Neonatal Gastrointestinal Emergencies
Step-by-Step Approach

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KEYWORDS

• Neonatal • Gastrointestinal • Intestinal atresia • Malrotation • Tracheoesophageal fistula • Pyloric stenosis • Hirschsprung disease • Meconium ileus

KEY POINTS

- Neonatal gastrointestinal emergencies comprise 2 main categories, those affecting the upper gastrointestinal tract and those affecting the lower gastrointestinal tract.
- Imaging approach is guided by a combination of prenatal history, presenting signs and symptoms, and abdominal radiographs, which help to differentiate upper from lower gastrointestinal emergencies.
- Although a handful of neonatal gastrointestinal emergencies have a diagnostic appearance on radiographs, more commonly either an upper gastrointestinal series or a contrast enema is necessary for definitive diagnosis.
- With a few exceptions, ultrasound, computed tomography, and MR imaging are typically reserved for problem solving in this population.

INTRODUCTION

Neonatal gastrointestinal emergencies arise from a constellation of varied abnormalities that can occur anywhere along the alimentary tract, from the esophagus to the colon. In some conditions, the underlying cause may be suggested by prenatal imaging. More frequently, the patient presents emergently and requires a combination of a careful history and physical examination, and correlative imaging for an accurate diagnosis. A correct, timely diagnosis is essential for minimizing potential mortality and morbidity in this population. The authors review the most common causes of gastrointestinal emergencies in neonates (**Box 1**), with an emphasis on imaging techniques and algorithms, and radiological features.

IMAGING MODALITIES AND TECHNIQUES
Radiography

Radiography is generally the first step in the imaging assessment of neonates with a suspected gastrointestinal emergency. A single supine anteroposterior (AP) view of the abdomen is often the first examination performed. The addition of a second view, either a left lateral decubitus or a cross-table lateral view, can often assist in the evaluation

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Box 1
Causes of gastrointestinal emergencies in neonates

Causes of upper gastrointestinal emergencies

- Esophageal atresia and tracheoesophageal fistula
- Pyloric atresia
- Hypertrophic pyloric stenosis
- Duodenal atresia
- Duodenal web and stenosis
- Malrotation and midgut volvulus

Causes of lower gastrointestinal emergencies

- Jejunoileal atresia
- Meconium ileus
- Meconium peritonitis
- Colonic atresia
- Functional immaturity of the colon
- Hirschsprung disease
- Anorectal malformations
- Bowel duplication cysts
- Necrotizing enterocolitis

for ectopic air, air-fluid levels, and rectal gas. Care should be taken to minimize artifact from overlying monitoring equipment and comfort pads to allow for the most optimal radiographic evaluation of the child and minimize radiation dose.[1,2]

Fluoroscopy

Upper gastrointestinal series (UGI) are performed when there is concern for abnormalities of the esophagus, stomach, or proximal small bowel. The patient ingests barium or water-soluble contrast under fluoroscopic monitoring. The patient is typically first positioned in the left lateral decubitus position, and a solid column view of the esophagus is obtained. The positioning on the patient's left side facilitates control of the administered contrast bolus, which typically pools in the gastric fundus in the left lateral decubitus position. An AP view of the esophagus is then obtained in the supine position. Subsequently, the patient is placed in the right decubitus position to study the gastric outlet. When the second portion of the duodenum is filled with contrast, the patient is then placed supine to evaluate the duodenal-jejunal junction, or ligament of Treitz. The patient may then be placed again in the right lateral position to fully distend all parts of the duodenum. A final frontal radiograph may be obtained to assess the distribution of contrast throughout the opacified portions of bowel. Patient radiation exposure should be minimized by using intermittent pulsed fluoroscopy, appropriate collimation, limiting digital magnification, minimizing the distance between the patient and the image intensifier, and removing the antiscatter grid.

Contrast enema examinations are performed when there is a concern for abnormalities of the rectum, colon, or distal small bowel. Contrast is instilled retrograde via a catheter placed within the rectum. Water-soluble contrast may be used if there is concern for perforation or a surgical abdomen. The examination typically begins with the patient in the decubitus position, and a lateral view of the distended rectum is obtained. The patient is then placed supine, and contrast is followed through the remainder of the colon. Oblique views are often helpful for visualizing all portions of the colon, particularly the sigmoid colon, and splenic and hepatic flexures. The examination is typically terminated once the cecum or distal small bowel is visualized; in patients with a competent ileocecal valve, the distal small bowel may not fill. As in the upper GI examination, an effort to minimize patient radiation exposure should be made, using the shortest fluoroscopy time with the lowest radiation dose possible to achieve a diagnostic quality examination.

Ultrasound, Computed Tomography, and MR Imaging

Ultrasound utilization in neonatal gastrointestinal emergencies has increased over the last decades, particularly in centers with specific expertise. However, the routine use of ultrasound in the diagnosis of most neonatal gastrointestinal emergencies is not universally accepted. The exception is pyloric stenosis, where the sensitivity and specificity of ultrasound approach 100%.[3–5] Sonography can serve as a complementary imaging tool in the evaluation of patients with necrotizing enterocolitis (NEC), providing a real-time cross-sectional examination of bowel loop anatomy and function as well as depiction of free fluid.[5–7] Ultrasound has been used in the evaluation of suspected intestinal malrotation to assess the anatomic relationship of the superior mesenteric artery (SMA) and vein as well as the presence of volvulus; however, upper GI examination remains the current standard of care to exclude malrotation.[5] In neonates with cystic abdominal masses, sonography can help delineate wall structure and cyst content to aid in the diagnosis of bowel duplication cysts, meconium pseudocysts, and mesenteric cysts.