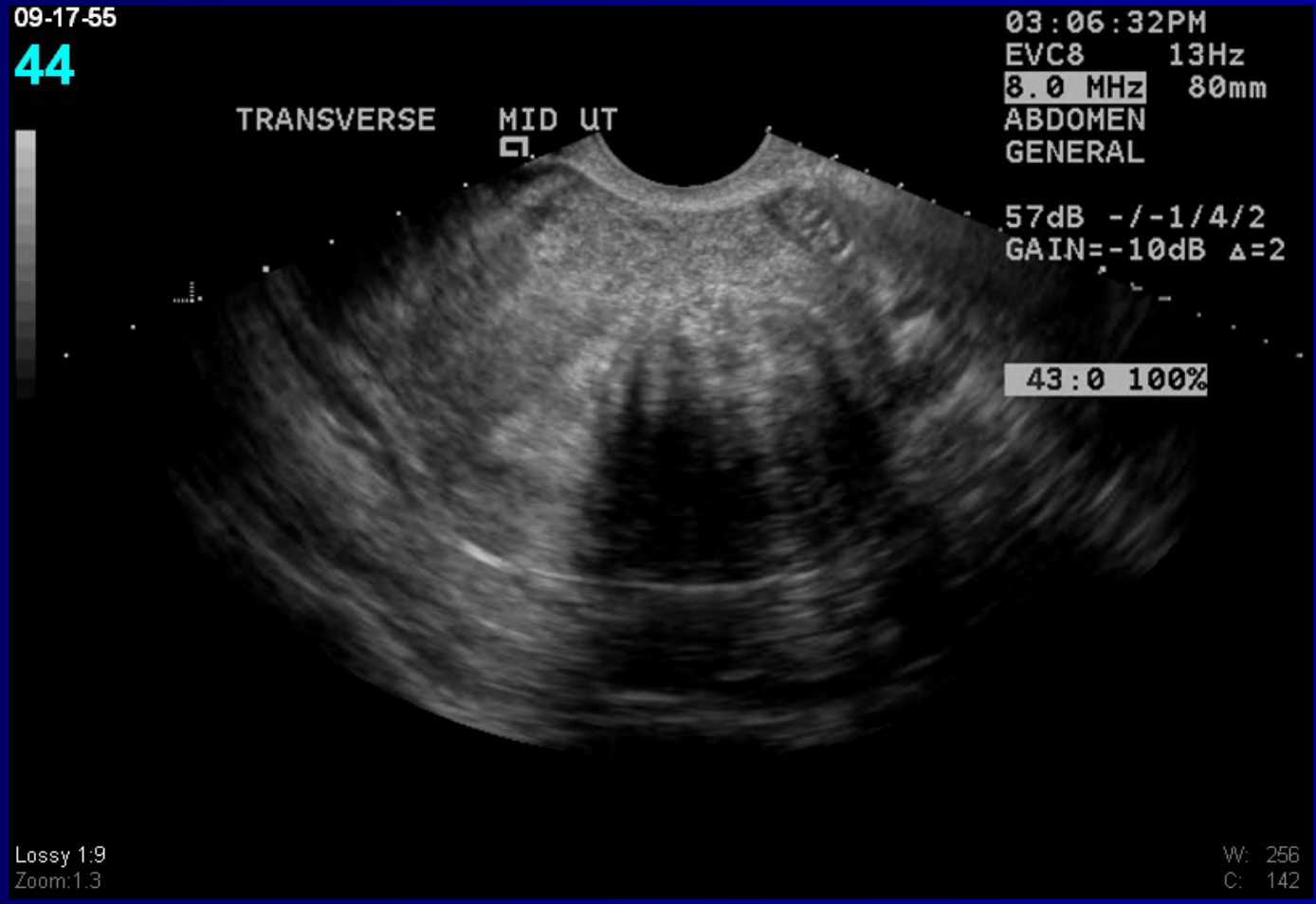
Uterine Fibroids

- Clinical Presentation
  - Menorrhagia – excessive menstrual bleeding
  - Dysmenorrhea – pain during menstruation
  - Bloating, pelvic pressure, frequency of urination, nocturia, constipation, etc.
  - Other bulk symptoms such as sciatic nerve compression

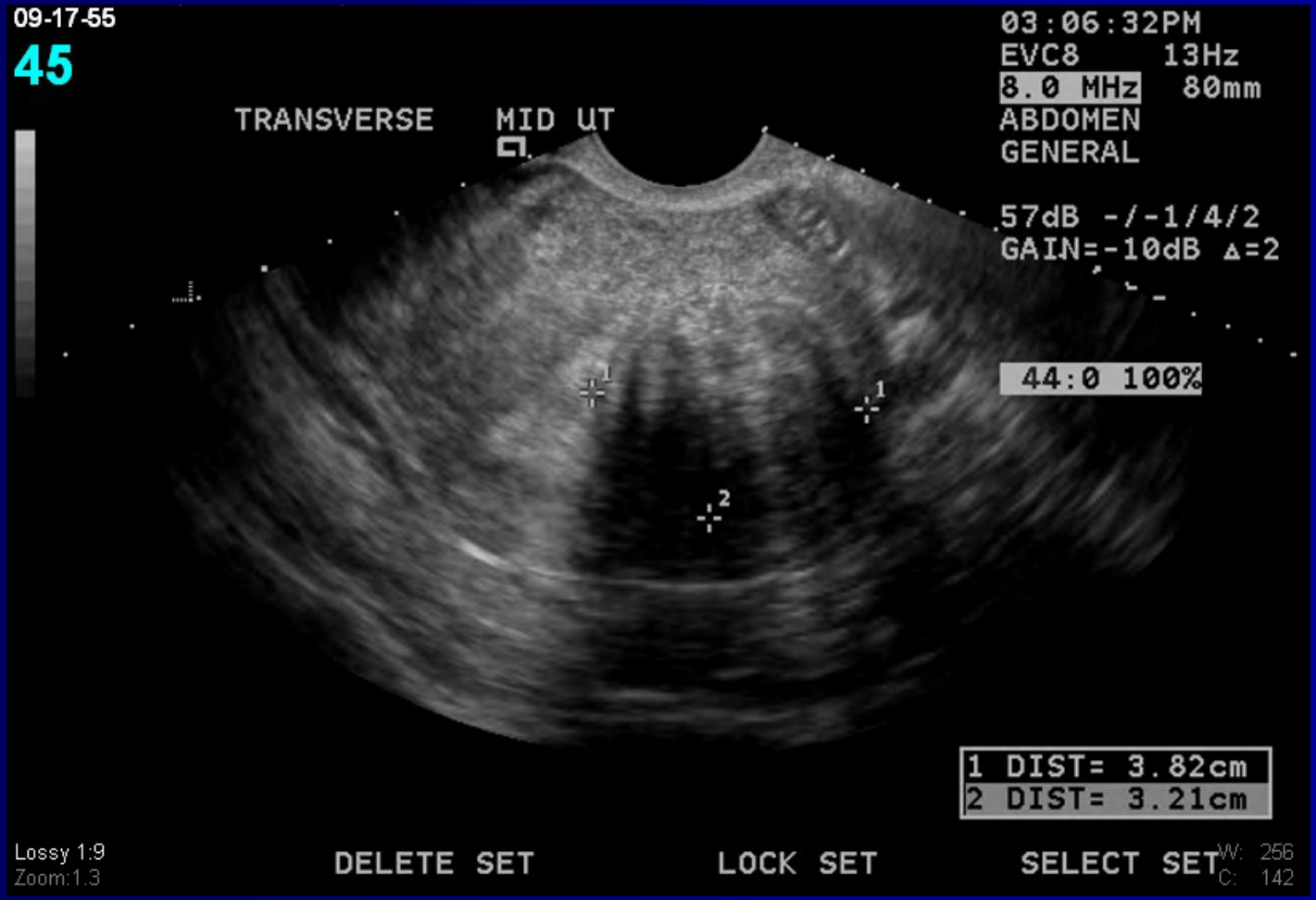
Uterine Fibroids

- Ultrasound
  - Solid
  - Hypoechoic
  - May show areas of increased echogenicity reflecting calcification
  - Well circumscribed

Uterine Fibroids



Uterine Fibroids



Uterine Fibroids

- MRI
  - Solid well circumscribed lesions
  - Generally decreased T2 and low to intermediate T1 signal intensity
  - Usually enhance – degree of enhancement correlates with efficacy of embolization
  - MRI better characterizes fibroids and relationship to the uterus – important for embolization

Uterine Fibroids

- UAE – Uterine artery embolization
  - Well accepted alternative to hysterectomy
  - Efficacy proven in EMMY, REST, and FIBROID registry trials (EMMY and REST were head to head trials with hysterectomy)
  - Future pregnancy still considered contraindication

Uterine Fibroids

- UAE – Uterine artery embolization
  - Similar HRQOL (health related quality of life) scores for UAE and hysterectomy – UAE better at 6 weeks in EMMY
  - Both provide about 90% patient satisfaction at 24 months

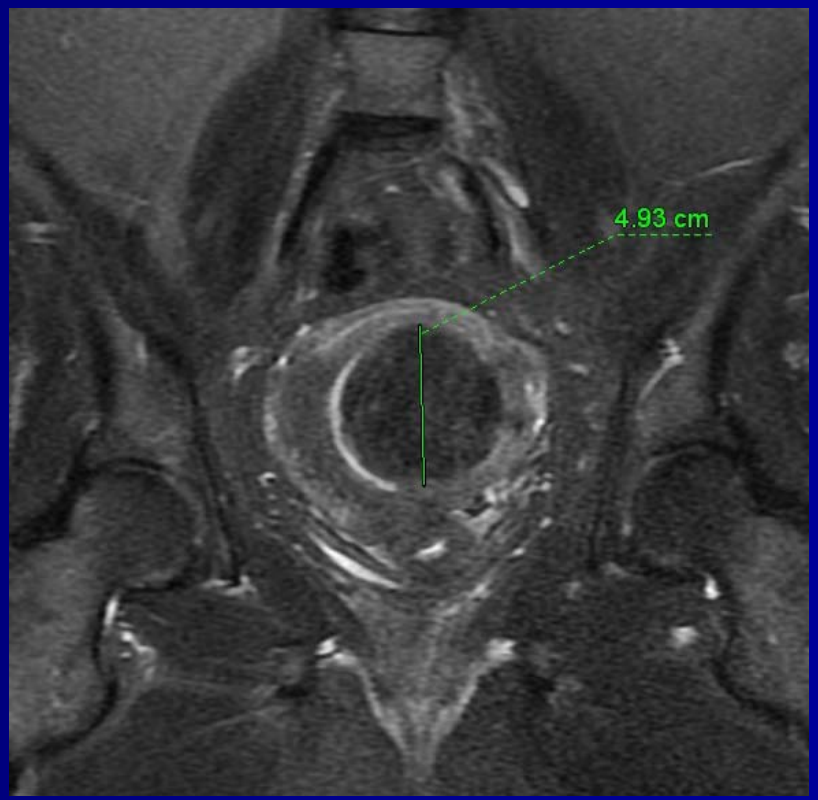
Uterine Fibroids

- UAE has shorter recovery time
  - Overnight hospital stay
  - About 1-2 weeks recovery vs. 4-6 weeks
- No recurrence of fibroids with hysterectomy but Spies et al reports about 20% recurrence at 5 years

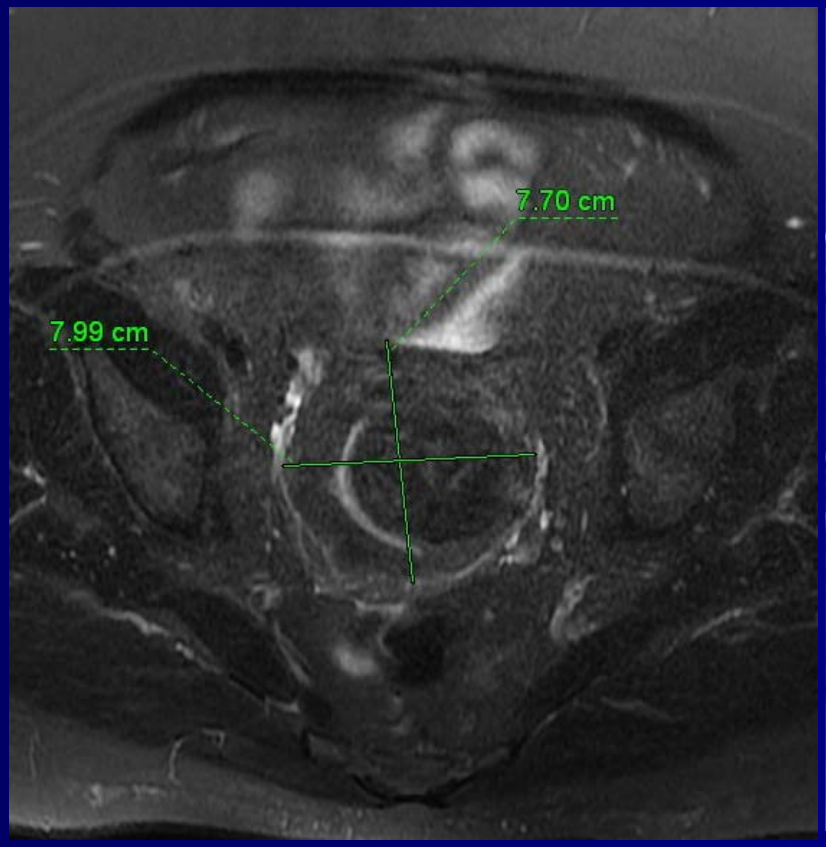
Uterine Fibroids

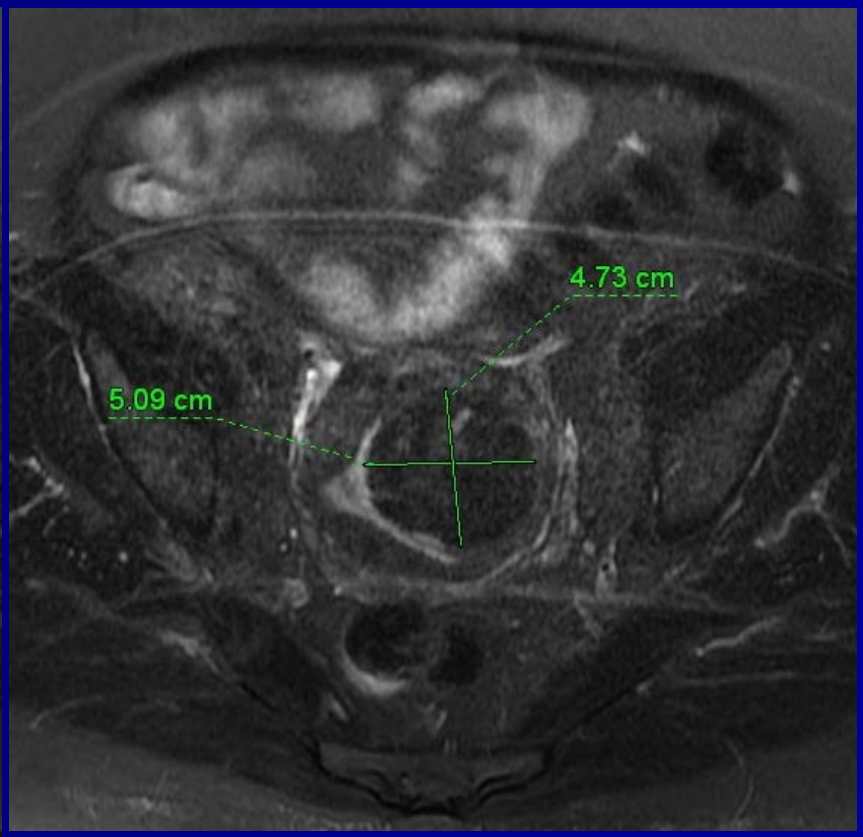
52 yo white female with 3 year history of worsening menorrhagia and dysmenorrhea presents for UAE consultation from gynecologist. She was first diagnosed with fibroids in 2005 on US. MRI is ordered.

Uterine Fibroids

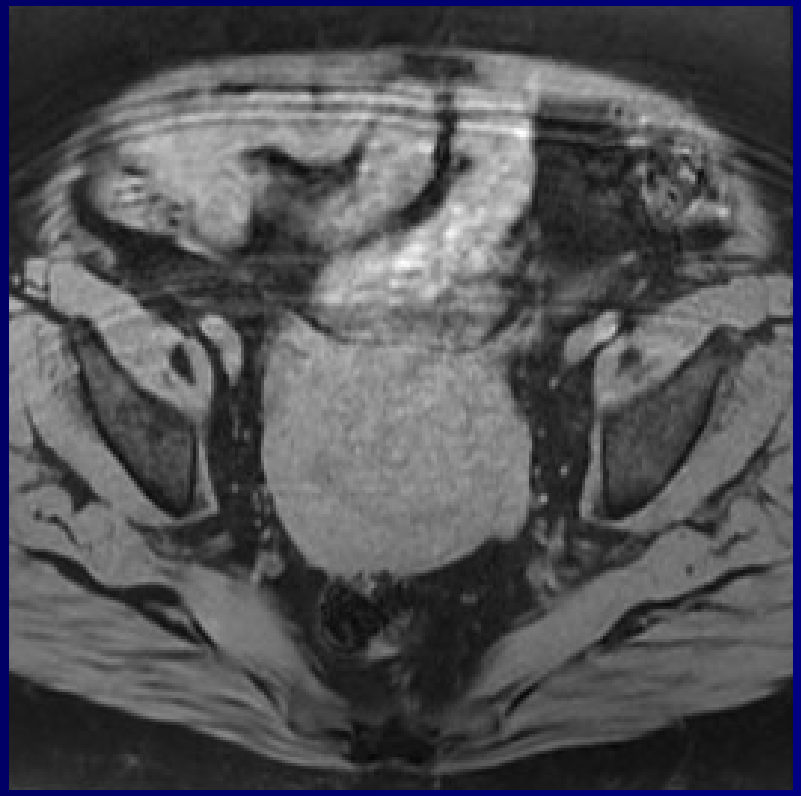


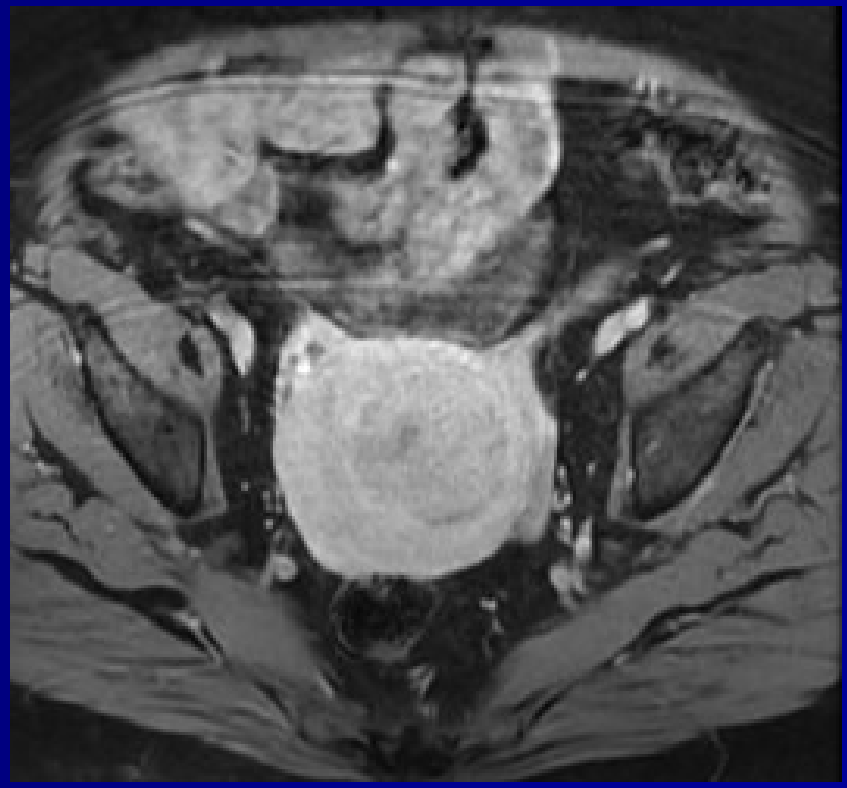
Uterine Fibroids





Uterine Fibroids





Uterine Fibroids

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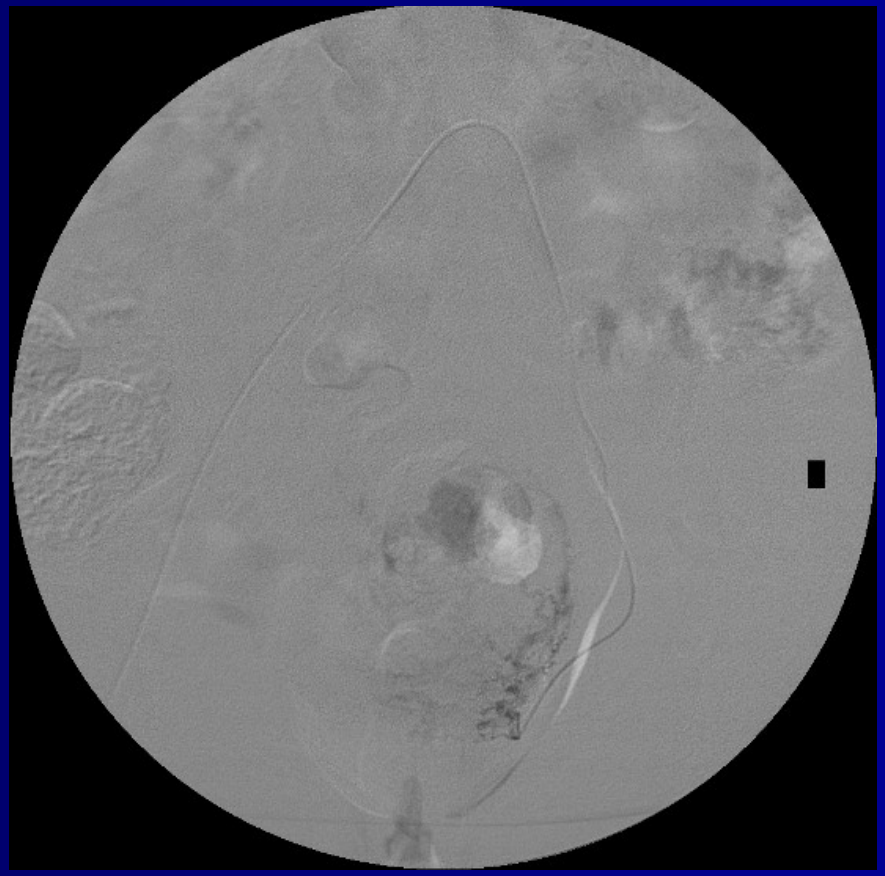

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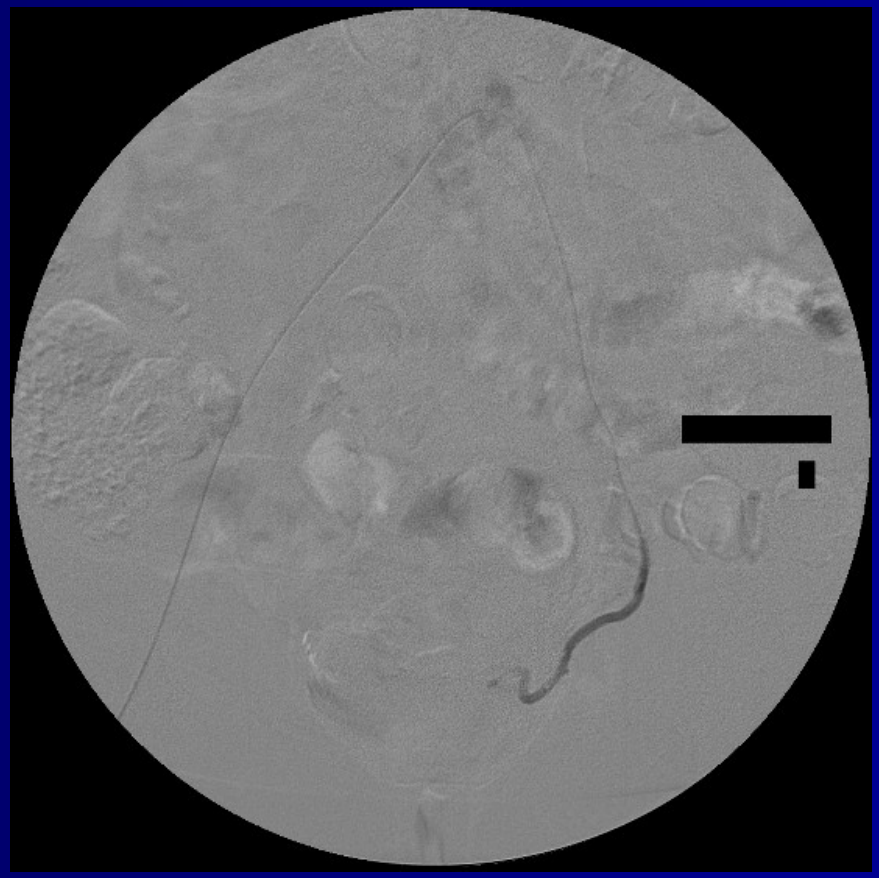

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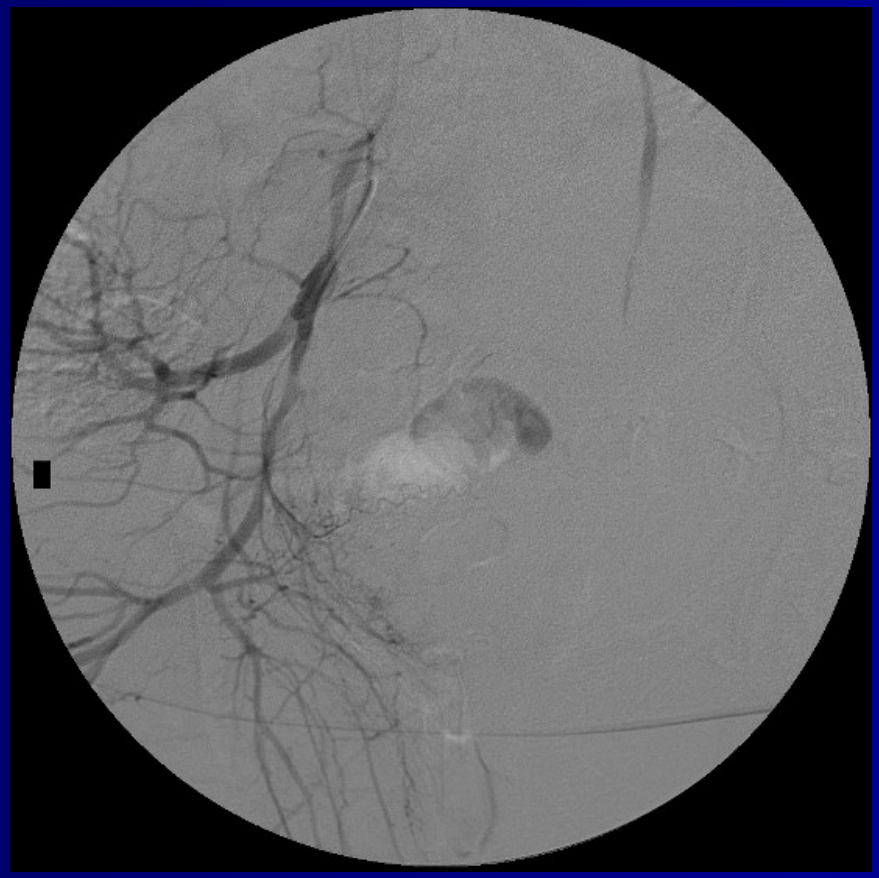

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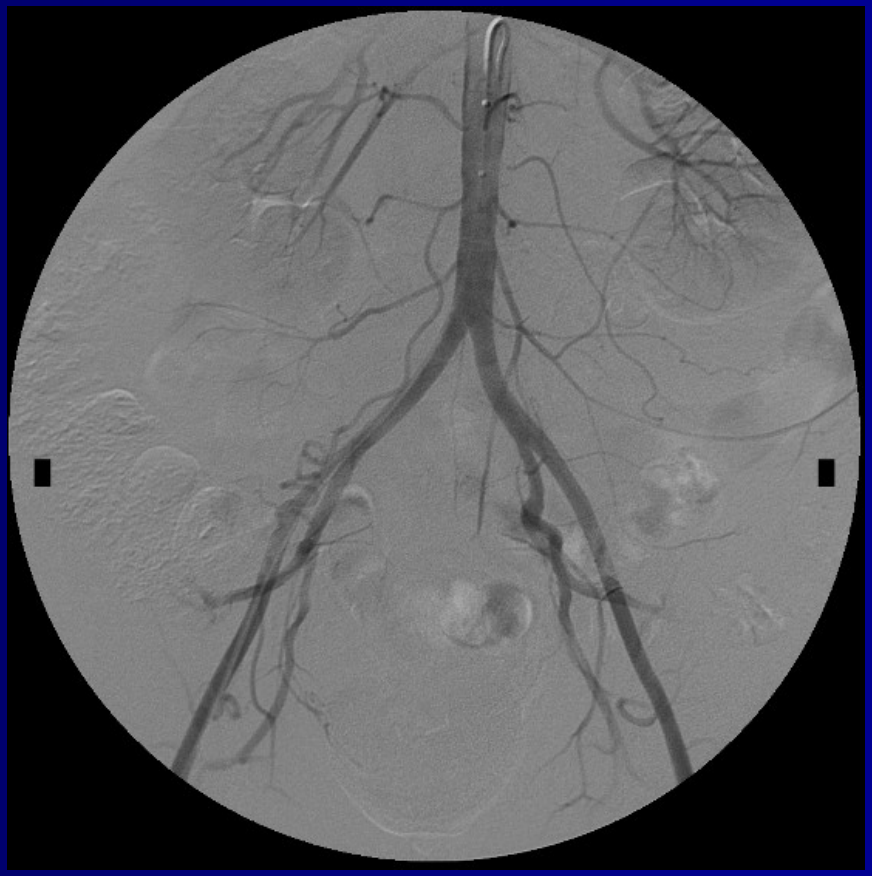

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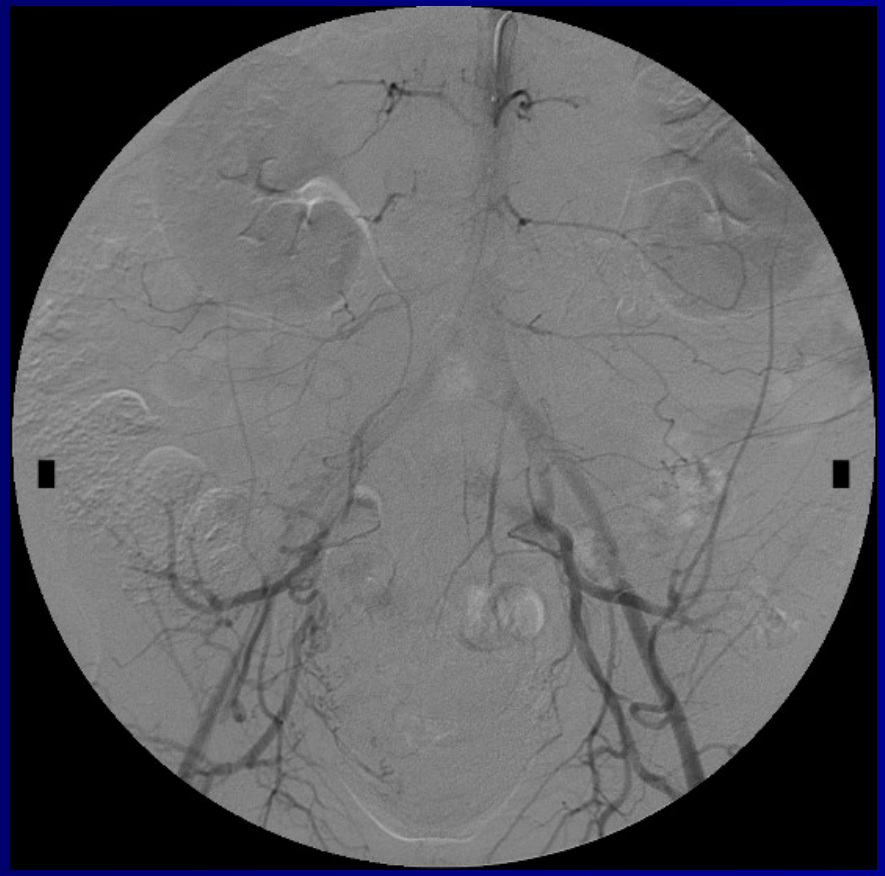

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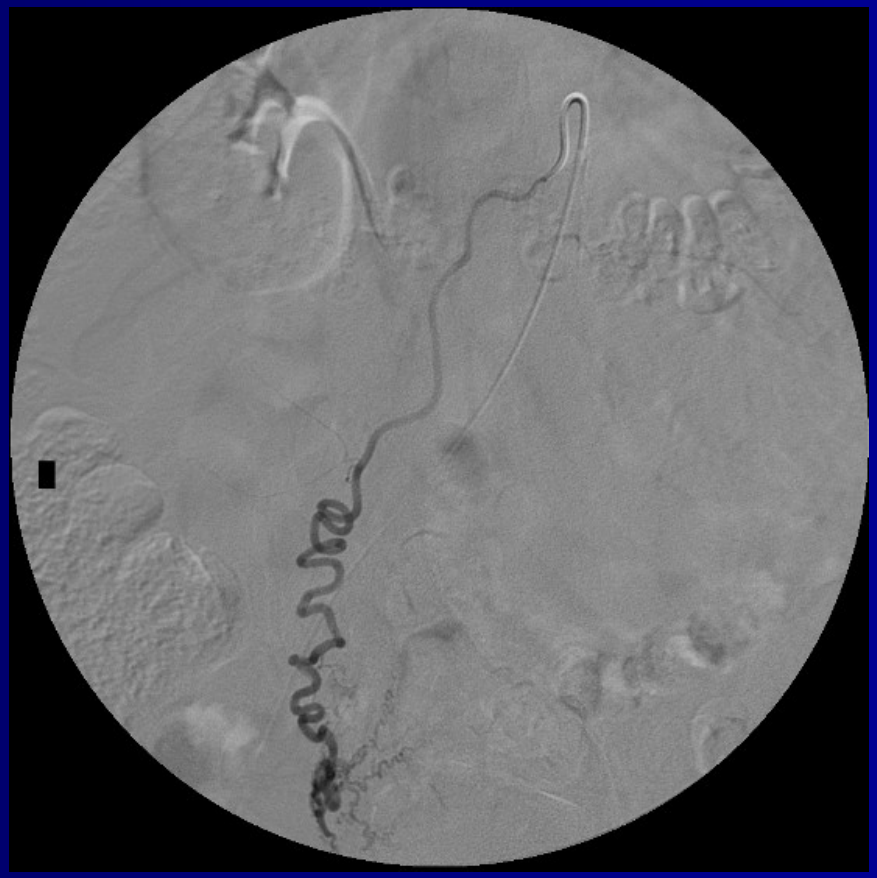

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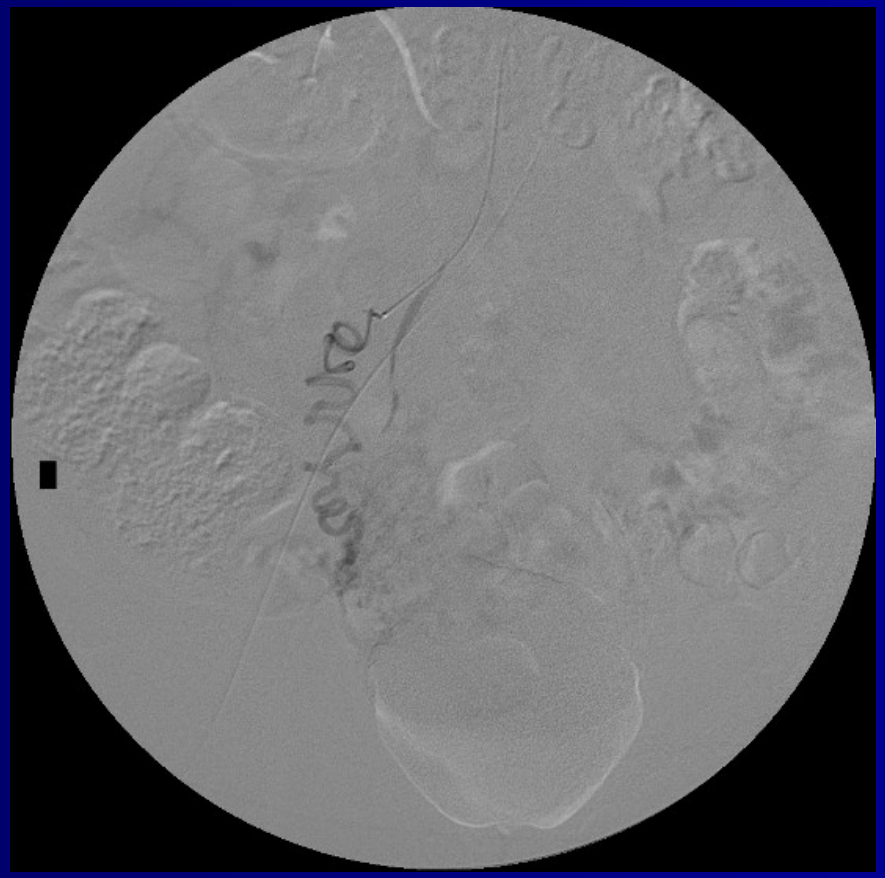

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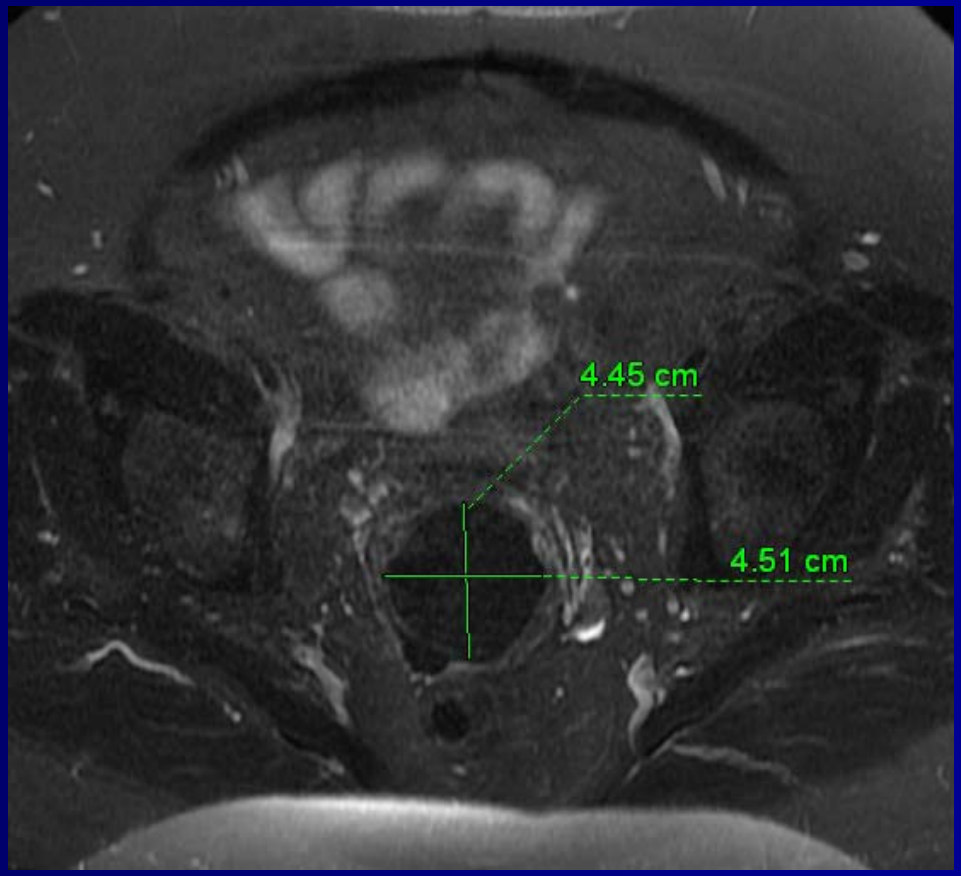

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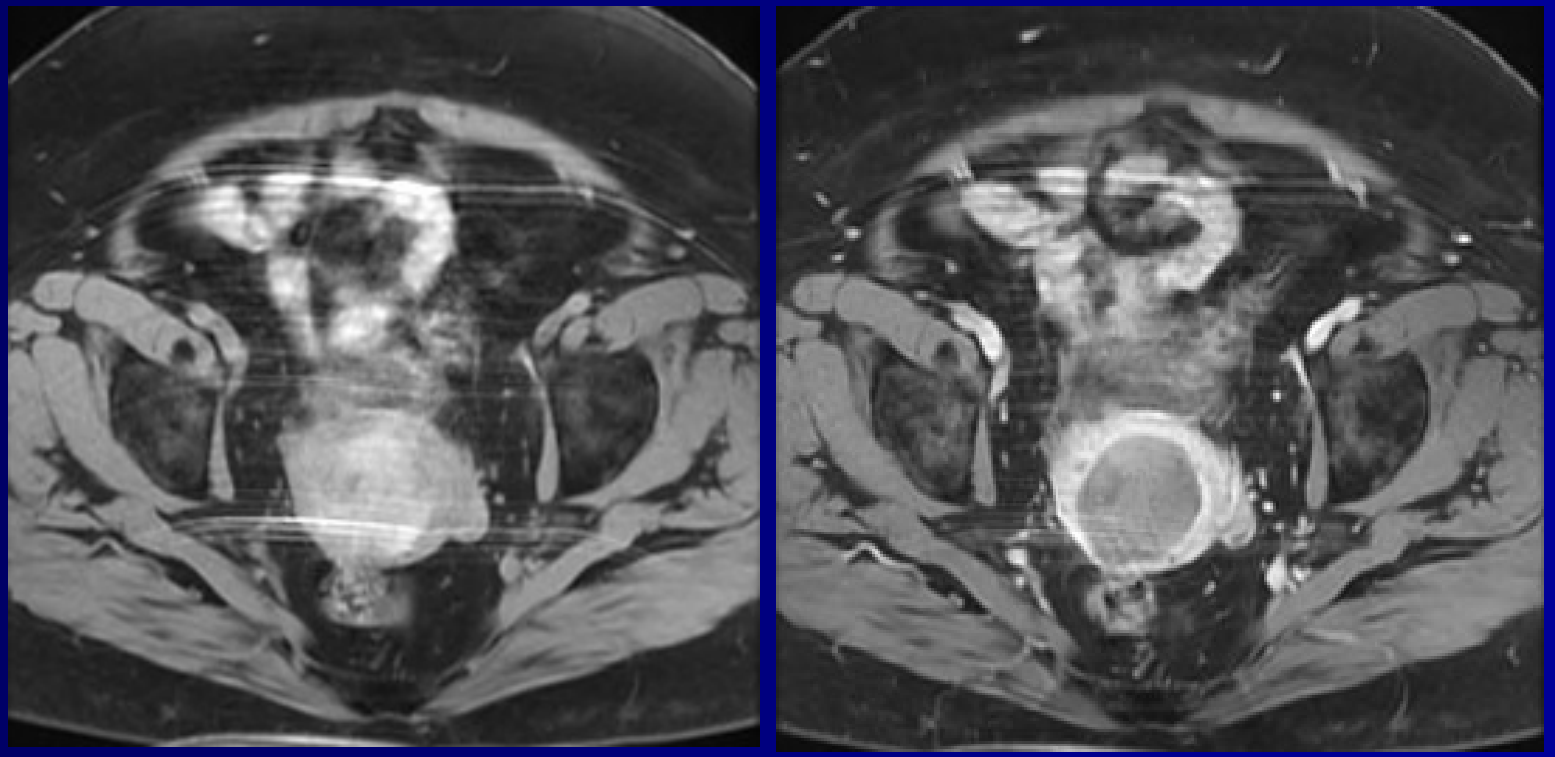

Uterine Fibroids

- Pre-embolization

Uterus:	7.7x8.0x10.0	-	320.32cc
Dominane fibroid:	5.1x4.7x5.0	-	119.85cc

- Post-embolization

Uterus:	6.7x6.6x5.8	-	133.37cc
Dominant fibroid:	4.5x4.5x3.9	-	41.07cc

- Volume Reduction

Uterus:	320.32cc to 133.37cc	58.4%
Dominant fibroid:	119.85cc to 41.07cc	66%

Additional Info

- MR Imaging in Pelvic Inflammatory Disease: Comparison with Laparoscopy and US, Timo A. Tukeva, MD1, Hannu J. Aronen, MD, PhD1, Pertti T. Karjalainen, MD1, Pontus Molander, MD2, Timo Paavonen, MD, PhD3 and Jorma Paavonen, MD, PhD, *Radiology.* 1999;210:209-216
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- Efficacy of the Intradecidual Sign and Fallacy of the Double Decidual Sac Sign in the Diagnosis of Early Intrauterine Pregnancy, Hsu-Chong Yeh, MD, Radiology. 1999;210:579-582
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Thank You