The Role of Sonography in the Diagnosis and Management of Necrotizing Enterocolitis

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No Disclosures

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Necrotizing Enterocolitis

• Necrotizing Enterocolitis: Assessment of Bowel Vialbility with Color Doppler US
  Ricardo Faingold, Alan Daneman et al, Radiology 2005;235:587-594

• Necrotizing Enterocolitis: Review of State-of-Art Imaging Findings with Pathologic Correlation

• Correlation of Sonographic Findings and Outcome in Necrotizing Enterocolitis
Necrotizing Enterocolitis

• *Comparison of sonography and plain radiographs for the detection of pneumoperitoneum in neonates*
  
  *Cicero Silva, Alan Daneman et al - IPR, Montreal, 2006*

• *How ultrasound contributes to the diagnosis and management of necrotizing enterocolitis*

  *Csilla Balassy, Aideen Moore, Ted Gerstle, Alan Daneman*  
  *APSA, Palm Springs, USA, May 2011*

• *A prospective comparison of intestinal sonography and abdominal radiographs in a neonatal intensive care unit*

  *Cicero Silva, Alan Daneman et al Pediatr Radiol 2013;43:1453-1463*
Necrotizing Enterocolitis:
Review of State-of-Art Imaging Findings with Pathologic Correlation
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Necrotizing Enterocolitis:
Review of State-of-Art Imaging Findings with Pathologic Correlation
Radiography vs Sonography

1. GAS - Intraluminal bowel gas - dilated/pattern
   Intramural gas
   Portal venous gas
   Free gas

2. CALCIFICATION - peritoneal, mural, lumen

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1. FLUID - free fluid
   Focal fluid/abscess
   Intraluminal G.I. fluid

2. BOWEL WALL - thickness/echogenicity
   Peristalsis - (real time)
   Perfusion - (Doppler)

AXR/US

US
Sonography

1. Intestinal wall
   - thickness
   - echogenicity
   - intramural gas
   - peristalsis
   - flow (color/power Doppler)

2. Liver – portal venous gas

3. Peritoneal cavity
   - fluid – free/focal
   - gas – pneumoperitoneum
Necrotizing Enterocolitis: Review of State-of-Art Imaging Findings with Pathologic Correlation
Monica Epelman, Alan Daneman et al, Radiology 2007;27:285-305
Necrotizing Enterocolitis: Review of State-of-Art Imaging Findings with Pathologic Correlation
Pneumoperitoneum
Intestinal wall
- Intramural gas (IMG)
Intestinal wall
- echogenicity
- thickness
Intestinal wall
- Pitfall 1
- Thickness / distension
Intestinal wall
- Pitfall 2
- Thickness and echogenicity
Intestinal wall - perfusion
Pneumoperitoneum
Necrotizing Enterocolitis: Assessment of Bowel Viability with Color Doppler US
Faingold, Daneman et al, Radiology 2005;235:587-594
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Neonatal Pneumoperitoneum
Silva, Daneman et al IPR Montreal 2006

- 5-year
  (Sep ‘00 - Dec ‘05)
- 62 neo NEC
- AXR + AUS
- Free gas in 11
- Proven perf.

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Pneumoperitoneum
- Pitfall 1
Pneumoperitoneum
- Pitfall 1
Pneumoperitoneum
- Pitfall 2
Purpose: Diagnosis of necrosis prior to perforation

**CDS**
- Absent perfusion 12/12 (2 Stage II+10 Stage III)
- CDS - 92 - 100% sensitivity

**AXR**
- Free Air 5/12
- AXR - 41.6% Sensitivity

**AXR vs CDS**
- p-value = 0.0156

Necrotizing Enterocolitis: Assessment of Bowel Viability with Color Doppler US
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US provided additional useful information in:

- 72% (23/32) of patients who had US
- 59% (23/39) of all patients

How ultrasound contributes to the diagnosis and management of necrotizing enterocolitis

Csilla Balassy, Aideen Moore, Ted Gerstle, Alan Daneman
APSA, Palm Springs, USA, May 2011
Purpose: To correlate US findings with outcome-40 neonates NEC

Adverse outcome (surgery/died) associated with:
In descending order of importance

1: Free gas
2: Focal fluid collections or
3: Three or more of:
   - increased bowel wall echogenicity - 3.65
   - absent bowel perfusion - 3.27
   - portal venous gas - 3.27
   - bowel wall thinning - 3.07
   - bowel wall thickening - 3.07
   - free fluid with echoes - 2.78
   - intramural gas - 1.64

Correlation of Sonographic Findings and Outcome in Necrotizing Enterocolitis
Purpose: To correlate US findings with outcome

Unhelpful in predicting outcome:

Risk Ratio

1. Increased perfusion - 0.95
2. Anechoic free fluid - 0.16

Correlation of Sonographic Findings and Outcome in Necrotizing Enterocolitis