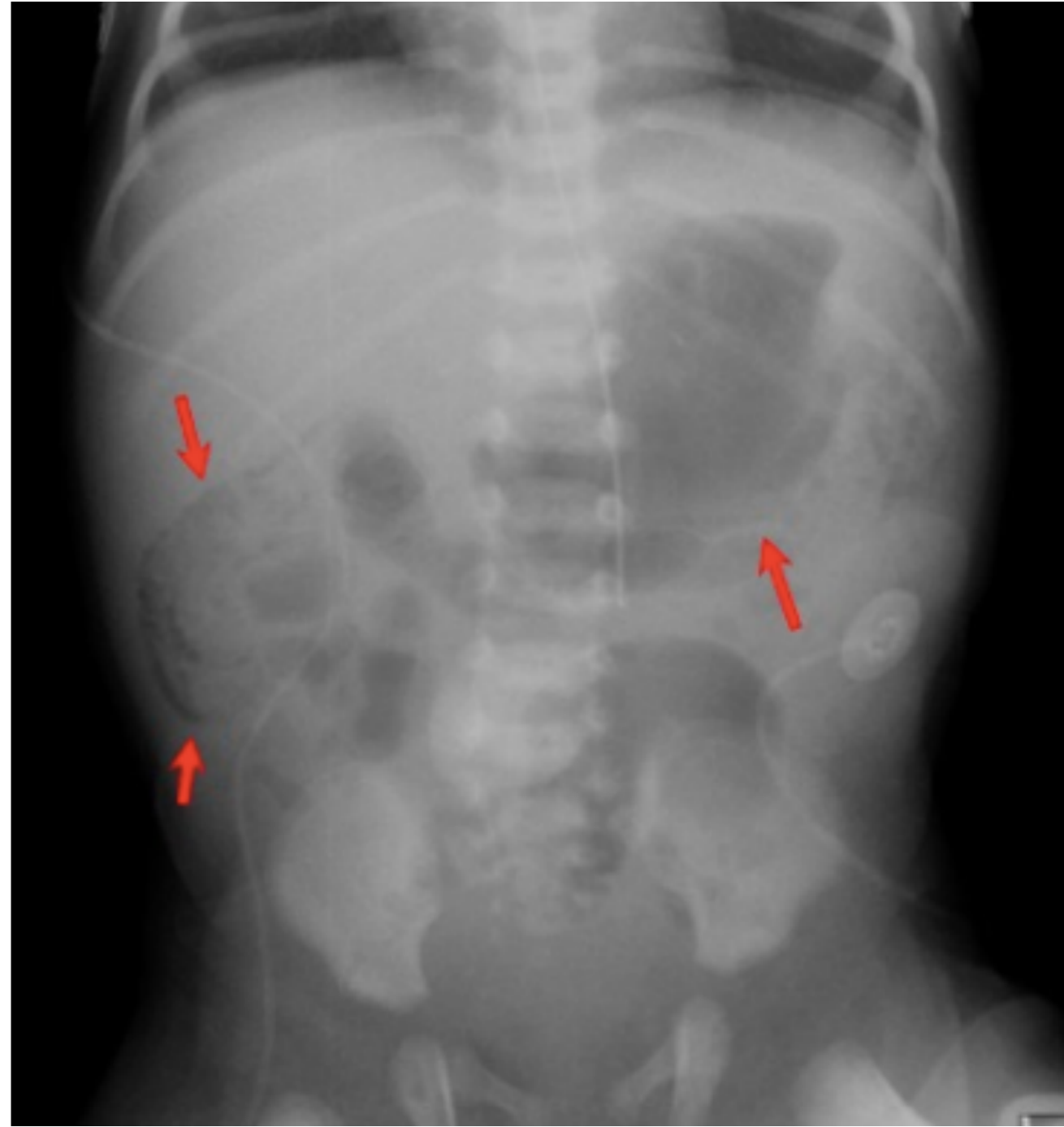


GI Emergencies in Infants and Young Children

Neonatal Necrotizing Enterocolitis

- **Path:** Disruption of intestinal mucosal barrier -> ischemic necrosis, bacterial translocation, inflammation, gas dissection into intestinal wall
- **Distribution:** 1-4 week (30-40wk CGA)
 - 90% in VLBW (<1500g) and GA < 32wk
 - 10% in term babies*
- **Sx/Si:** feeding intolerance, distention, bilious emesis, diarrhea, hematochezia (can be occult), apnea, lethargy, temp instability, LATE abdominal wall erythema/induration



Pneumatosis intestinalis

Management

Labs

CBC w diff, BCx, CMP, coags, blood gas, FOBT (not specific)

Imaging

2v abdominal XR

Immed

Fluid resuscitation, gastric decompression +/- inotropes, resp support

Supportive Care

Bowel rest, Fluid replacement, TPN, serial exams/labs/imaging

Empiric Antibiotics

Ampicillin/Vanco + Gentamicin/Cefotaxime + Metronidazole/Clindamycin
Piperacillin-Tazobactam + Gentamicin

Surgical

NICU + Peds Surgery

Malrotation w/ Midgut Volvulus

- **Path:** arrest of normal rotation of the embryonic gut. ~60% have associated anomaly
- **Distribution:** Malro presentation by 1mo (30%), 1y (60%), 5y (75%)
- **Sx/Si:** typically bilious vomiting, distention, abd tenderness -> bowel ischemia -> hematochezia, peritonitis (perforation) -> hemodynamic instability (hypovolemia, septic shock)



Upper GI study: AP and lateral show central and low positioned duodenaljejunal junction (red arrow), and corkscrew appearance of distal duodenum and proximal jejunum (blue arrow)

Management

Unstable

Systemic decompensation (hematemesis, hematochezia, peritonitis, shock)

Fluid resuscitation, +/- pressors

Empiric antibiotics

Emergent ex lap

Stable

(non)bilious emesis, tender distended abdomen

2v abdominal XR

Limited UGI series + PO contrast

Radiologist/Surgery consult

Hirschsprung Disease

- **Path:** motor disorder of colon caused by failure of neural crest cells (precursors of enteric ganglion cells) to migrate completely during intestinal development -> aganglionic segment of colon fails to relax -> distal obstruction
- **Distribution:** 0-12 weeks, M:F 3:1
- **Sx/Si:** delayed/failure to pass meconium (majority), abdominal distension and tenderness, poor feeding, vomiting, diarrhea, infrequent BMs; abnormal DRE with empty rectal vault, contracted anal sphincter, and explosive foul smelling output with removal of finger
 - ***Hirschsprung-associated Enterocolitis (HAEC):** +fever, explosive diarrhea, lethargy, hypovolemic shock



Barium enema showing transition zone (arrow) between lower aganglionic bowel and normal colon above.

Management

Labs*

CMP, Mg, Phos, TSH + CBC w diff, BCx, coags, blood gas

Imaging

2v abdominal XR -> barium enema

Immed*

Fluid resuscitation, gastric decompression

Empiric Antibiotics*

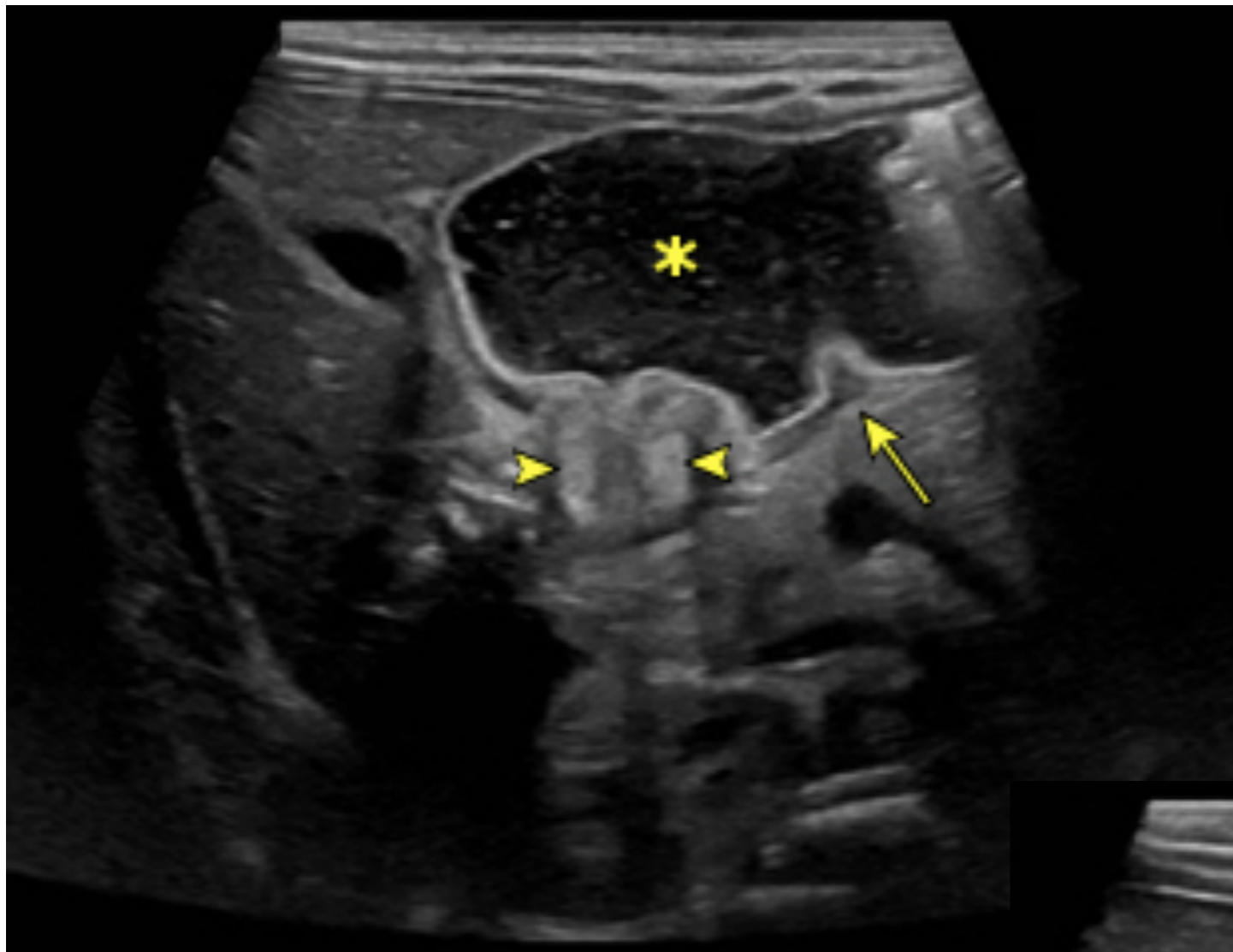
Piperacillin-Tazobactam or Metronidazole

Surgical

Rectal irrigation 10cc/kg NS Q12H; +/- Manometry; Rectal suction biopsy* —> one-stage, definitive pull-through

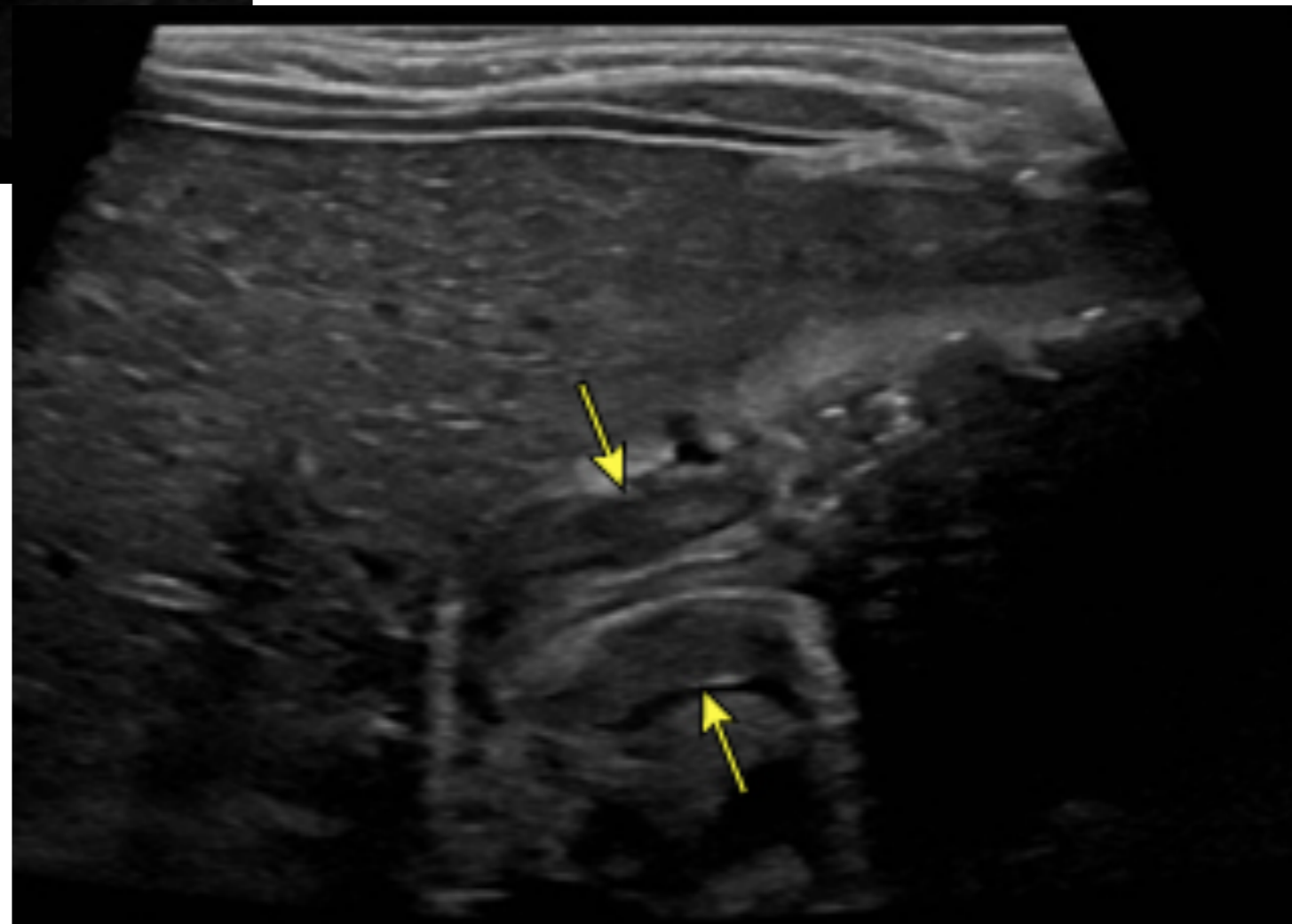
Pyloric Stenosis

- **Path:** Genetic predisposition + environmental factors (Neonatal hypergastrinemia and gastric hyperacidity? Prematurity?)
- **Distribution:** 3-5 weeks (rarely >12wk); M:F 4:1; 1.5x risk first-born
- **Sx/Si:** forceful nonbilious emesis, heightened appetite, diminished urine output; hydration assessment, +/- olive sign



LEFT: distal stomach and pylorus - dilated stomach (asterisk) with peristaltic waves (arrow) and pyloric wall thickening (arrowheads)

BOTTOM: epigastrium - wall thickening (arrows) and lengthening



Upper Limits

Pyloric muscle thickness (PMT): 3-4 mm

Pyloric diameter (PD): 10-14mm

Remember with Pi:

$$\pi = 3.14$$

Management

Labs

CBC w diff, VBG, BMP +/- Fractionated Bili, AST, ALT, GGT

Imaging

US pylorus +/- UGI series (less commonly)

Immed*

Fluid resuscitation, bowel decompression, electrolyte correction

Surgical

Pyloromyotomy

Incarcerated Inguinal Hernia

- **Path:**

- Indirect (most) = abd contents thru internal ring inguinal canal into scrotum.
- Direct (rare) = weak abd muscle allows intest into inguinal canal.
- Femoral = hernia into femoral canal.
 - Incarceration = hernia cannot be reduced by manipulation. May involve intestines, ovary, fallopian tubes, testes
 - Strangulation = vascular compromise (>2h incarceration) -> ischemia, necrosis, perforation
- **Distribution:** 5% all newborns, 10% of premies, M:F 4:1, R > L (p. vaginalis closes on L first). Incarceration rate up to 30% (most < 1yo)
- **Sx/Si:** Abrupt onset pain, irritability, poor feeding, emeses. Bulge in groin, scrotum or labia...vs hydrocele (also thru p.vaginalis) does not transilluminate

Management

Imaging

+/- US limited abdomen/scrotum with doppler

Reduction of incarcerated hernia

Trendelenburg + ice +/- sedation. Pressure applied along proximal inguinal canal with one hand, while the other "milks" the gas or contents out of the incarcerated bowel with gentle pressure (up to 5min). Next, pressure is slightly increased over the distal aspect of hernia to reduce the bowel. If unsuccessful, consult surgery, consider dose morphine.

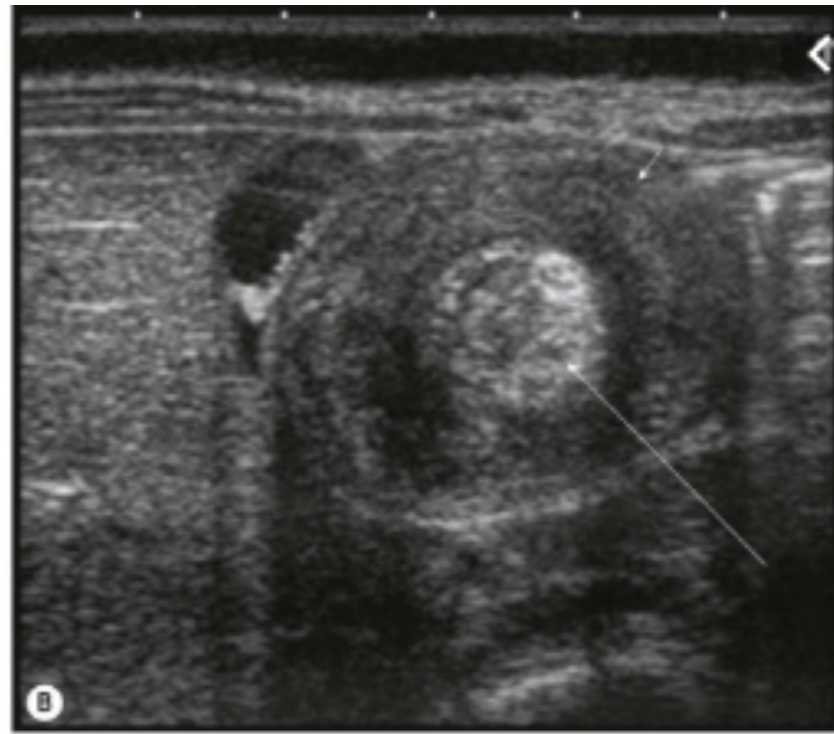
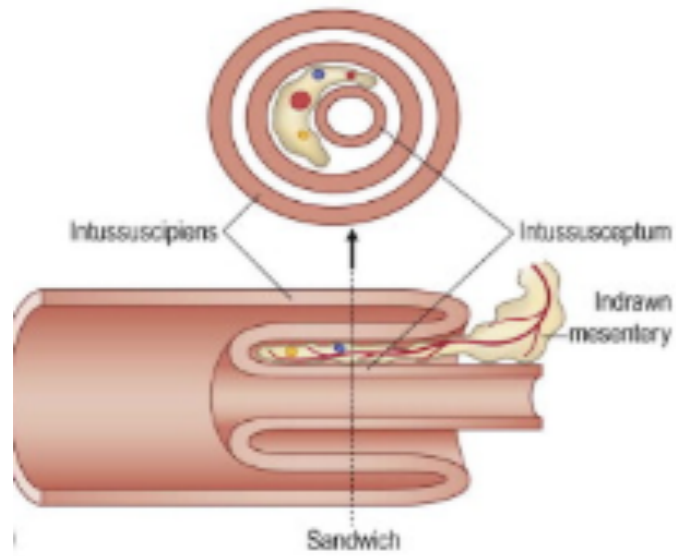
Immed*

Surgical

Surgical repair: emergent vs prompt

Intussusception

- **Path:** Invagination (telescoping) of part of intestine into itself - *intussusceptum* (proximal) and *intussuscipiens* (distal)
 - 90% cases ileocolic
 - Common: Post-infectious inflamed Peyer patch*
 - < 25% with lead point
 - Meckel diverticulum, polyp, CF, cysts, lymphoma, AVM
- **Distribution:** 3mo-5yo* (60% < 1yo, 80% < 2yo); M:F 3:2
- **Sx/Si:** acute onset intermittent severe crampy pain (inconsolable, emeses - can be bilious), initially normal in between episodes -> dehydration, lethargy, AMS. Grossly bloody stool 50% (intestinal ischemia); currant jelly rare (mucosal sloughing). **Abdomen exam can be totally normal (nontender, nondistended, no sausage mass). Finding can be incidental!



Transverse axis with “target sign”, or layers of the intestine within the intestine. Usually in RLQ for ileocolic intussusception



Long axis demonstrating invagination of intestines on itself

Management

Imaging

US limited abdomen/intussusception +/- abdominal XR

Immed*

Fluid resuscitation +/- bowel decompression. No antibiotic ppx

**Surgical/
Radiology**

Hydrostatic or pneumatic enema + surgery stand-by

Appendicitis

- **Path:** Obstruction of appendiceal lumen > polymicrobial overgrowth > inflammation + peritonitis > ischemia > gangrene > perforation
 - Perforation rare < 12h, common >72h
- **Distribution:** Most common >10yo. Only 5% cases < 5yo. Perforation common in younger (non-specific symptoms). M > F
- **Sx/Si*:** Poorly localized pain (early) > anorexia, migrating pain to RLQ (within 24h onset), pain with movement (limp, pain with hopping, preference to lie still), vomiting, fever (24-48h after onset), RLQ tenderness, peritoneal irritation signs (Rovsing, Obturator, Iliopsoas, Rebound tenderness, Involuntary guarding/rigidity)
 - **Caveat #1: Pattern varies by age and frequently outside of classic presentation**
 - **Caveat #2: Findings less obvious when appendix in retrocecal, retroileal, or pelvic position instead of retroperitoneal**

High Risk: Classic exam findings (PAS ≥ 7); elevated WBC, ANC, and/or CRP/PCT

Y | N

Urgent surgery consult prior to imaging

Mod Risk: Some exam findings (PAS 3-6); normal or elevated WBC, ANC, and/or CRP/PCT

Y

N

Antibiotics given prior to eval?

Diagnostic imaging

Y

N

Imaging (+) or not definitive?

Y

N

Surgery consult

RLQ pain/tenderness?

Y

N

Reeval in 12-24h OR admit for serial exams

Discharge and return if pain increases or localizes to RLQ

Low Risk: Minimal tenderness and soft abdomen OR PAS ≤ 2 OR ANC $< 6750/mm^3$ AND minimal RLQ pain

Pediatric Appe Score (PAS)

Anorexia	1
Nausea/Vomit	1
Pain migration	1
Fever $>38C$	1
Pain with cough, hop, or percussion	1
RLQ tenderness	1
WBC >10	1
ANC >7500	1
Total	10

Algorithm from: Wesson D and Brandt M. Acute appendicitis in children: clinical manifestations and diagnosis. Up to Date. Oct 2019.

Management

Labs*

WBC+ANC, CRP/Procalcitonin, UA+micro,
Upreg

Imaging

RLQ US -> CT abd/pelvis w/ cont (may be
requested by surgery if eval indeterminant)

Immed*

IV morphine 0.1mg/kg PRN, Fluid resuscitation

Empiric Antibiotics*

Piperacillin-Tazobactam or Ceftriaxone +
Metronidazole

Surgical

Laparoscopic Appendectomy

*Either WBC or ANC elevated in 96% of cases, however is nonspecific and may be elevated by conditions mimicking appe (strep pharyngitis, pneumonia, PID, gastroenteritis)

Further Reading

- Baker R. Acute Abdominal Pain. Pediatrics in Review March 2018, 39 (3) 130-139.
- N Hijaz and Friesen C. Managing acute abdominal pain in pediatric patients: current perspectives. Pediatric Health Med Ther. 2017; 8: 83-91.