Imaging in Pregnant Patients: Examination Appropriateness

C. Stalvey
I. Schmalfuss

Intro
- Risk of radiation exposure to fetus
- US and MRI are preferred for evaluating acute conditions in a pregnant patient
- No exam should be withheld when an important clinical diagnosis is under consideration
- No evidence to suggest significant risk to fetus after single imaging study or interventional procedure
- All efforts should be made to minimize exposure, with consideration of risk vs benefit for each given clinical scenario

Stochastic effects
- Result of cellular damage, likely at the DNA level, causing cancer or other germ cell mutation
- No threshold value
- Theorized to occur with exposure to any amount of ionizing radiation
- Severity of radiation-induced stochastic effects is independent of the radiation dose

Nonstochastic effects
- Threshold effects or deterministic effects
- Caused by exposure to radiation at high doses
- Effects are predictable and involve nucleic acid, chromosomal, or cellular injury, which can include chromosome aberrations
- Threshold effects follow a linear progression, with risk proportional to increasing dose
- Risks depend on the timing of the exposure

Recommendations for use of CT in Pregnancy
- ACOG
  - Perform necessary examinations only after clinical work-up
  - Iodinated contrast material in pregnancy
- Counsel for radiation exposure

- ACR
  - Keep radiation levels as low as reasonably achievable (ALARA)
  - Iodinated contrast material in pregnancy
  - Counsel for radiation exposure

2008 ACR practice guidelines
- "To maintain a high standard of safety, particularly when imaging potentially pregnant patients, imaging radiation must be applied at levels as low as reasonably achievable (ALARA), while the degree of medical benefit must counterbalance the well-managed levels of risk."

MR Imaging
- Advantages of MR
  - Lack of ionizing radiation
  - Multiphase capability
  - Excellent soft tissue contrast
- Risk to the fetus (at 1.5-T magnet strength) appears negligible and is outweighed by the potential benefit of making a necessary diagnosis

Recommendations for use of MR in Pregnancy
- Safety Committee of the Society of Magnetic Resonance Imaging – 1991
  - When other non-ionizing forms of diagnostic imaging are inadequate
  - If diagnosis would otherwise require exposure to ionizing radiation
  - No evidence of adverse effects on the fetus or embryo of patients undergoing MR imaging during pregnancy
- ACR – 2007
  - MR imaging should be used when the risk-benefit ratio warrants the study

Informed Consent
- Obtain informed consent to document
  - Patient's comprehension of the alternative options
  - Risks and benefits of the procedure to be performed
  - Contrast material-related risk should be obtained from patients receiving
  - Intravenous contrast material
  - Iodinated contrast material
  - Gadolinium contrast material
Most Common Clinical Scenarios with Algorithms

- Pulmonary Embolism
- Appendicitis
- Trauma
- Urolithiasis
- Nonspecific Abdominal Pain
  - Colitis/Inflammation
  - Infective/Infectious
  - Gastrointestinal blood loss
  - Peritonitis
  - Liver

Pulmonary Embolism

- Obtain PA lateral chest radiographs and check for symptoms of DVT.
- Assess for alternative diagnoses.
- Asymptomatic
- Symptomatic
- Non-pulmonary embolism
- Further imaging
- No further imaging
- Low-dose CPA or incidental long-distance imaging

Nonspecific Abdominal Pain

- Ultrasound
- If ultrasound is non-diagnostic
- MR Abdominal/Pelvic
- CECT Low Dose Protocol

Specific Abdominal Pain

- RLQ Pain
- Strong Suspicion of Appendicitis

- FLUQ, LUQ or LLQ Pain
- Flank Pain
- Suspected Urolithiasis

RUQ, LUQ or LLQ Pain

- Flank Pain

Strong Suspicion of Appendicitis

* Use CT if MR imaging is unavailable
Pelvic Pain

Summary

- Non-ionizing modalities (US, MR) preferred for evaluating acute conditions in pregnant patients
- No examination should be withheld when an important clinical diagnosis is under consideration
- Exposure to ionizing radiation may be unavoidable, but there is no evidence to suggest that the risk to the fetus after a single imaging study or interventional procedure is significant
- All efforts should be made to minimize the exposure, with consideration of the risk versus benefit for a given clinical scenario

References