

RADY 403 Pediatric Vomiting

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September 16, 2022

Focused Patient History and Workup

- 4 week old M infant presents with **5 days of worsening vomiting**.
- Initially mother describes vomiting as spit-ups however progressed to **projectile vomiting** during the past 2 days.
- Otherwise healthy, born at term, no prior surgeries, takes no medications, makes 3-4 wet diapers per day.
- Physical Exam: Well-developed & non-toxic appearing, abdomen is soft, non-tender, no palpable masses felt.

Differential Diagnosis of Neonatal and Pediatric Vomiting

- Pyloric Stenosis
- Malrotation with Volvulus
- Intussusception
- GERD
- Intestinal atresia, stenosis, or duplication
- Foreign body
- Food protein-induced
- Infectious etiology

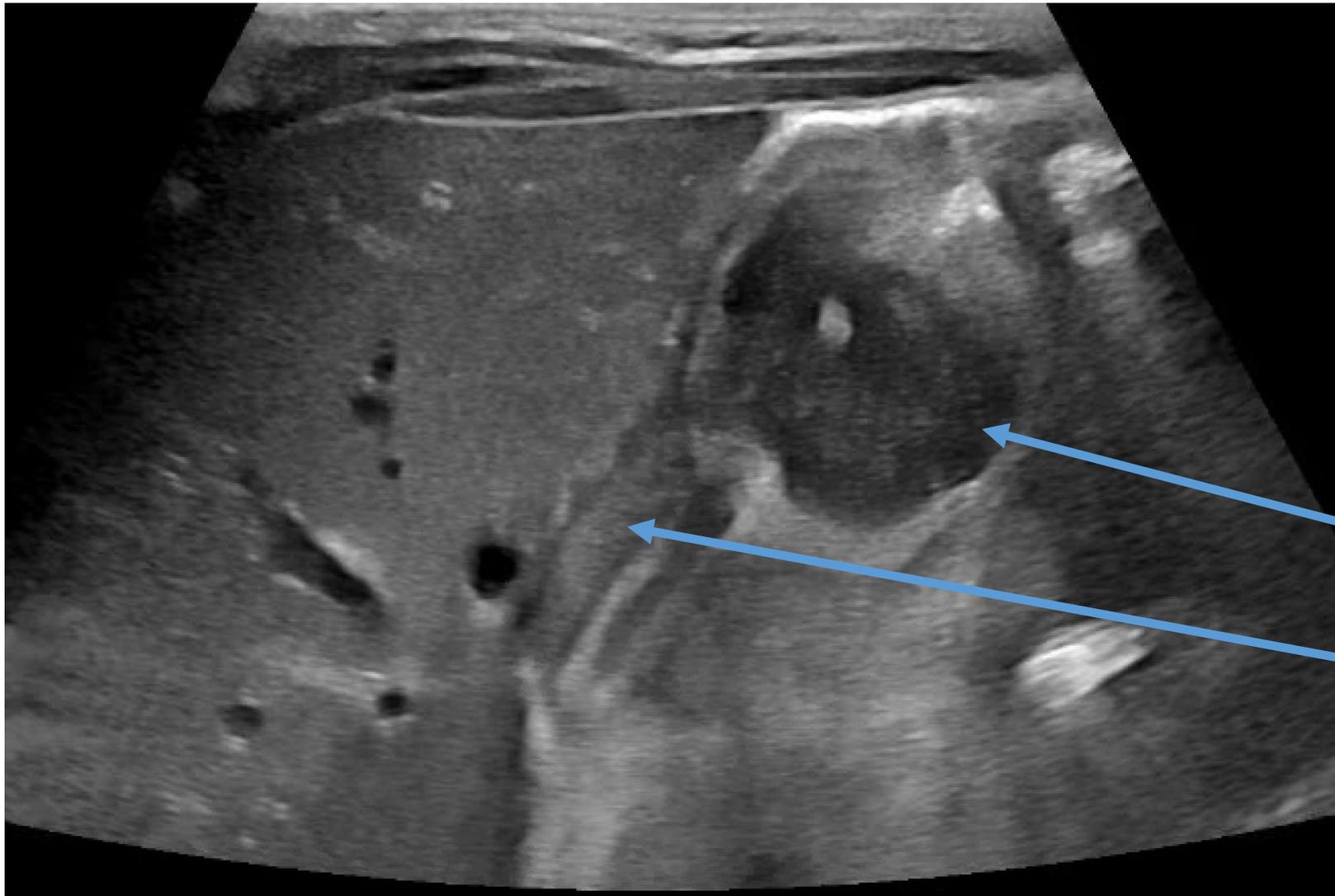
List of Imaging Studies

- Pyloric Stenosis Ultrasound
- Fluoroscopy Upper GI Series
- CT Abdomen Pelvis W Contrast

Pyloric Stenosis Ultrasound (Long Pylorus)



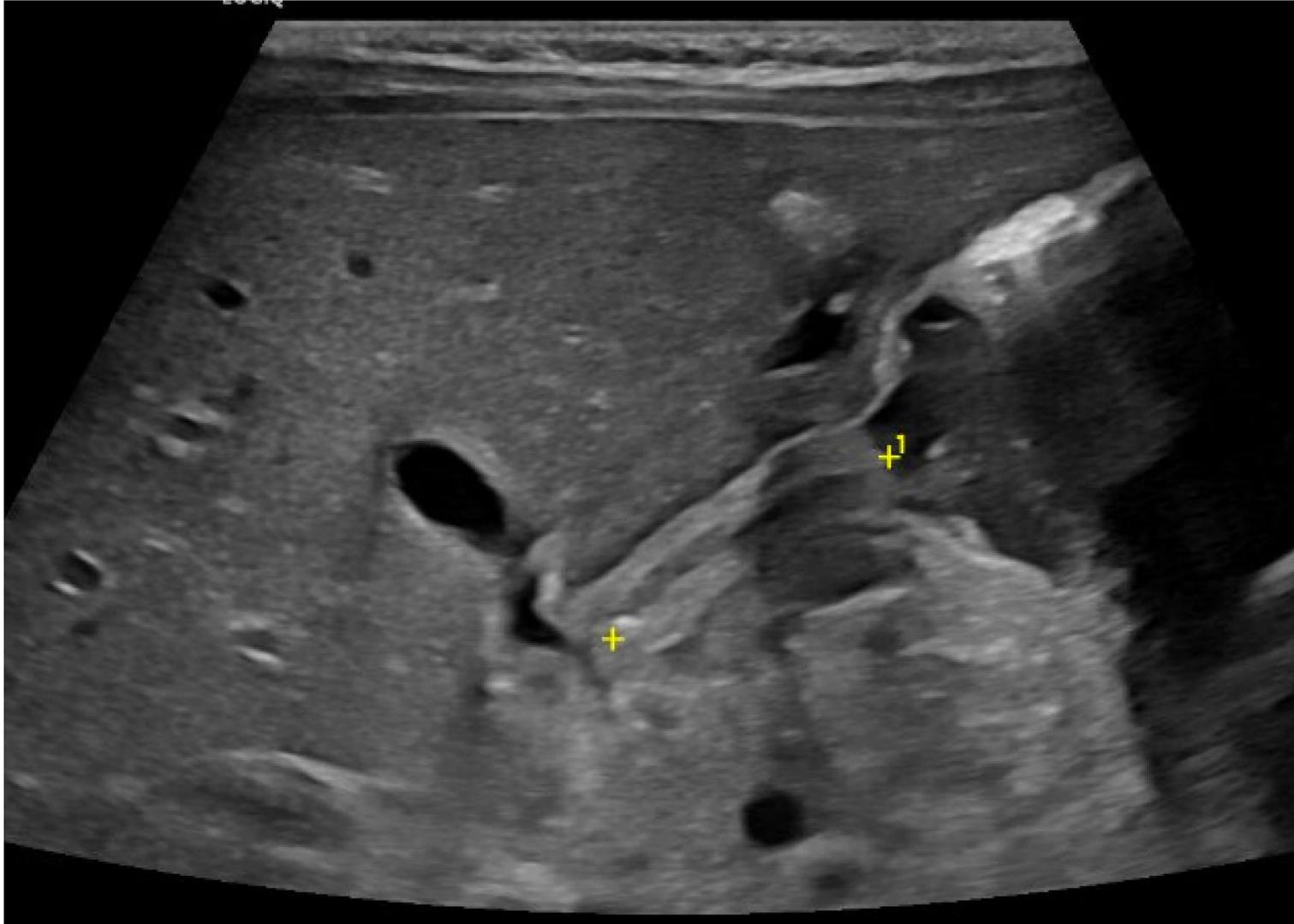
Pyloric Stenosis Ultrasound (Long Pylorus)



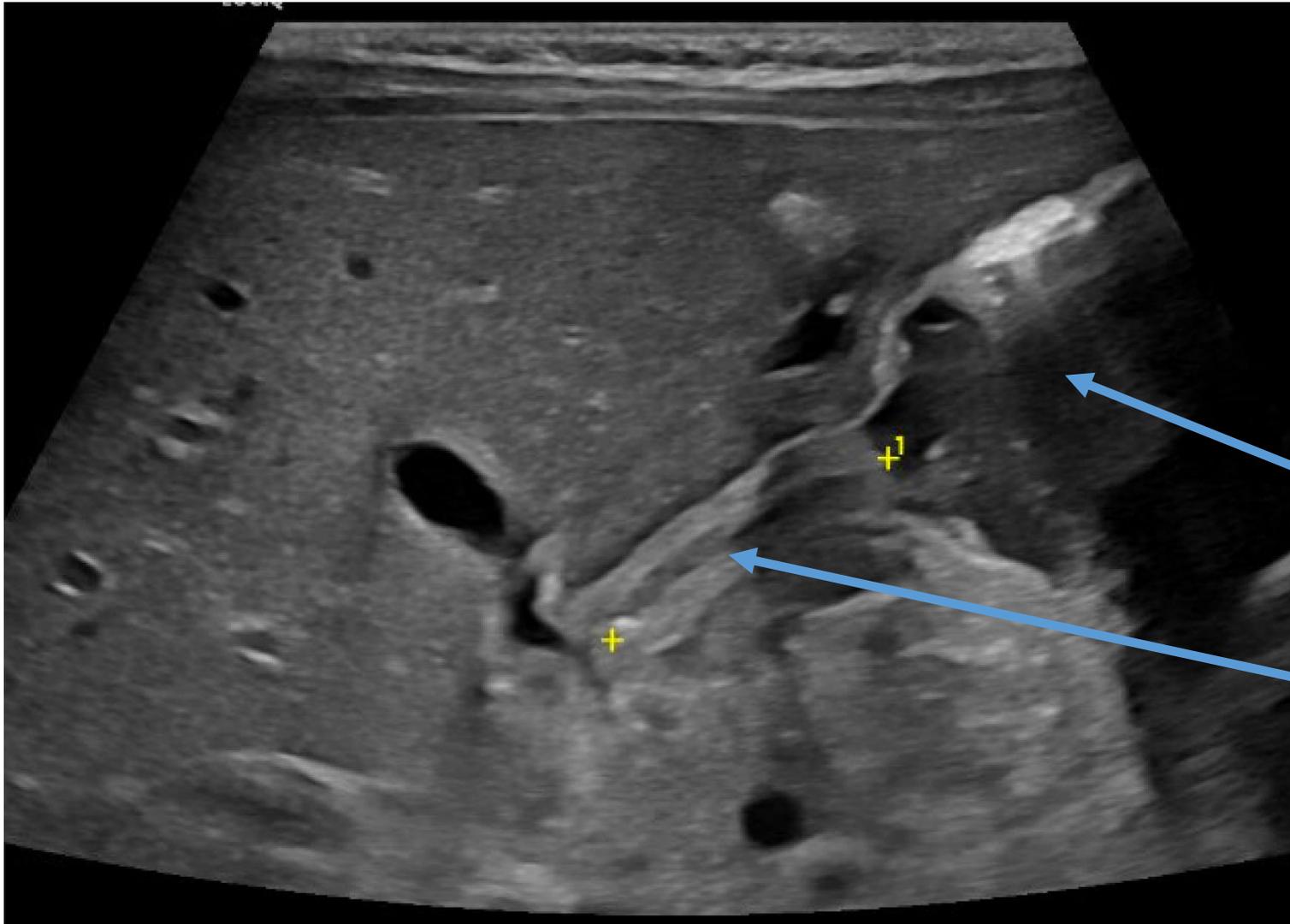
Stomach

Thickened Pylorus

Pyloric Stenosis Ultrasound (Long Pylorus)



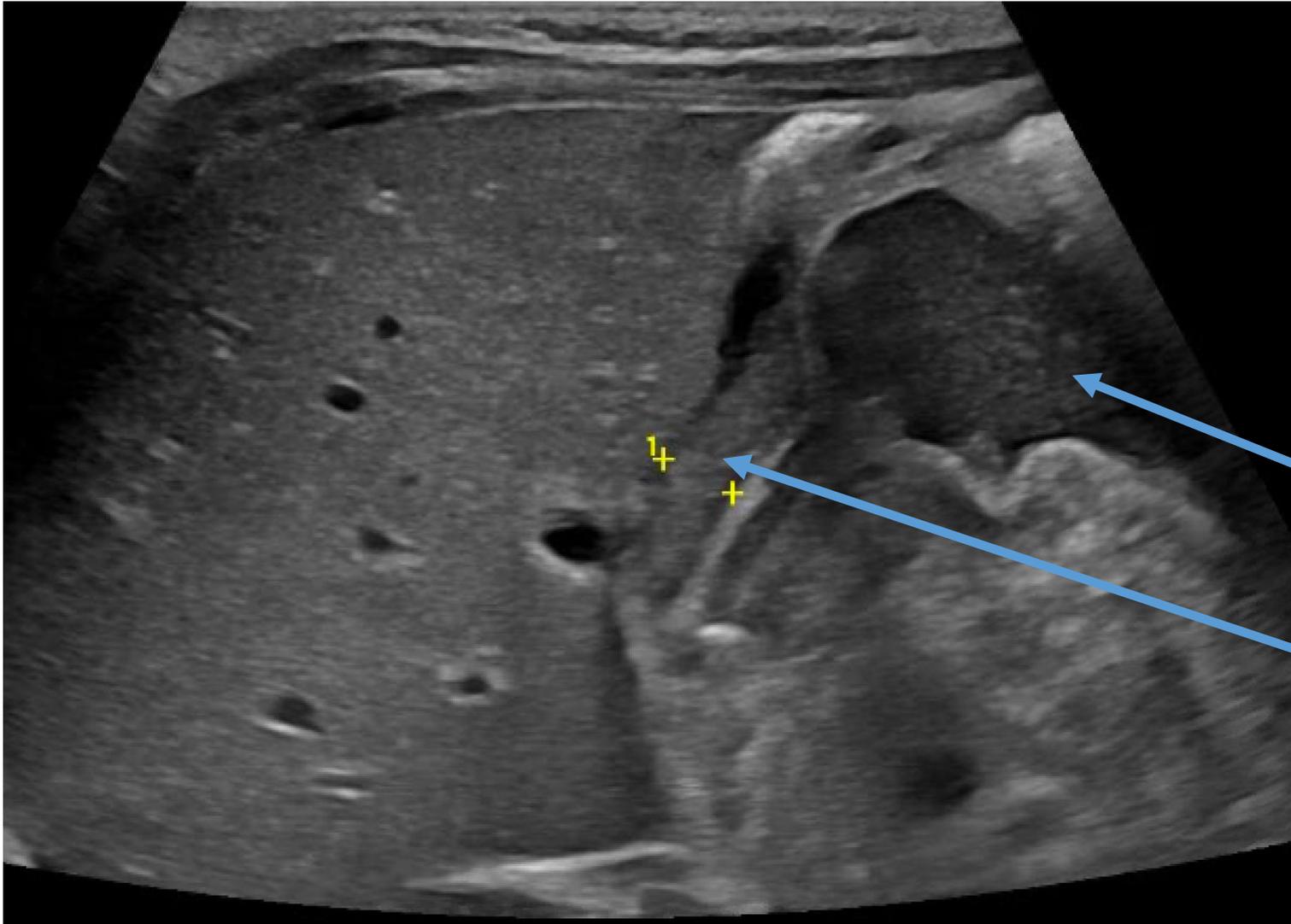
Pyloric Stenosis Ultrasound (Long Pylorus)



Stomach

Thickened Pylorus
(15 mm in length)

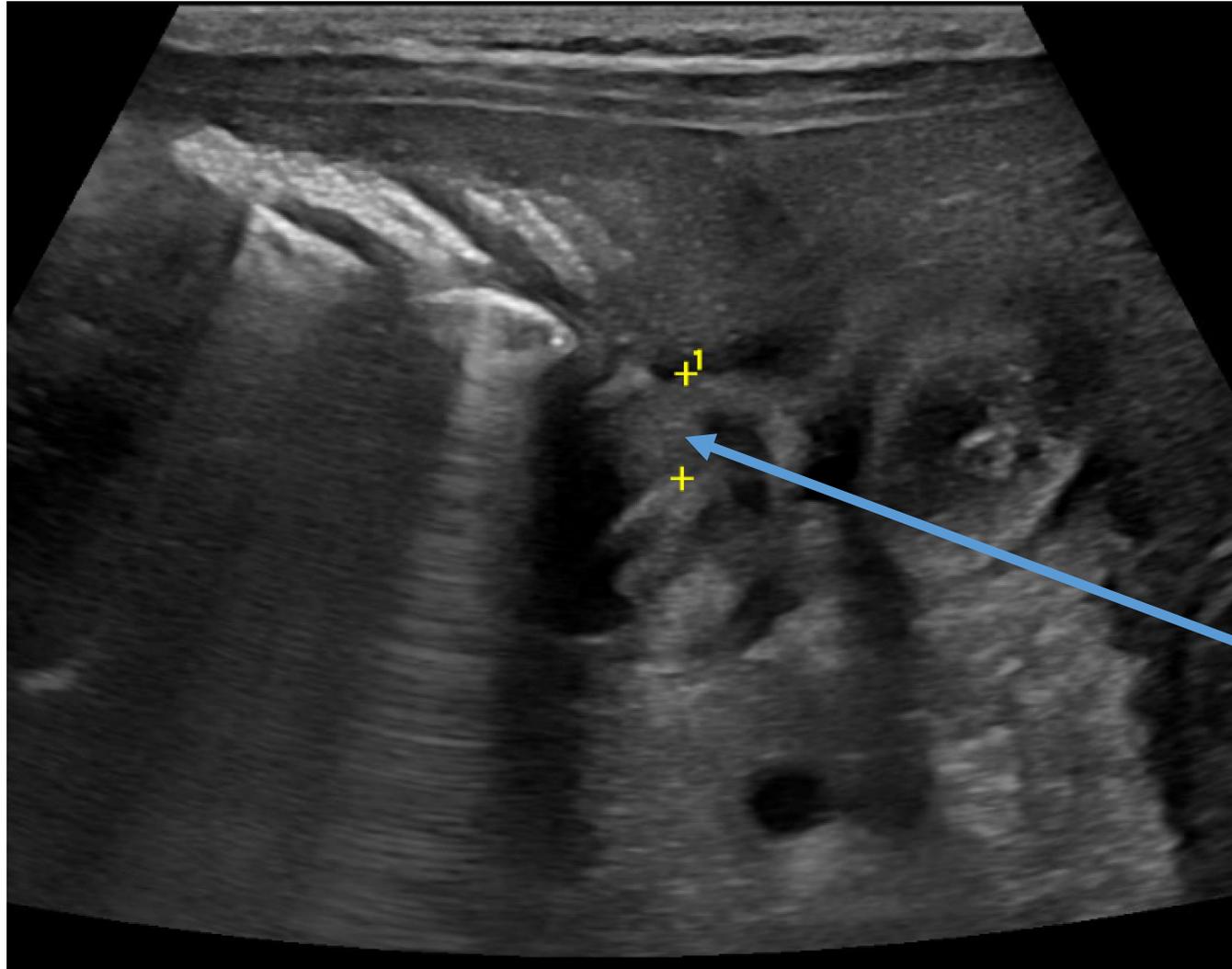
Pyloric Stenosis Ultrasound (Long Pylorus)



Stomach

Thickened Pylorus
(4.2 mm muscle wall)

Pyloric Stenosis Ultrasound (Transverse Pylorus)



Thickened Pylorus
(4.2 mm muscle wall)

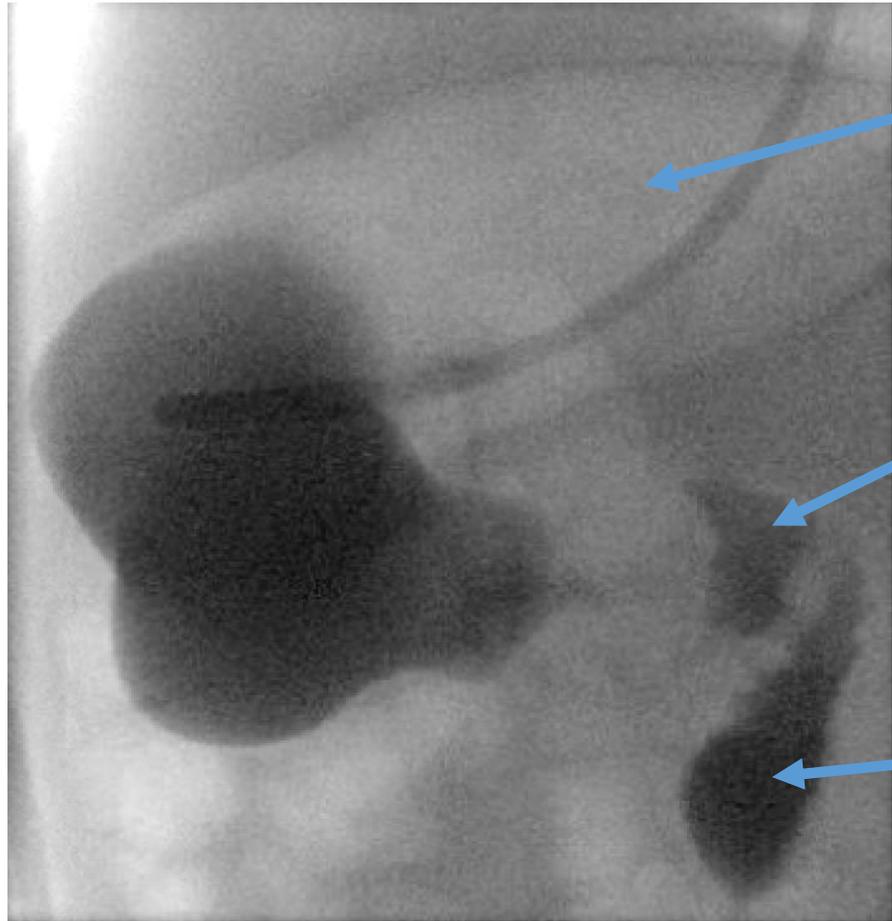
Pyloric Stenosis Ultrasound Formal Read

- Pyloric muscle thickening, with a single muscular wall measuring up to 4.2 mm. The channel measures approximately 15 mm in length.
- Fluid did not pass from the stomach into the proximal small after administration of Pedialyte. The muscle thickness persisted.

Patient Treatment and Outcome

- Patient underwent pyloromyotomy – pyloric muscle is divided down to the submucosa.
 - Operation is curative and has a very low morbidity
- Patient developed intermittent episodes of vomiting and umbilical draining 2 days s/p surgery. Suspected surgical leak.

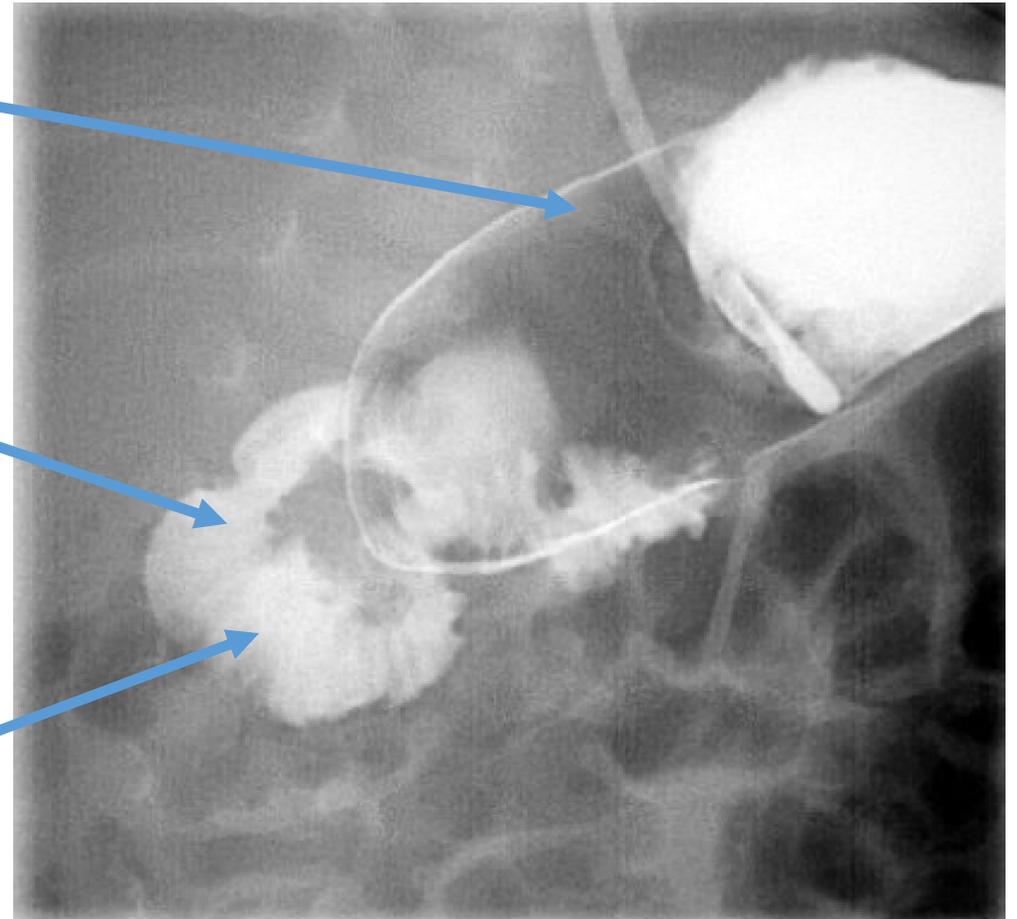
Upper GI Fluoroscopy



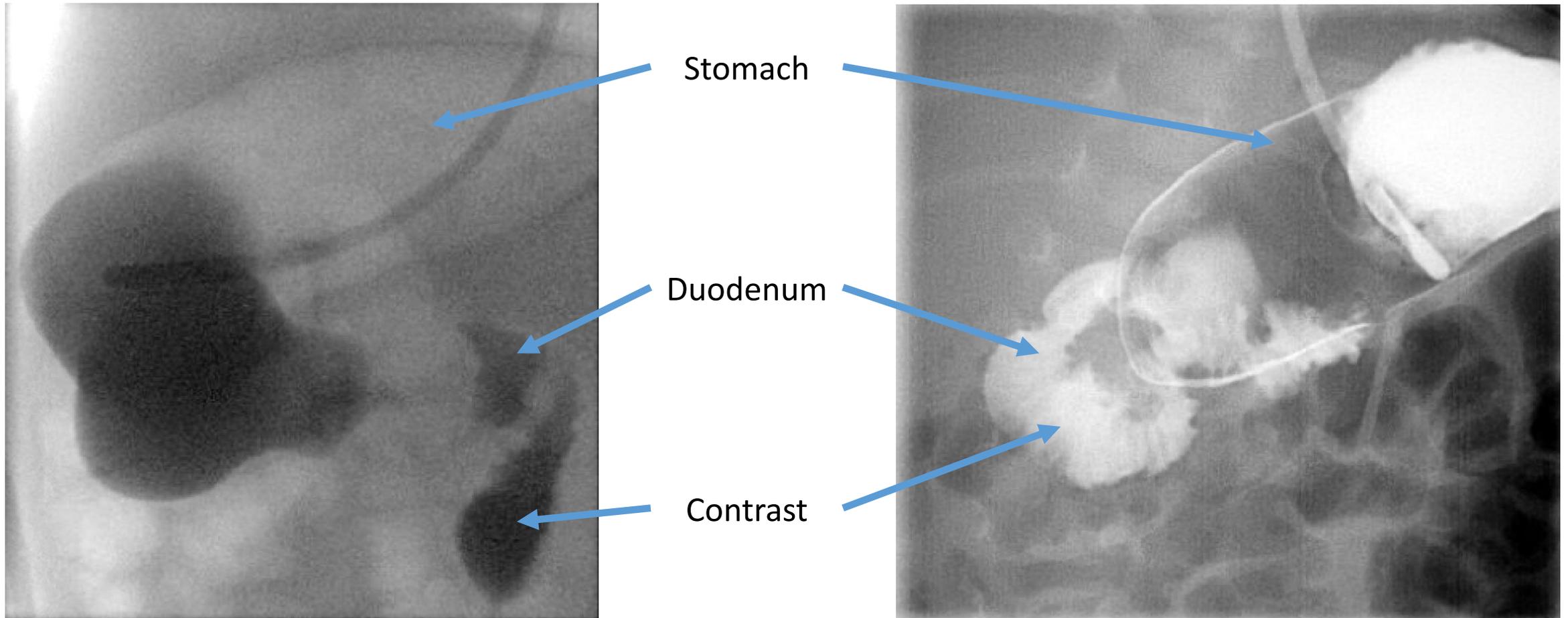
Stomach

Duodenum

Contrast



Upper GI Fluoroscopy

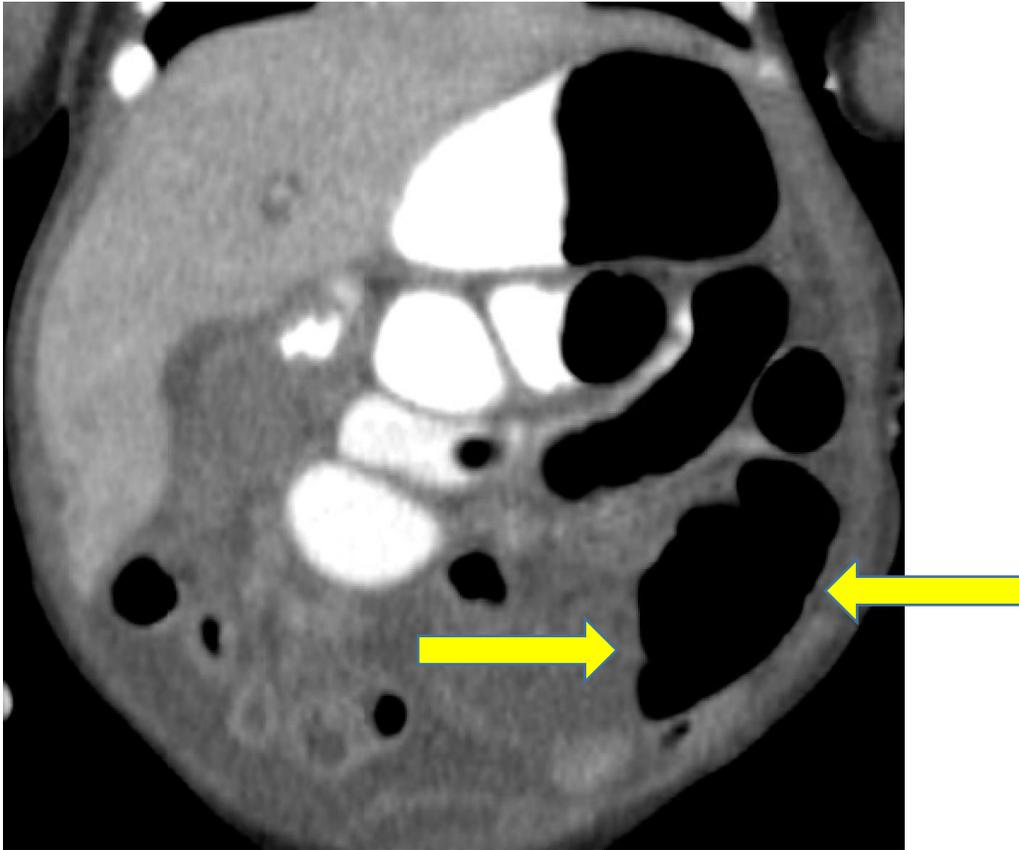


Contrast filled the distal stomach. Contrast was slow to pass through the pylorus. No extraluminal contrast was visualized to suggest leak. The stomach and duodenum appear normal position. The duodenojejunal junction is in normal position.

Patient Outcome

- Found to have fascial dehiscence of umbilicus after draining
 - Multiple exploratory laparotomies performed
- Subsequently patient received a CT Abdomen & Pelvis with contrast for abdominal distension s/p multiple exploratory laparotomies.

CT Abdomen Pelvis



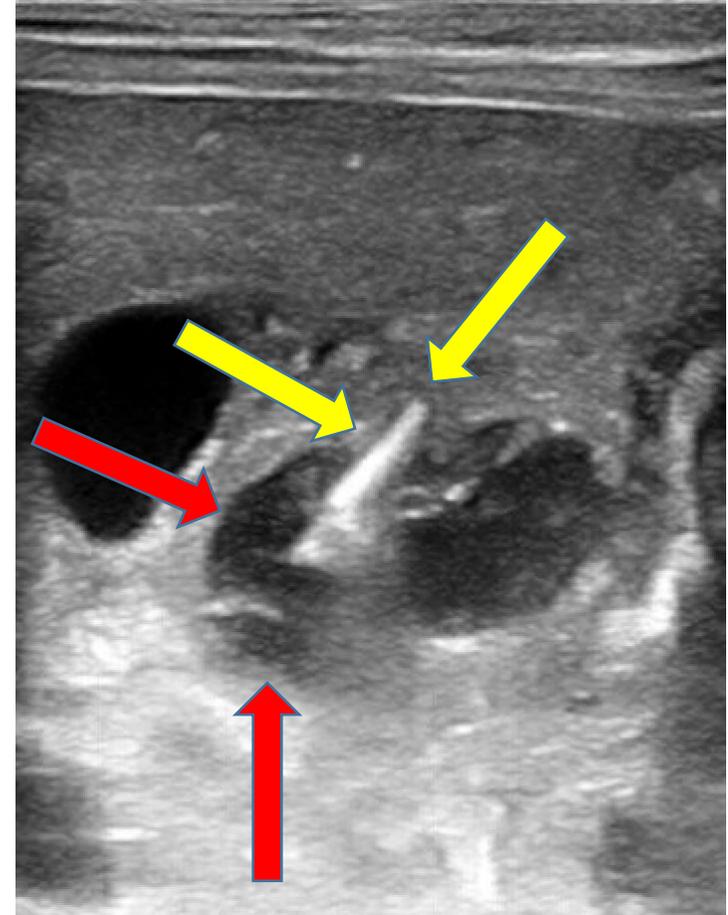
Multiple dilated fluid filled small bowel loops in the left hemi-abdomen (yellow arrows) without discrete transition point. Possibly ileus versus partial small bowel obstruction.



Area loculated fluid in the right upper quadrant, inferior to the pylorus, may demonstrate subtle rim enhancement (red arrows). Concerning for possible intra-abdominal abscess/phlegmon.

Patient Outcome

- Found to have intraabdominal abscess
 - Interventional radiology drain placement
 - Currently on broad-spectrum antibiotics



Ultrasound image showing hyperechoic needle (yellow arrows) advancement into the intraabdominal abscess (red arrows).

Initial Imaging in Suspected Pyloric Stenosis

- ACR Appropriateness

Variant 7: **Infant older than 2 weeks and up to 3 months old. New onset nonbilious vomiting (suspected hypertrophic pyloric stenosis). Initial imaging.**

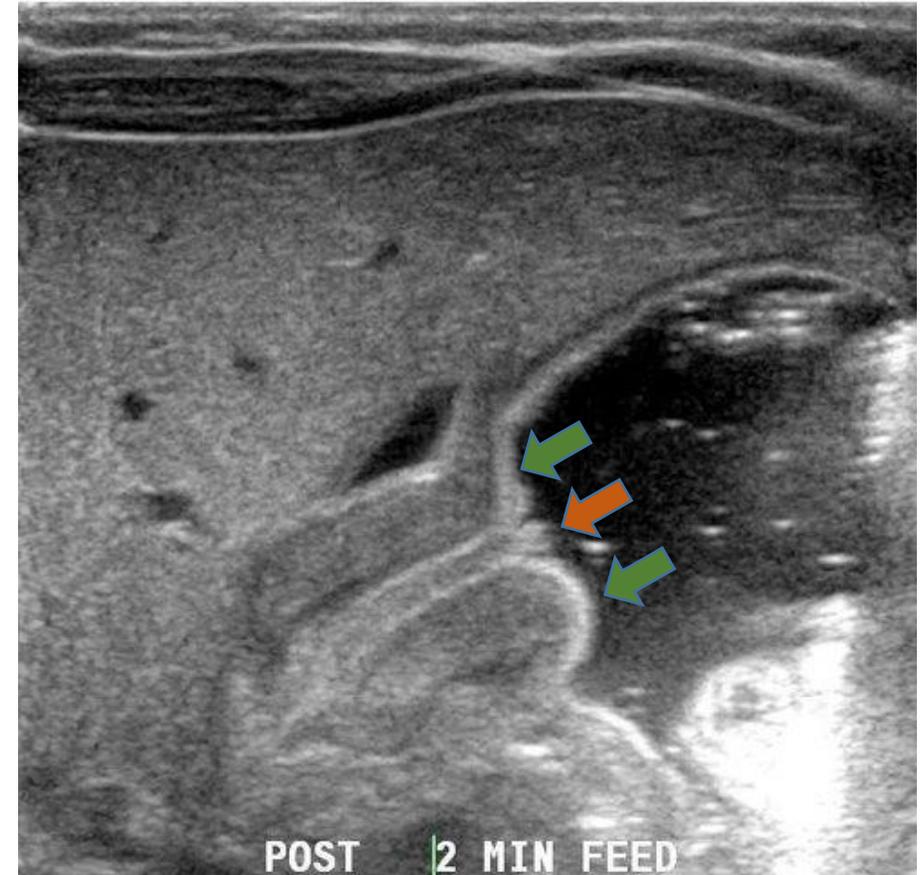
Procedure	Appropriateness Category	Relative Radiation Level
US abdomen (UGI tract)	Usually Appropriate	○
Fluoroscopy upper GI series	May Be Appropriate	⊛⊛⊛
Radiography abdomen	Usually Not Appropriate	⊛⊛
Fluoroscopy contrast enema	Usually Not Appropriate	⊛⊛⊛⊛
Nuclear medicine gastroesophageal reflux scan	Usually Not Appropriate	⊛⊛⊛

Imaging Findings in Pyloric Stenosis

- Ultrasound
 - Hypertrophied muscle is hypoechoic with hyperechoic central mucosa
 - Diagnostic measurements:
 - Pyloric muscle thickness >3 mm
 - Length (longitudinal measurement) >15-17 mm
 - Pyloric volume >1.5 cm³
 - Pyloric transverse diameter >13 mm
- Fluoroscopy
 - Delayed gastric emptying
 - Peristaltic waves (caterpillar sign)
 - Elongated pylorus with a narrow lumen

Sonographic Signs of Pyloric Stenosis

- Antral Nipple Sign
 - Pyloric mucosa protruding into the gastric antrum
- Cervix Sign
 - Indentation of pylorus into the fluid-filled antrum
- Target Sign
 - Hypertrophied hypoechoic muscle surrounding echogenic mucosa



Sample ultrasound image demonstrating the **antral nipple sign** and **cervix sign**.

UNC Top Three

- If suspicious for hypertrophic pyloric stenosis, obtain a pyloric ultrasound.
- Diagnostic measurements of pyloric stenosis include pyloric muscle thickness > 3 mm, pyloric longitudinal length $> 15-17$ mm, pyloric volume > 1.5 cm³, and pyloric transverse diameter >13 mm
- Specific imaging findings may be associated 3 signs: antral nipple sign, cervix sign, and target sign.

References

- Alazraki, Adina L., et al. "ACR appropriateness criteria® vomiting in infants." *Journal of the American College of Radiology* 17.11 (2020): S505-S515.
- Amini, B., O'Shea, P. Pyloric stenosis. Reference article, Radiopaedia.org. (accessed on 15 Sep 2022) <https://doi.org/10.53347/rID-1941>
- Gaillard, F., El-Feky, M. Cervix sign (pyloric stenosis). Reference article, Radiopaedia.org. (accessed on 16 Sep 2022) <https://radiopaedia.org/articles/1096>
- Gaillard, F., Glick, Y. Target sign (pyloric stenosis). Reference article, Radiopaedia.org. (accessed on 16 Sep 2022) <https://radiopaedia.org/articles/2147>
- Hernanz-Schulman Marta, Yuwei Zhu, Sharon M. Stein et-al. "Hypertrophic Pyloric Stenosis in Infants: US Evaluation of Vascularity of the Pyloric Canal1." *Radiology* 229, no. 2 (November 2003): 389-393. [doi:10.1148/radiol.2292021303](https://doi.org/10.1148/radiol.2292021303).