

NECROTIZING ENTEROCOLITIS (NEC) ULTRASOUND PROTOCOL

BILLING CODES: UABDL & UORGDL

PATIENT PREP: NPO 2-3 hours preferred, however NPO status is not required.

EQUIPMENT: mL26-8 or eL18 and mC12-3 or c5-8

The attending radiologist should be present for all NEC ultrasound exams when possible.

NECROTIZING ENTEROCOLITIS is inflammation of the intestine. This can lead bacterial invasion causing cellular damage or death of the colon and intestine. NEC can lead to intestinal perforation which can result in peritonitis, sepsis, and death of the neonate. Causes of NEC can be prematurity, chorioamnionitis, low oxygen levels during birth, congenital heart disease and blood transfusion. Signs and symptoms of NEC are non-specific, but may include poor feeding, vomiting or diarrhea, lethargy, blood in stool, and abdominal tenderness or bloating.

NEC ULTRASOUND EXAMINATION WILL EVALUATE FOR:

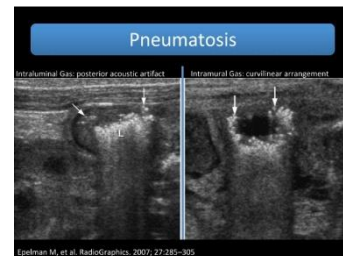
- Peristalsis of bowel
- Perfusion of bowel wall
- Thickened, thinned, or perforation of bowel wall
- Gas within the bowel wall
- Bowel loop dilation
- Echogenic contents in bowel lumen
- Ascites
- Complex fluid or abscess
- Air/gas within the portal venous system

IMAGES TO OBTAIN

BOWEL LOOPS

High frequency, linear transducer eL18-4 or higher to be used. Hockey stick mL26-8 preferred.

- **ALL FOUR QUADRANTS and MIDLINE:**
 - Start with scanning the RLQ, then RUQ, LUQ, LLQ. The RLQ has the highest likelihood of developing NEC.
 - Cine clip in sagittal and transverse (from superior to inferior) showing global view of each quadrant and accessing for free fluid, collections, abscess, or other areas of interest.
 - 2D still image in transverse and sagittal where loops are most concentrated
 - Cine clip, holding steady, documenting peristalsis is. If within one minute it is not seen, the region should still be documented with a quick cine and noting that peristalsis was absent.
 - Document any areas of pneumatosis, gas within the bowel wall. The air bubbles will always be gravity dependent, roll the patient into decubitus if uncertain if air is in bowel wall or lumen.



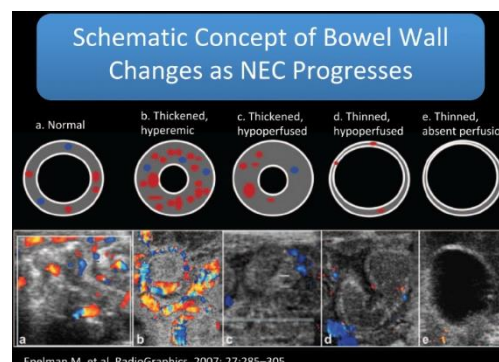
IMAGES TO OBTAIN

BOWEL LOOPS *continued....*

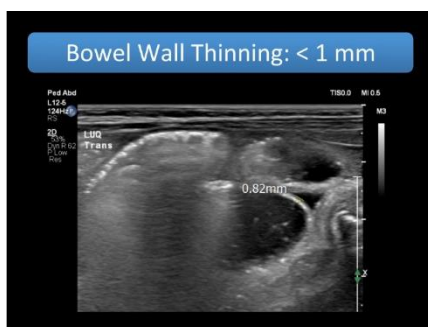
High frequency, linear transducer eL18-4 or higher to be used. Hockey stick mL26-8 preferred.

- **ALL FOUR QUADRANTS and MIDLINE:**

- Color image of bowel wall showing perfusion using low doppler settings.
 - Additional color images or cine clips of bowel wall as needed to demonstrate any areas of hyperemia.
 - MFI image of bowel wall if no detectable flow on color doppler imaging.



- Measurement of bowel wall thickness when abnormal. This could be regions of wall thinning or thickening. Normal measurement of bowel wall is 1.0 - 2.7 mm



- Additional images and cine clips as needed to show any abnormalities further.

ABDOMEN IMAGES

mC12-3 or C5-8 Curvilinear transducer to be used

- **LIVER** Right and left lobe cine sweep showing any venous gas, free air in portal system peripherally
- **MPV**
 - **2D** cine clip watching for free air, venous gas moving through portal system. Air/gas will look like echogenic dots rapidly moving through the vessel. This can best be seen with the vessel parallel to the transducer
 - **Color image showing patency of MPV**
 - **Spectral doppler looking for spikes in waveform.** Keep volume on to help hear the pops.

NECROTIZING ENTEROCOLITIS (NEC) IMAGE LIST

IMAGE	MODE
BOWEL - ALL FOUR QUADS & MIDLINE	
Transverse cine clip S-I for global view	Cine
Sagittal cine clip for global view	Cine
Still image showing bowel loops where most concentrated	2D
Cine clip w peristalsis <i>watch at least 1 min</i>	Cine
Document air/gas in bowel wall	2D/Cine
Color flow of bowel wall perfusion	Color
Measure wall thickness if abnormal <i>(Normal is 1-2.7 mm)</i>	2d+
LIVER	
Rt liver trans cine sweep looking for air	Cine
Lt liver trans cine sweep looking for air	Cine
MPV	
2d Cine looking for air/gas	Cine
Color image	Color
Spectral waveform looking for spikes	Spectral
BLADDER	
Sagittal and transverse images	2D

REFERENCES:

[Necrotizing Enterocolitis: Review of State-of-the-Art Imaging Findings with Pathologic Correlation
Epelman et al https://doi.org/10.1148/rg.272055098](https://doi.org/10.1148/rg.272055098)

NEC Ultrasound Protocol History

	Date	Changes made	By whom
Created	03/27/2024		Manjiri Dighe Christina Ozuna R Betit Fitzgerald
Approved	3/28/2024		Protocol Meeting Attendees Dighe, Dhyani, Bornemeier, Marion, Edden, Fitzgerald
Added	12/23/2024	Sagittal cines sweeps of all 4 quadrants.	Manjiri Dighe R Betit Fitzgerald