Common Radiology Studies in Pediatric Surgery: Make no Bones About it!

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Disclosure Information

I have no disclosures

Objectives

By the end of this presentation, the learner will be able to:
1. Discuss a basic approach to interpreting common radiology studies, including chest and abdominal X-rays, upper GIs, and CT scans.
2. Discuss key radiographic findings exhibited by patients with congenital abnormalities.
3. Recognize key abnormal radiological findings with acquired surgical diagnoses.
Specific Radiology Examinations

- Chest X-ray (CXR)
- Abdominal X-ray (KUB)
- Computerized topography (CT)
  - Chest
  - Abdomen
- Ultrasound
- Upper gastrointestinal series (UGI)
- Contrast enema
- Esophagram

Chest X-ray

**Quality:**
- Rotation
- Inclusion
- Penetration
- Expansion

**Interpretation:**
- Airway
- Bone
- Cardiac
- Diaphragm
- Extrathoracic tissues
- Fields
- Gastric bubble
- Hilum and mediastinum
- Instrumentation

Abdominal X-ray

**Interpretation:**
- Air
- Bowel
- Calcifications
- Diaphragm
- Everything else
Normal Abdominal X-ray

- Air?
- Bowel
- Calcifications?
- Diaphragm
- Everything else

Flat
Upright

Computerized Topography (CT) Abdomen

Ultrasound

May be used for diagnosis or evaluation of:
- Masses
- Appendicitis
- Intussusception
- Cholelithiasis/cholecystitis
- Hypertrophic pyloric stenosis
- Malrotation
- Ovarian pathologies
SMA/SMV to Evaluate for Malrotation

SMA = Superior Mesenteric Artery
SMV = Superior Mesenteric Vein

Esophagram

May be used for:
- Evaluation for esophageal stricture
- Integrity of anastomosis after TE fistula repair
- Retained food bolus
- Esophageal damage after caustic ingestion (e.g. battery)
- Other congenital abnormalities
Upper Gastrointestinal Series

Used to evaluate for:

- Duodenal atresia
- Malrotation
- Strictures or atresias of small bowel
- Hypertrophic pyloric stenosis (not modality of choice)
Contrast Enema

Used to evaluate for:

- Hirschprung disease
- Strictures or atresias of colon
- Other reasons for delayed passage of meconium

Treatment for intussusception

May use:

- Air
- Water soluble contrast
- Barium

Normal Contrast Enema

Radiological Findings of Specific Surgical Diagnoses
Appendicitis

Diagnostic Criteria:
• Enlarged >6mm diameter
• Wall thickening >2mm
• Wall enhancement
• Fat stranding
• Appendicolith
• Fluid filled
Appendicitis

Pyloric Stenosis

Diagnostic Criteria:

- Muscle Thickness >3mm
- Channel Length >14mm
- Failure of channel to open and stomach contents to empty
Necrotizing Enterocolitis

Placement of Medical Devices

Central Venous Line Placement

The tip of the CVL should be in the superior vena cava or at the cavo-atrial junction.
Central Venous Line Placement

Central Venous Line Placement

Central Venous Line Placement
Post-Pyloric Tube

Nasojejunal Tube

Congenital Abnormalities
Duodenal Atresia

Coiled Orogastric Tube (OGT)

Absence of distal bowel gas

What is your diagnosis?

Long Gap Esophageal Atresia
Long Gap Esophageal Atresia

What is your diagnosis?

Esophageal Atresia with Distal Fistula (C)

Coiled OGT

Presence of distal bowel gas
Work Up for Midline Defects

- Esophageal Atresia +/- Tracheoesophageal Fistula
- Imperforate Anus +/- Fistula
- Omphalocele

Work Up for Midline Defects

- Physical Exam
- Echocardiogram
- Renal Ultrasound
- Spinal Ultrasound +/- Delayed MRI
- Skeletal Survey

Imperforate Anus with Bucket Handle
High Pressure Distal Colostogram

Malrotation

Malrotation with Midgut Volvulus
Esophageal Stricture

Esophageal Diverticulum and Stricture
Free Air

Pectus Excavatum

Haller Index:
243/72 = 3.37

Bezoar
Radiation exposure may lead to:
- Increased cancer risk throughout lifetime

Pediatric considerations
- Children are more radiation sensitive
- Potential for radiation exposure over lifetime

Radiation exposure expressed as effective dose

- Millisievert (mSv)
  - Considered whole body dose of radiation in relation to environmental exposure
  - Typical environmental exposure is 3 mSv/year

Qualitative risk levels
- Negligible - less than 2 days background exposure
- Minimal - more than 2 days, less than 1 month background exposure
- Very low - more than 1 month, less than 8 months
- Low - 8 months to 6 years
- Moderate - more than 6 years

<table>
<thead>
<tr>
<th>Type of Exam</th>
<th>Months of Annual Background Radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 view CXR</td>
<td>10 days</td>
</tr>
<tr>
<td>CT scan of abdomen and pelvis</td>
<td>3 years</td>
</tr>
<tr>
<td>Upper GI</td>
<td>2 years</td>
</tr>
<tr>
<td>CT chest</td>
<td>2 years</td>
</tr>
<tr>
<td>CT head</td>
<td>8 months</td>
</tr>
</tbody>
</table>
### Radiation Exposure

Helpful websites regarding guidelines for pediatrics:

- American College of Radiology  
  - www.acr.org  
- Image Gently  
  - www.imagegently.org  
- The Society for Pediatric Radiology  
  - www.pedrad.org

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### One last story.....

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### ANY QUESTIONS

Special thanks to Tom Boulden, MD for his help and review.