Diagnostic Imaging Studies
Radiology for the Primary Care Provider
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Objectives

- Understand the types of diagnostic imaging studies that are available and the information they can provide.
- Determine the clinical indications for obtaining studies and the relative risk/benefit of radiologic procedures
- Explain the diagnostic limitations of imaging studies and how these parameters affect patient care.

Overview

- Modality overview
  - X-ray, Ultrasound, CT, and MRI
  - Fluoroscopy, Mammography, Nuclear Medicine
- Contrast Overview
- Imaging by body part
  - Neuro
  - Chest
  - Abdomen/Pelvis

X-ray

- Pros
  - Low cost
  - Access
- Cons
  - Radiation
  - Low sensitivity
Ultrasound

• Pros
  • Low cost
  • No radiation
  • Soft tissue

• Cons
  • User dependent
  • Limitations:
    • Body habitus
    • Bone and air

CT

• Pros
  • Cost
  • Availability
  • Resolution

• Cons
  • Cost
  • Radiation

MRI

• Pros
  • No Radiation
  • Soft Tissue

• Cons
  • High Cost
  • Limitations:
    • Availability
    • Time
    • Motion
    • Bone and air

Contrast Enhanced Imaging

• Ultrasound
• X-ray/CT
• MRI
When do I use contrast?

• Inflammatory Process
• Neoplastic Process
• Endovascular Imaging

X-ray and CT Contrast

• Intravenous vs oral contrast
  • Intravenous contrast
    • Iodinated contrast media – CT, IVP
  • Oral Contrast
    • Barium vs iodinated water soluble contrast

Ultrasound

• Contrast-enhanced ultrasound (CEUS)
  • Microbubbles

Iodinated Contrast
Contrast Induced Nephrotoxicity

• Etiology
  • Renal hemodynamic changes (vasoconstriction) vs direct tubular toxicity.
• Diagnosis
  • Serum creatinine > .3mg/dL
  • Percent increase in creatinine > 50%
  • Urine output reduced to <.5mL/kg/hr for 6 hrs
• Avoid contrast if creatinine > 1.5 to 2.0
• Hydration most effective prevention
CT Contrast

MRI Contrast

- Gadolinium based agents
MRI Contrast
Nephrogenic Systemic Fibrosis

- Fibrosing disease involving the skin, subcutaneous tissues, and organs.
- Gadolinium based agents and chronic kidney disease.
  - Dissociation of gadolinium from chelate.
- Avoid contrast if GFR < 30.

MRI Contrast

MRI Contrast

Neuro Imaging
Available Studies

- Brain
  - CT Brain
  - CT Brain w/wo
  - CTA Head/Neck
  - MRI Brain
  - MRI Brain w/wo
    - Routine, IAC, Pituitary, Seizure
  - MRA Head/Neck

- Spine
  - CT Spine
  - CT Spine w/wo
  - CT Myelogram
  - MRI Spine
  - MRI Spine w/wo
History: 78 year old female s/p fall with head trauma.

History: 56 yo M with 6 days of constant headache.
History: 75 yo female presenting with aphasia and right sided weakness.

History: 63 yo man with HTN, DM, PVD, ESRD s/p kidney transplant presenting with dizziness and right facial droop.
History: 70 yo Female brought in by family, nonverbal with r sided paralysis.
History: 76 yo female with unsteady gait, remote hx of lung cancer.
History: 44 yo male with history of IVDA presenting with low back pain.
History: 37 yo female with back pain.

Chest Imaging
Available Studies
- CT Chest
- CT Chest w
- CTA Chest
  - PE
  - Dissection
- MRI Chest
- MRI w/wo
- MRA w or wo

History: 57 yo female with ESRD on peritoneal dialysis presenting with back pain.
History: 63 yo with chest pain and abdominal pain.
54 year old admitted for colloid cyst resection.
Abd Imaging
Available Studies
• CT Abd/Pel wo
• CT Abd/Pel w
• CT Abd/Pel w/wo
• CTA
• MRI wo
• MRI w/wo
• MRA

History: RLQ pain and nausea
History: 22 yr old F, 15 wk pregnant with RLQ abdominal pain.
History: 54 yo female with LLQ pain.

History: Another patient with LLQ pain.

Normal Diverticulosis Diverticulitis w/ Perforation
History: 55 yo male with HIV presenting with left flank pain.

History: Acute onset LLQ pain.
History: Epigastric pain, nausea.
History: 55 yo female presenting with RUQ and RLQ abdominal pain.

History: 77 yo male with an ileus with an increasing white count.
History: 34 yo presenting with fever 103 and LLQ pain. R/O abscess or TOA.

Is anyone still awake?
ACR Appropriateness Criteria


• Microbubble-enhanced US Body Imaging. Radiology; Volume 257: Number 1—October 2010

References