Intussusception: A Guide to Diagnosis and Intervention in Children

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The Anatomy of Intussusception

- Intussusception occurs when a segment of bowel, the *intussusceptum*, telescopes into a more distant segment of bowel, the *intussusciens*.

- The most common type is ileocolic (pictured here), followed by ileoileocolic, ileoileas, and colocolic.

Radiologic Clinics of North America 1997

www.yoursurgery/Intussusception.jpg
Demographics

- Most common acute abdominal disorder of early childhood (56 children/ 100,000/ year in US)
- Boys 4x’s more frequently than girls
- Majority of patients between 3 mon and 3 yr
  - Peak incidence between 5 and 9 months
  - 75% under 2 years
- Seasonal peaks in spring and autumn
- 95% no pathologic lead point
- 5-10% recognizable lead point
- Some evidence of significant attributable risk with rotavirus vaccine administration
Etiologies of Intussusception

- Idiopathic: no defined lead point
  - Association with viral illness (adenovirus)
  - Hypertrophy of lymphoid tissue
- Recognizable cause for lead point
  - Meckel’s diverticulum
  - Intestinal polyp
  - Enteric duplication
  - Lymphoma
  - Intramural hematoma
  - Ameboma
  - Henoch-Schönlein purpura
Clinical Presentation: VARIABLE

- Intermittent, colicky cramping, pain
- Later development of lethargy and somnolence
- Vomiting (may be bile-stained)
- Current jelly stool (blood and mucus)
- Sausage shaped mass
- Distention and tenderness

**Classic Triad:** abdominal pain, currant jelly stool, palpable abdominal mass (<50%)
Complications

Typically do not occur within the first 24 hrs…

- Bowel obstruction
- Intestinal ischemia
- Perforation
- Shock
- Sepsis
- Dehydration

…thus we have a window of opportunity in which to treat and avoid surgery.
Overview of Screening Tools

- Abdominal Radiograph
  - Screen for other Dx’s and free air
  - Can be safely omitted in the presence of US
  - 45% sensitivity

- Abdominal Sonography
  - Diagnostic accuracy near 100%, eval of reducibility, +/- lead point, post reduction, ischemia

- Abdominal CT scan
  - Accuracy approaching 100%; especially good for lead points
  - High cost, risk of radiation, and risk of sedation in children make it unpractical
Patient One: Presentation

- 6 year old female
- 3 weeks ago: URI w/ fever, vomiting, diarrhea (greenish, non-bloody), abdominal pain; seemed to resolve after 3 days
- 1 week ago: increasingly lethargic and irritable, w/vomiting and fever
Patient One: Supine KUB
Patient One: Supine KUB

Paucity of Gas on Right Side of Abdomen
Abdominal Radiograph

- Signs of Intussusception
  - Soft tissue mass
  - Target sign: created by mesenteric fat
  - Absence of cecal gas and stool
  - Meniscus sign: crescent of gas outlining intussusceptum
  - Loss of visualization of the tip of the liver
  - Paucity of bowel gas

- Poor sensitivity for dx of intussusception: 45%
- May be useful to exclude other Dx
- Determine presence of free air (contraindication to non-surgical reduction with contrast)
- May be safely omitted if ultrasound is available
Target & Meniscus Signs

RadioGraphics 1999
Target & Meniscus Signs

RadioGraphics 1999
Patient One: Longitudinal Ultrasound
Patient One: Longitudinal Ultrasound

- Telescoping Bowel
- Sandwich Sign/ Pseudokidney
Patient One: Axial Ultrasound
Patient One: Axial Ultrasound

Doughnut/Target Sign
Patient One: Doppler Ultrasound
Patient One: Doppler Ultrasound

- Blood flow maintained
- Rule out ischemia of involved bowel
Abdominal Ultrasound

- Replaced abdominal radiograph as primary screening modality
- Sensitivity 98 -100%; specificity 88 -100%
- Appearance: outer hypoechoic region surrounding an echogenic center or multiple concentric rings
- Use Doppler to determine bowel ischemia; guides reduction decisions
- Guide hydrostatic and pneumatic reduction
Ultrasound Cross-Sections

- A = intussuscipliens
- B = everted intussusceptum
- C = central intussusceptum
- M = mesentery
- L = lymph nodes
- MS = contacting mucosal surfaces
- S = contacting serosal surfaces
Patient One: Air Enema

Normal bowel gas pattern: Spontaneous Reduction
Enemas

- Air, Liquid (saline, soluble contrast), Barium
- At one time used for Dx
  - Coiled spring: edematous mucosal folds of returning intussusceptum outlined by contrast in colon
  - Meniscus sign
- Now used mainly for Treatment/Reduction
  - Avoid patient discomfort and risk of perforation
  - US better diagnostic tool & rule out tool
Meniscus & Coiled Spring Signs
Reduction Procedures

- **Barium enema: previous standard for Dx and reduction**
  - Risk of barium peritonitis, infection, adhesions, radiation exposure with fluoroscopy, only see lumen
  - 55-95% accuracy
  - Iodinated contrast safer but causes fluid shifts

- **US-guided Hydrostatic reduction**
  - No radiation, good visualization of intussusception & lead points
  - Need sonographer

Reduction Procedures cont.

- **Pneumatic reduction with fluoroscopic guidance**
  - Quick, safe, clean (less fecal spillage), cheap
  - Radiation exposure, cannot depict lead points well, only see intraluminal content

- **US-guided Pneumatic reduction**
  - No radiation, confirm dx, highest successful reduction rate (92%), quick and clean, can see lead points well (but not all)
  - Air blocks US beam; difficult to see ileocecal valve and residual intussusceptions

- **Surgical**
Contraindications to Enema

- Dehydration
- Peritonitis
- Shock
- Sepsis
- Free air on radiograph

Stabilize then treat surgically
Complications of Reduction

● Perforation
  – Overall rate of 0.8%
  – Similar rates for liquid and air enemas
  – Perforations with air usually smaller

● Recurrence
  – Approximately 10%
  – Similar rates for liquid and air enemas
  – 50% will occur within 48 hrs
  – Repeat enemas are safe and effective
Reduction Guidelines

- **Liquid Enema Rule of Three’s for Barium**
  - 3 attempts
  - 3 min duration
  - Liquid enema bag 3 feet above fluoroscopy table (5 feet if using water-soluble contrast)

- **Air Enema**
  - Ensure maximal pressures <120 mm Hg at rest
Success of Reduction Depend On…

- Short duration of symptoms (<24-48 hrs)
- Adequate hydration
- Age (older than 3 months)
- Absence of small-bowel obstruction
- Absence of trapped intraperitoneal fluid
- Absence of enlarged lymph nodes in the intussusceptum
- Adequate blood flow
- Location other than the rectum (rectum only 25% success)
Patient Two: Presentation

- 2 year old male
- Worsening vomiting and abdominal pain since the morning of admission
- Vomited 8x’s since morning, no bile, blood or stool
- No fevers; no current or recent illness
- No new foods, travel or trauma
- Prior incident of vomiting which he recovered from one month prior
- Abdomen soft, non-distended with active BS, diffusely tender
Patient Two: Supine KUB

Patient does not have classic triad of intussusception

Use KUB to consider other diagnoses
Patient Two: Supine KUB

- Paucity of Gas on Right
- Dilated loops of small bowel
- Looks like obstruction
DDx of Intestinal Obstruction in a Child

- Adhesions/Congenital peritoneal bands (Ladd’s bands)
- Appendicitis
- Hernia, incarcerated (internal or external)
- Hirschsprung disease
- Intussusception

Uncommonly: Crohn’s, fecal impaction, bezoar, Kawasaki, neoplasm, congenital stenosis, TB, volvulus, CF, Chronic granulomatous disease
Patient Two: Longitudinal Ultrasound

Use US to explore possible causes of obstruction including intussusception

Patient is not exposed to any further radiation or the discomfort of enema until further Dx
Patient Two: Sagittal Ultrasound

Dilated loops of bowel
Patient Two: Axial Ultrasound
Patient Two: Axial Ultrasound

- Doughnut/Target Sign
- Patient’s obstruction is due to intussusception
Patient Two: Doppler Ultrasound

RLQ TRV
Patient Two: Doppler Ultrasound

- Blood flow maintained
- Rule out bowel ischemia
- Patient is safe to receive an US guided air enema with likelihood of resolution
Review

- Intussusception is COMMON in young children
- Clinical presentation is variable underscoring the need for a safe, quick, inexpensive screening tool such as ultrasound
- Ultrasound is extremely accurate in diagnosing obstruction; CT is more accurate in defining a lead point; abdominal radiographs can be helpful in considering other diagnoses
- Ultrasound guided air enema combines the safety of ultrasound (lack of radiation) with the effectiveness, ease, cleanliness, and safety of air enema in reducing intussusception
What does intussusception look like on CT?

- Since lead points are more likely in the adult population, CT is done more frequently in this population with suspected intussusception.
- Scroll through the following images to get a sense of what intussusception looks like on CT.
- Notice the familiar target sign, also useful in diagnosis using plain film and ultrasound!
Intussusception on CT
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Intussusception on CT
References

- Felson. Gamuts in Radiology.
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