Abdominal MR in Pregnancy

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Why MRI?
• Protocol is robust
  – Motion insensitive
  – Std sequences
  – Done in 20 min
• Safe
  – No ionizing radiation (mom and fetus!)
• Good accuracy to dx appendicitis
• Broad visualization
  – Allows for demonstration of alternate dx’s

Appendicitis in Pregnancy
• Incidence in pregnancy (0.05% - 0.07%) = general population
• Diagnostic challenge
  – displacement of the appendix
  – Physiologic Δ’s of pregnancy
• Perforation (43%-55% vs. 4-19%)
• Fetal death:
  - Perforation (20% vs 2 -3 %)
  - Surgery (3%)

FAQ’s
• Always US first!
  – Ectopic pregnancy
  – Ovarian Torsion
  – Appendicitis
• All MR’s should be monitored (in early experience)
• Safety and efficacy
  – 1.5 Tesla (Do not scan @ 3 Tesla)
  – NO Gadolinium
  – No harm to the fetus in 2nd and 3rd trimester
  – First trimester → risk-benefit (though no known risks)

MRI Protocol
• Informed consent
• 1.5 T MR scanner (GE, Siemens)
• Supine, Phase Array Body Coil
• Oral prep (1.5 hours)
  – 300 mL Gastromark (Mallinckrodt Medical, St. Louis, MO)
  – 300 mL Readi-cat 2 (EZEM, Westbury, NY)
• Same prep can be given retrograde

Oral Contrast on T2-WI

**MRI Protocol**
- SSFSE / HASTE (T2-WI)
  - Axial
  - Coronal
  - Sagittal
- Axial Fat sat SSFSE / HASTE
- Axial 2D TOF
- Axial T1 GRE in- and out-of-phase

**Location of the appendix**

**How do I know this is the appendix?**

**MR criteria for appendicitis**
- Normal
  - Diameter ≤ 6 mm
  - Air and/or contrast in its lumen (blooming on T2*)
- Abnormal
  - Diameter > 7 mm
  - Periappendiceal fat stranding
  - RLQ abscess/phlegmon
- Inconclusive
  - Diameter between 6-7 mm without ancillary findings
MR criteria for appendicitis

Mild Appendicitis (US “Negative”)

13 wks

Acute appendicitis

“Ruling-out” Acute Appendicitis

- MR → normal appendix seen:
  - 89% (20/23) Oto et al. Radiology 2005
  - 88% (105/119) Pedrosa I et al. RSNA 2006

- US → normal appendix typically not seen
  Negative Result = Ambiguous result

Alternative diagnoses

- Fibroid degeneration
- Ovarian torsion
- Right hydronephrosis
- Gas in urinary bladder 2nd to infection
- Right ovarian vein varices

Fibroid “red” degeneration
**Ovarian torsion**

MR findings
- Tubal thickening
- ↑ size & ↑ SI of ovarian stroma on T2-W
  - (probably related to edema)

Ghossain MA et al. JMRI. 2004

**Ovarian hyperstimulation syndrome**

- Complication of ovulation induction (65%)
- Only 0.2-0.3% require hospitalization
- Abdominal pain, N&V, diarrhea
- MR findings:
  - Diffusely enlargement of the ovaries
  - Multiple large cysts of uniform size (1-3 cm)
  - Hemorrhage within cysts (↑ SI on T1-W)
  - Ascitis
- Complications: hemorrhage, torsion

**Hydronephrosis**

Pregnancy hydronephrosis

Roy C. Magn Reson Imaging 1995
Conclusion

- Prevalence of acute appendicitis among pregnant women with abdominal pain is extremely low.
- Identification of a normal appendix excludes acute appendicitis
- MR can avoid unnecessary radiation with an excellent NPV, diagnose acute appendicitis, and identify other sources of abdominal pain