Intussusception

Nicholas Chai

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Intussusception: What is it

- Telescoping of one segment of the intestine intussusceptum into another adjacent distal segment intussuscipiens
- Most commonly occurs 2 months - 2 years

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Intussusception: What happens

Telescoping — Drags mesentery, vessels, nerves

Compression — Veins

↓

Swelling

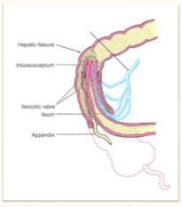
↓

Obstruction

3

Intussusception: The types

- Ileocaecal – 90% (Waseem et al 2016)
- Ileoileocoloic
- Ileoileal
- Colocolic



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Intussusception: Etiology

- Idiopathic
- Hypothesis:
  - Hypertrophied lymphoid tissue in the terminal ileum
  - Viral

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Intussusception: Etiology

- Idiopathic
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... Is there a lead point?

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Intussusception: Clinical presentation

- Intermittent, colicky abdo pain
- Vomiting (bilious)
- Currant jelly stool (arterial supply compromised → ischemia, necrosis with outpouring of mucus)
- Palpable abdominal mass
- Lethargic
- Fever

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Intussusception: Clinical presentation

Classic triad

- Intermittent colicky abdominal pain
- Palpable mass
- Currant jelly stool

All 3 present in only 30%

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Intussusception: Clinical presentation

ıgns/Symptoms	<12 mo	12–36 mo	>36 mo	All Patients
,bdominal pain (n = 189)	90%	96%	97%	93% ($P < 0.041$)
mesis (n = 214)	94%	79%	64%	85% ($P < 0.001$)
natsaic-positive stool (n = 98)	83%	60%	67%	76% ($P = 0.027$)
rossly bloody stools (n = 185)	83%	41%	37%	65% ($P < 0.001$)
ritability (n = 196)	71%	51%	14%	58% ($P < 0.001$)
ilious emesis (n = 187)	48%	24%	31%	39% ($P = 0.004$)
ethargy (n = 199)	47%	26%	13%	36% ($P < 0.001$)
iarrhea (n = 193)	38%	34%	41%	37% (NS)
onstipation (n = 167)	13%	24%	25%	18% (NS)
emperature >38.5°C (n = 216)	8%	10%	6%	8.3% (NS)
,bdominal tenderness (n = 211)	36%	48%	61%	43% ($P = 0.017$)
,bdominal mass (n = 212)	33%	23%	22%	28% (NS)
,bdominal distention (n = 209)	25%	18%	21%	23% (NS)

Those findings that had statistical difference ($P < 0.05$) in children younger than 12 months versus those older than 12 months are noted.
NS indicates not statistically significant.

Mandeville et al. 2012

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Mandeville et al. 2012

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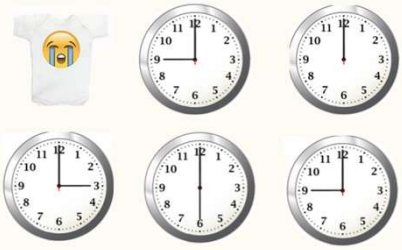
Intussusception: When do they present?



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Intussusception: Diagnosis

- X-ray
  - 3 view abdominal x-ray (supine, prone, left lat debub)

- Criteria to rule out intussusception:
  - Air visualized in ascending colon in each view and transverse colon on supine

Sensitivity 100%
Specificity 17.4%
Negative predictive value 100%

Roskind et al 2012

Radiation + Not specific

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Intussusception: Diagnosis

- Ultrasound
  - No ionising radiation
  - Other pathologies evident

Sensitivity: 98-100%
Specificity: 88-100%

Applegate et al. 2009

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Intussusception: How to scan...

- Different transducers

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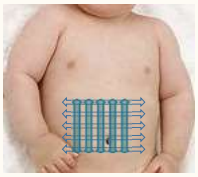
Intussusception: How to scan...

- RLQ
  - Psoas muscle
  - Iliacs
  - Cecum
  - Ileocaecal valve
  - Follow colon
  - Graded compression



"Side to side"

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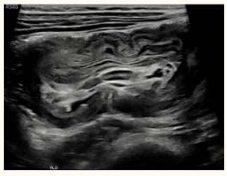
Intussusception: What sign?

TRANS	LONG
'Donut sign'	'Pseudo-kidney'



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Intussusception: What information?

- Size and location
- Is there peristalsis
- Blood flow
- Reactive changes
- Dilated bowel
- Is there a lead point

Large bowel → usually > 3cm

Small bowel → usually < 2cm

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Obstructed bowel → limited peristalsis

Transient intuss. → peristalsis

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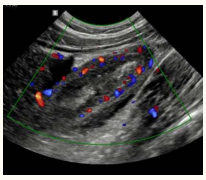

Absent blood flow → ? Necrosis

Success to reduce → decreased

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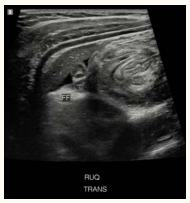

Free Fluid

Lymph nodes

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Intussusception: What information?

- Size and location
- Is there peristalsis
- Blood flow
- Reactive changes
- Dilated bowel
- Is there a lead point

Indicative of obstruction

Increased risk of perforation

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Intussusception: What information?

- Size and location
- Is there peristalsis
- Blood flow
- Reactive changes
- Dilated bowel
- Is there a lead point

Decreases reducibility
Increases risk of surgery
Increase risk of recurrence

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Intussusception: Worksheet

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Intussusception: Worksheet

Intussusception

Present: - Select -

Location: - Select - Type of Intussusception: - Select -

Length: mm Lead point identified: ○Yes ○No

Vascularity: - Select -

Interloop fluid: - Select -

Comment

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Intussusception: Treatment

- Fluoroscopy
  Air enema
  - Team
    - Radiographers
    - Radiologist
    - Surgical team
- Surgery

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Intussusception: Contraindications

- Perforation
  - Xray in rare cases → ?peritonitis
- Age
  - History intussusception increase risk of recurrence

? Gas seen on fluoro prelim

>2 often lead point

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Intussusception: Air enema: MH data

- 5 year study 2008-2012(Doan Ly, Coombs P)

83.9% success rate

Frequency of Sonographic Features in Successful and Unsuccessful Reductions

Sonographic Features	N (%) in Successful Reductions	N (%) in Unsuccessful Reductions	N	P- value
Interloop Fluid	13 (76.5)	4 (23.5)	17	0.06
Free intraperitoneal fluid	16 (84.2)	3 (15.8)	19	0.39
Pathological lead point	43 (87.8)	5 (12.2)	49	>0.99
Reduce Doppler Blood Flow	2 (50)	2 (50)	4	0.35

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Intussusception: Air enema: 2022 MH data

225 differential diagnosis of intussusception

Ultrasound

YES = 23 | NO = 202

Intuss. = 14 | Transient = 9

Air enema = 9

Successfully reduced =7 → 78% success

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Intussusception: ? Fail

AGE	LEAD POINT
> 2 years	Meckel diverticulum
< 2 months	Burkitt lymphoma

AJR Am J Roentgenol. 2016 Aug;207(2):424-33. doi: 10.2214/AJR.15.15659. Epub 2016 May 25.

Failed Intussusception Reduction in Children: Correlation Between Radiologic, Surgical, and Pathologic Findings.

Ntoulia A[1], Tharakan SJ[1], Reid JR[1], Mahboubi S[1].

Author information

Abstract

OBJECTIVE: The objective of this study was to identify causes of irreducible intussusception after contrast enema and to correlate imaging findings with surgical and histopathologic findings.

75.7% idiopathic

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Intussusception: Lead point

- Reduced success rate of air enema
- Two unsuccessful cases:

Meckel's diverticulum

No lead point during operation

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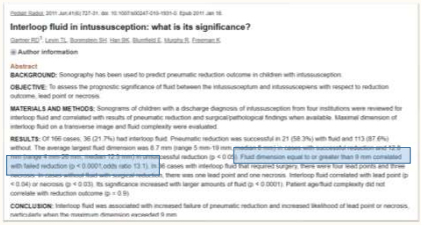
Intussusception: Interloop fluid



Interloop fluid in intussusception: what is its significance?

Gartner RD[1], Levin TL, Bonnesteln SH, Van BK, Blumfield E, Murphy R, Freeman K

Author information

Abstract

BACKGROUND: Sonography has been used to predict pneumatic reduction outcome in children with intussusception.

OBJECTIVE: To assess the prognostic significance of fluid between the intussusceptum and intussuscipiens with respect to reduction outcome, lead point or necrosis.

MATERIALS AND METHODS: Sonograms of children with a discharge diagnosis of intussusception from four institutions were reviewed for interloop fluid and correlated with results of pneumatic reduction and surgical/pathological findings when available. Maximal dimension of interloop fluid on a transverse image and fluid complexity were evaluated.

RESULTS: Of 196 cases, 36 (21.7%) had interloop fluid. Pneumatic reduction was successful in 21 (58.3%) with fluid and 113 (87.6%) without. The average largest fluid dimension was 8.7 mm (range 5 mm-19 mm; median 8 mm in cases with successful reduction and 12.5 mm [range 5 mm-26 mm; median 12.5 mm] in unsuccessful reduction ($p < 0.05$). Fluid dimension equal to or greater than 9 mm correlated with failed reduction ($p < 0.0001$; odds ratio 13.1). In 36 cases with interloop fluid that required surgery, there were four lead points and three necrosis. In cases without fluid with surgical reduction, there was one lead point and one necrosis. Interloop fluid correlated with lead point ($p < 0.04$) or necrosis ($p < 0.03$). Its significance increased with larger amounts of fluid ($p < 0.0001$). Patient age/fluid complexity did not correlate with reduction outcome ($p < 0.9$).

CONCLUSION: Interloop fluid was associated with increased failure of pneumatic reduction and increased likelihood of lead point or necrosis, particularly when the maximum dimension exceeded 9 mm.

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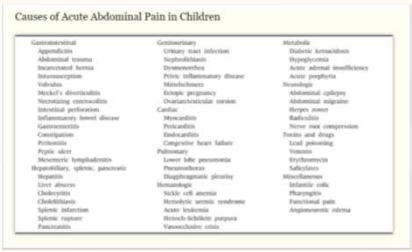
Intussusception: What else can it be?



Causes of Acute Abdominal Pain in Children

Gastrointestinal	Genitourinary	Metabolic
Appendicitis	Urinary tract infection	Diabetic ketoacidosis
Abdominal trauma	Nephrolithiasis	Hypoglycemia
Incarcerated hernia	Dysmenorrhea	Acute adrenal insufficiency
Intussusception	Pelvic inflammatory disease	Acute porphyria
Volvulus	Mittelschmerz	Neurologic
Meckel's diverticulitis	Ectopic pregnancy	Abdominal epilepsy
Necrotizing enterocolitis	Ovarian/testicular torsion	Abdominal migraine
Intestinal perforation	Cardiac	Herpes zoster
Inflammatory bowel disease	Myocarditis	Radiculitis
Gastroenteritis	Pericarditis	Nerve root compression
Constipation	Endocarditis	Toxins and drugs
Peritonitis	Congestive heart failure	Lead poisoning
Peptic ulcer	Pulmonary	Venoms
Mesenteric lymphadenitis	Lower lobe pneumonia	Erythromycin
Hepatobiliary, splenic, pancreatic	Pneumothorax	Salicylates
Hepatitis	Diaphragmatic pleurisy	Miscellaneous
Liver abscess	Hematologic	Infantile colic
Cholecystitis	Sickle cell anemia	Pharyngitis
Cholelithiasis	Hemolytic uremic syndrome	Functional pain
Splenic infarction	Acute leukemia	Angioneurotic edema
Splenic rupture	Henoch-Schönlein purpura	
Pancreatitis	Vasoocclusive crisis	

The Korean Society of Pediatric Gastroenterology, Hepatology and Nutrition, 2013

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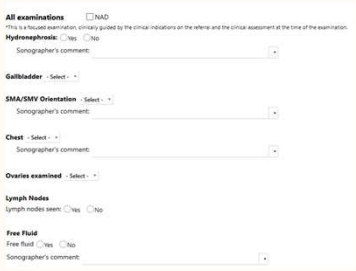
Intussusception: What else can it be?



All examinations ☐ NAD

*This is a focused examination, clinically guided by the clinical indications on the referral and the clinical assessment at the time of the examination.

Hydronephrosis: ○ Yes ○ No

Sonographer's comment:

Gallbladder - Select -

SMA/SMV Orientation - Select -

Sonographer's comment:

Chest - Select -

Sonographer's comment:

Ovaries examined - Select -

Lymph Nodes

Lymph nodes seen: ○ Yes ○ No

Free Fluid

Free fluid ○ Yes ○ No

Sonographer's comment:

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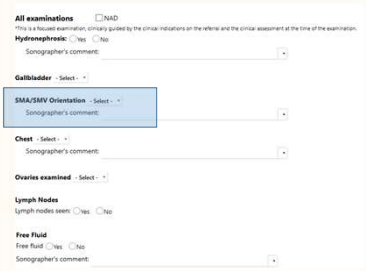
Intussusception: What else can it be?



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Lymph Nodes

Lymph nodes seen: ○ Yes ○ No

Free Fluid

Free fluid ○ Yes ○ No

Sonographer's comment:

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Intussusception: SMA/SMV

- Orientation of SMA/SMV
- Whirlpool sign

Malrotation

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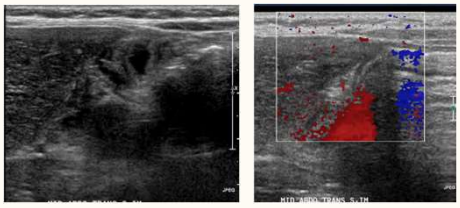
Intussusception: SMA/SMV



Malrotation

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Intussusception: Is it appendicitis...

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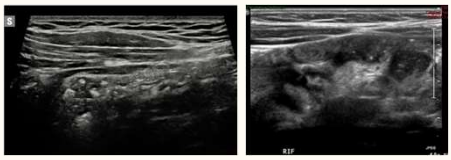
Intussusception: Pitfalls - ICJ

- Thickened ileocaecal junction



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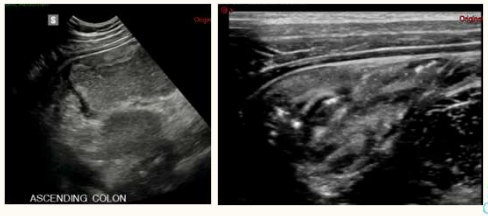
Intussusception: Pitfalls

- Colitis



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Intussusception: Learning outcomes

- Varied clinical presentations
- Ultrasound appearance
  - Location
  - Size
  - Peristalsis
  - Vascularity
  - Bowel dilatation
  - Interloop fluid
- Is there a lead point
- Other pathology

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References

- Mandeville K, Chien M, Willyerd FA, Mandell G, Hostetler MA, Bulloch B. Intussusception: clinical presentations and imaging characteristics. Pediatr Emerg Care. 2012;28(9):842-844.
- Applegate KE. Intussusception in children: evidence-based diagnosis and treatment. Pediatr Radiol. 2009;39 Suppl 2:S140-143
- Roskind CG, Kamdar G, Ruzal-Shapiro CB, Bennett JE, Dayan PS. Accuracy of plain radiographs to exclude the diagnosis of intussusception. Pediatr Emerg Care. 2012;28(9):855-858
- Ntoulia et al (2016) Failed Intussusception Reduction in Children: Correlation Between Radiologic, Surgical, and Pathologic Findings. AJR Am J Roentgenol. 2016 Aug;207(2):424-3
- Waseem et al 2016. Pneumatic reduction of pediatric intussusception: Experience at Queen Rania Al-Abdullah Hospital for Children. Journal of the Royal Medical Services Vol. 23 No. 3 Sep 2016

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