Gastro-intestinal emergencies in early life: clinical symptoms and priorities in use of imaging modalities

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Introduction

- Gastro-intestinal emergency should be categorized in congenital obstruction in neonates and acquired conditions including different abnormalities in the first months of life.
- Vomiting, gastric retention, abdominal distention and failure to pass meconium or abnormal defecation are usual symptoms.
- Surgical intervention contribute largely to reduce morbidity and mortality in such cases.
- An effective diagnostic modality is absolutely indicates to look for obstruction or other changes of abdominal cavity.
Classification of gastro-intestinal emergencies in early life

1. Congenital gastro-intestinal abnormalities.
   a. Congenital gastric outlet obstruction
   b. Complete duodenal obstruction
   c. Incomplete duodenal obstruction
   d. High small bowel obstruction
   e. Malrotation and volvulus
   f. Complete low intestinal obstruction
   g. Incomplete low intestinal obstruction
   h. Extra abdominal location of GI tract
1a: Gastric outlet obstruction

Causes:
- Antral or pyloric atresia (1% of all GI artresia)
- Atresia by epidermiolysis bullosa
- Gastric duplication
- Extrinsic peritoneal bands

Clinical symptom:
- Non bilious vomiting

Imaging priorities:
- Abdominal radiograph
- US
- MRI
- GI series?
A case of antral atresia

A case of epidermyolysis bullosa with artretic pylorus
Antral duplication cyst
1b: Complete duodenal obstruction

- Duodenal atresia
- Frequency: 1 : 5000
  - 1 : 4 in M. Down

Clinical symptoms:
- Early and continued bilious vomiting
- Absent urination
- Absent bowel movements, only a few after birth

Imaging priority:
- Abdominal plain film
COMPROMISED BLOOD SUPPLY TO THE BOWEL IN UTERO RESULTS IN INTESTINAL ATRESIA:

**Type I:** Mucosal (membranous) atresia with intact bowel wall and mesentery

**Type II:** Blind intestinal ends separated by a fibrous cord

**Type III:** Blind intestinal ends separated by a V-shaped mesenteric defect

Adapted from Pediatric Pathology, Eds J Thomas Stocker & Louis P Dehner. 2001. Lippincott Williams & Wilkins. p 644.
Two cases of duodenal atresia

A. Morbus Down
Meconium peritonitis with atretic duodenum
1c. Incomplete duodenal obstruction

Causes:
- Intrinsic: Duodenal web (diaphragm)
- Extrinsic: Ladd bands (midgut malrotation)
  - Annular pancreas
  - Duplication cysts
  - Hematoma
  - Preduodenal portal vein

Clinical symptoms:
- Similar signs as by duodenal atresia but less severe

Priority of diagnostic imaging
- Abdominal plain film
- US
- GI series
- CT or MRI
a. Duodenal stenosis by pancreas annulare

b. Duplication cyst of duodenum
Duodenal web
1d. High small bowel obstruction

- Jejunal atresia
- Frequency 1 : 5000

Clinical symptoms:
- Bilious vomiting
- Gastric retention
- Mild abdominal distension

Imaging priorities:
- Abdominal plain film
- US
- GI-series
Two cases of jejunal atresia
1e. Malrotation/volvulus

- Frequency: 1 : 2500

Clinical symptoms:
- Bilious vomiting
- Drawing up the legs
- Abdominal pain
- Abdominal distension
- Rapid heart rate
- Rapid breathing
- Bloody stool

Imaging priorities:
- Abdominal plain film
- US
- GI series
1f. Complete low intestinal obstruction

- Ileal atresia 1:6000
- Colonic atresia 1:40000-60000
- Atretic meconium peritonitis 1:35000

Clinical symptoms:
- Abdominal distension
- Delayed passage of meconium
- Vomiting
- Abdominal pain

Imaging priorities:
- Abdominal plain film
- Diagnostic enema
- US
Ileum atresia
Abdominal plain film of colon atresia

Enema of colon atresia
1g. Incomplete low intestinal obstruction

- Meconium ileus (MI) by 10-20% of patients with CF
- Hirschsprung disease (HD) 1 : 5000
- Meconium plug syndrome (MPS)
- Non-artretic meconium peritonitis 1 : 3500
- Cystic duplication of ileocoecal region
- Anorectal malformation (ARM) 1-6 : 10000

Clinical symptoms:
- Abdominal distension
- Delayed passage of meconium
- Failure to pass meconium
- Bilious vomiting
- Painful abdomen

Imaging priorities:
- Abdominal plain film
- Contrast enema (MI, HD, ARM)
- US (MI, ARM)
- MCG + MRI (ARM)
Meconium ileus
Therapeutic enema with water soluble contrast enema in a case of meconium ileus
Cystic duplication of coecum
Meconium ileus with a therapeutic enema
Left colon syndrome
Short segment Hirschsprung
Long segment Hirschsprung
Anorectal malformation
Anorectal malformation
1h. Extra abdominal localization of Gastro-Intestinal organs.

1. Congenital diaphragmatic hernia
   - Frequency 1 : 2200

Clinical symptoms:
   - Scaphoid abdomen
   - Barrel shaped chest
   - Respiratory distress

Imaging priorities:
   - Fetal: Ultrasound, MRI
   - Postnatal: Thoraco abdominal plain radiograph
   - Cardial and renal ultrasound
   - Cranial MRI
Hernia diafragmatica:

a. Fetal MRI
b. Left sided (88%)
c. Right sided (10%)
d. Bilateral (2%)
1h. Extra abdominal localization of Gastro-Intestinal organs.

2. Gastrochisis and omphalocele due abdominal wall defect.
   - Frequency gastrochisis: 1 : 2 – 3000 (mortality 17%)
   - Frequency omphalocele: 1 : 4000 (mortality 10%)

Clinical symptoms:
   - Small abdominal cavity.
   - Herniated intestines.
   - Gastrochisis associated anomalies 10 – 20%
   - Omphalocele associated anomalies 50 – 70%

Imaging priorities:
   - Fetal: Ultrasound, MRI
   - Postnatal: Abdominal plain film?
   - Ultrasound and other modalities to exclude associated abnormalities.
3 different cases of gastroschisis.
15 week old fetus with omphalocele

Neonate with omphalocele
Gastro-intestinal emergencies in early life

2. Acquired GI diseases in early life
   a. Necrotizing enterocolitis
   b. Hypertrophic pyloric stenoses
      — Prostaglandine induced gastric outlet obstruction
   c. Idiopathic gastro-intestinal perforation
   d. Milk Curd syndrome
   e. Incarcerated inguinal hernia
2a. Necrotizing enterocolitis

- Frequency: 1 : 2000- 4000 (5-10% of infants < 1500 g)

More specific clinical symptoms:
- Gastric residuals and vomiting
- Painful and distended abdomen
- Blood in stool

Less specific symptoms:
- Temperature and blood pressure instability
- Apnoea or brady cardia
- Lethargy

Imaging priority
- Abdominal plain film
- US
- Enema
Necrotizing enterocolitis
Radiographic findings of NEC

- Dilated bowels mostly with a gasless rectum caused by reduced motility
- Thickening of bowel wall
- Distended abdomen
- Cystic or linear intestinal pneumatosis
- Portal venous gas
- Intraperitoneal fluid collection
- Pneumoperitoneum
- Edema of abdominal wall in cases complicated with sepsis
- Unmoved dilated bowel on several following films (bowel necrosis)
Dilated bowel, bowel wall thickening, gasless rectum, ascites, pneumatosis, portal venous gas and pneumoperitoneum in NEC
Anatomic findings of NEC by obduction

Findings of NEC by contrast enema
2b. Hypertrophic pyloric stenosis.

- Frequency: 1-4 : 1000

Clinical signs and symptoms:
- Projectile no bilious vomiting (2-4 weeks of age).
- Poor feeding and weight loss
- Persistent hunger
- Dehydration

Imaging priority:
- US
Hypertrophic pyloric stenosis,
Note: gastric hyperperistaltic activity
Prostaglandine induced gastric out let obstruction
2c. Idiopatic gastro-intestinal perforation

- Frequency: 7% < 1500 g

Clinical symptoms:
- Abdominal distension
- Bilious vomiting
- Dehydration
- Fever
- Poor oral feeding
- Failure or delayed defecation
- DD: Bowel perforation due to NEC, congenital intestinal obstruction or iatrogenic conditions

Imaging priority:
- Abdominal plain film
Two cases with idiopathic GI perforation
2d. Milk curd syndrome

- Frequency: 6%

Clinical symptoms:
- Very low birth weight
- Constipation
- Abdominal distension
- Abdominal pain
- Gastric residues

Imaging priorities:
- Abdominal plain film
- US
- Contrast enema
Milk Curd syndrome.

Intestinal dysfunction by prematuritas.
2e. Incarcerated inguinal hernia

Clinical presentation
- Abdominal pain
- Vomiting
- Swelling or a bulge in groin
- Abdominal distention
- Anorexia

Imaging priority
- Abdominal plain film
- US
- GI-series
2 cases of inguinal hernia
Conclusion

• Clinical and radiological evaluation of GI tract in early life remain a challenge for both clinician and radiologist

• Congenital malformation of GI-tract in neonates is the most frequent cause of abdominal emergencies

• Vomiting, abdominal pain and distention as well as abnormal defecation are the four cardinal symptoms of GI-disorders

• Age is an important key point for diagnosis of GI-tract diseases
Conclusion

- Abdominal radiograph is the first step in GI-imaging
- US contributes largely in diagnostic of several abdominal diseases
- The fetal MRI contributes largely in diagnosis of gastro-intestinal anomalies.