

# Colonic volvulus in children

Stephen F. Miller, MD

Jeffrey A. Scrugham, MD

Department of Radiology

LeBonheur Children's Hospital

University of Tennessee Health Science Center

Memphis, Tennessee, USA

# Disclosures

- The authors have no disclosures

# Purpose of exhibit

- Demonstrate the radiographic signs of colonic volvulus on plain radiographs, including the “coffee beak” and “northern exposure” signs
- Demonstrate the fluoroscopic “beak” sign of sigmoid volvulus
- Show the CT features of cecal and sigmoid volvulus, emphasizing the characteristic “whirlpool” sign

# Background information

- Colonic volvulus is a rare but often catastrophic cause of bowel obstruction in children
- Sigmoid and transverse colonic volvulus due to abnormally elongated mesentery
- Cecal volvulus related to poor retroperitoneal fixation
- Incidence: sigmoid > cecal > transverse
- Symptoms of colonic volvulus may be vague and presentation is often delayed
- Plain radiographs may be suggestive of cecal or sigmoid volvulus, but are most often nonspecific
- Fluoroscopy and/or CT are usually diagnostic of colonic volvulus and can direct appropriate management

# Sigmoid volvulus in children

- Rare - Salas (2000) reported a literature review of 63 cases
- M:F = 3.5:1, mean age = 7-12 years
- Volvulus occurs when a dilated, redundant sigmoid twists around an elongated mesentery
  - 180 degree twist obstructs bowel lumen
  - 360 degree twist obstructs bowel vasculature
- Predisposing factors:
  - Hirschprung disease
  - Chronic constipation
  - Developmental delay
  - Colonic dysmotility

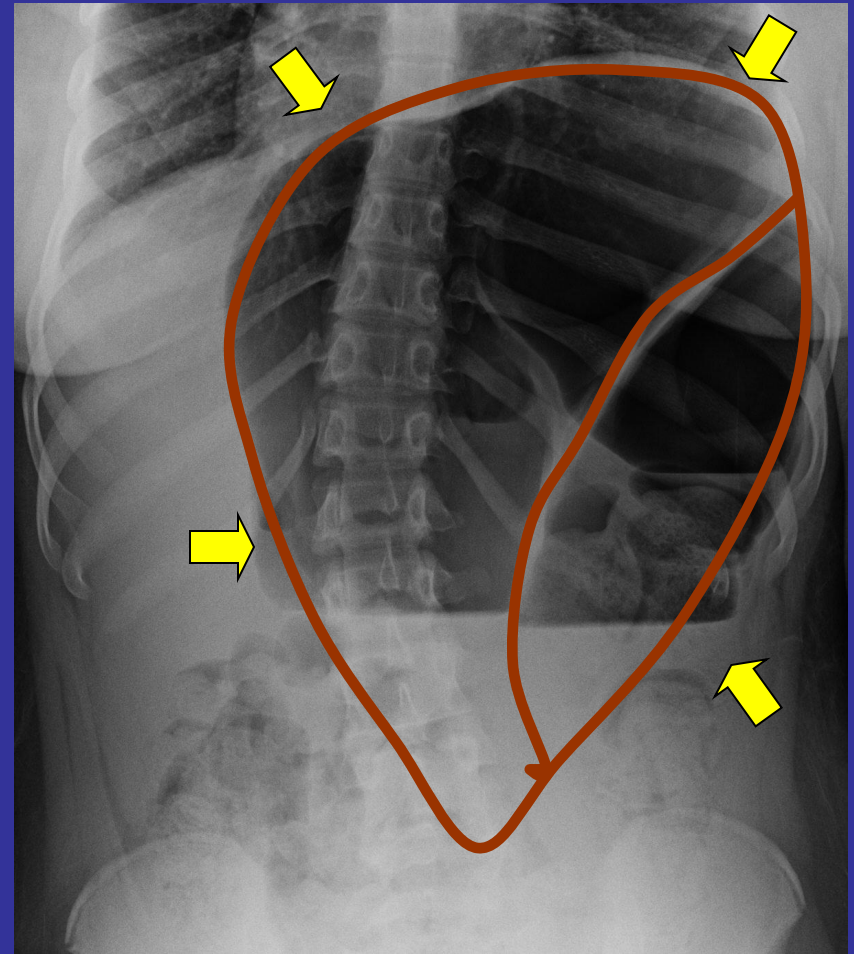
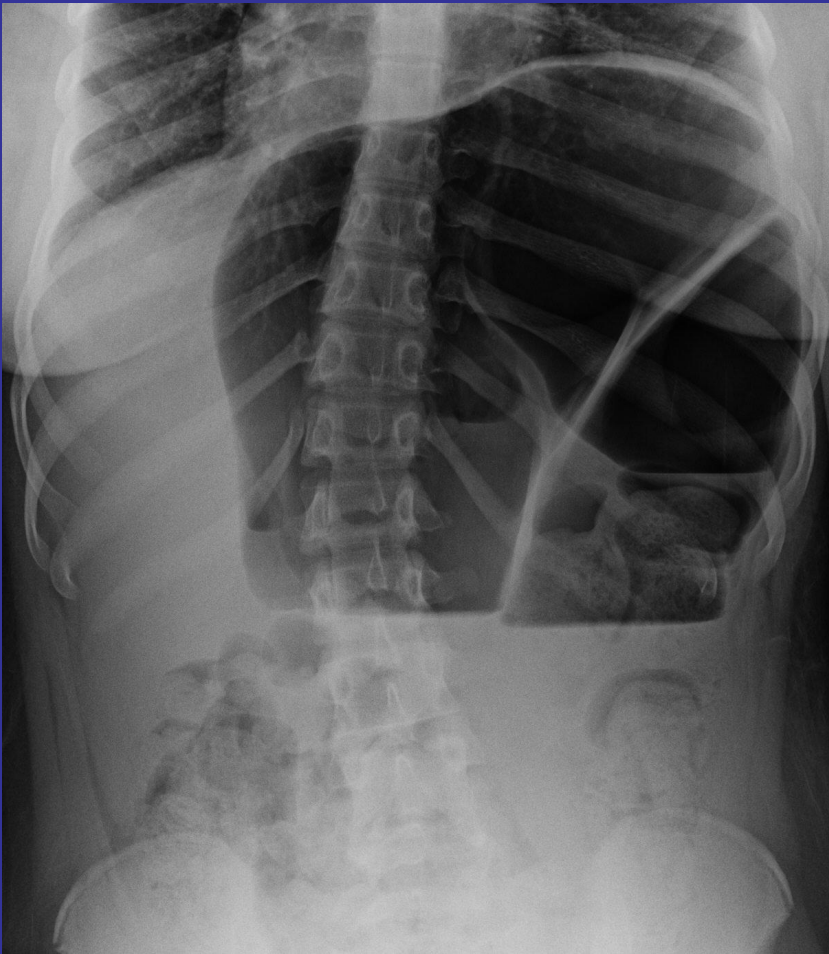
# Clinical features of sigmoid volvulus

- Most present with acute abdominal pain and distension of <2 hours
- Tenderness in 41%, vomiting in 31%
- Some patients present with recurrent pain and distension
- Symptoms and signs are nonspecific, and delayed diagnosis is common
- Mortality is ~10-15%, due to sepsis and ischemia

# Plain radiographs in sigmoid volvulus

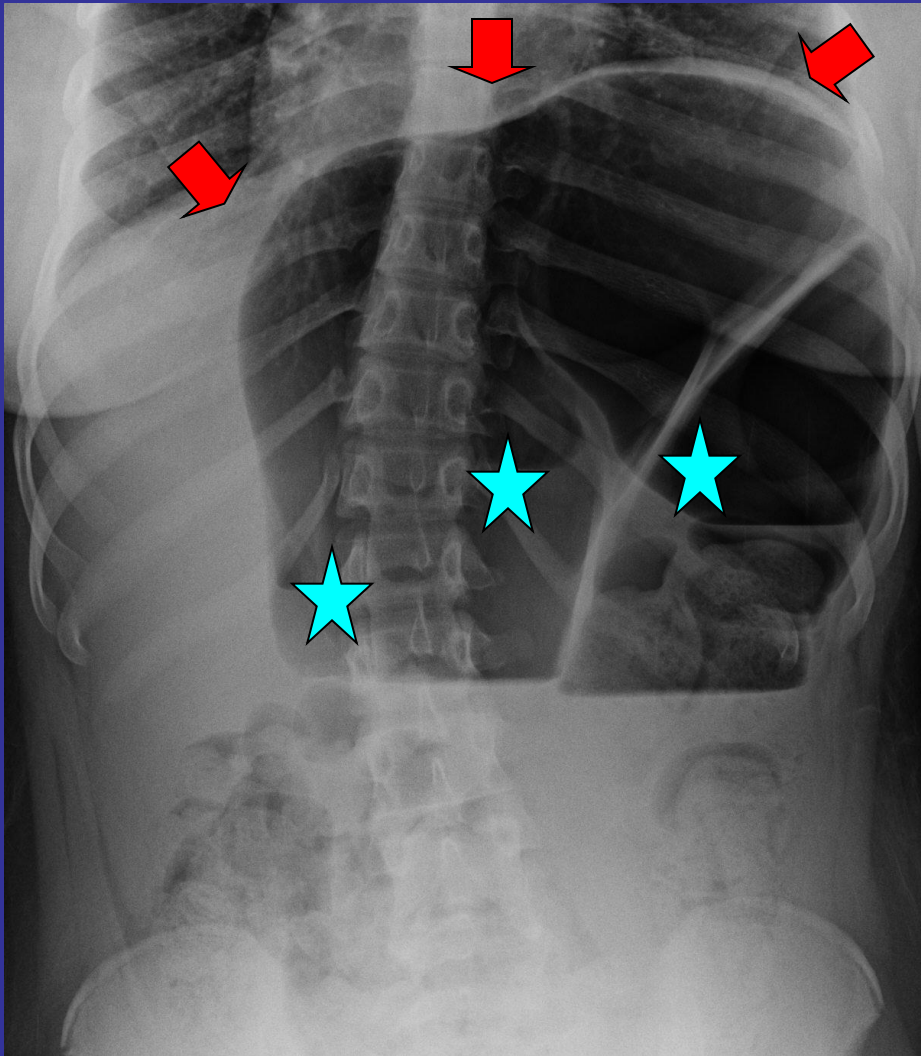
- Generalized abdominal distension is common
- In the adult, the dilated sigmoid colon assumes a “coffee bean” appearance in ~80% of patients, with two large air-filled compartments and a central double wall ending at the point of the twist, and is displaced into the RUQ
- In children, the dilated sigmoid is often midline or displaced into the RUQ or LUQ
- Classic “coffee bean” sign seen in <33% of pediatric patients
- Ischemia may result in perforation with free intraperitoneal gas

# “Coffee bean” sign in sigmoid volvulus



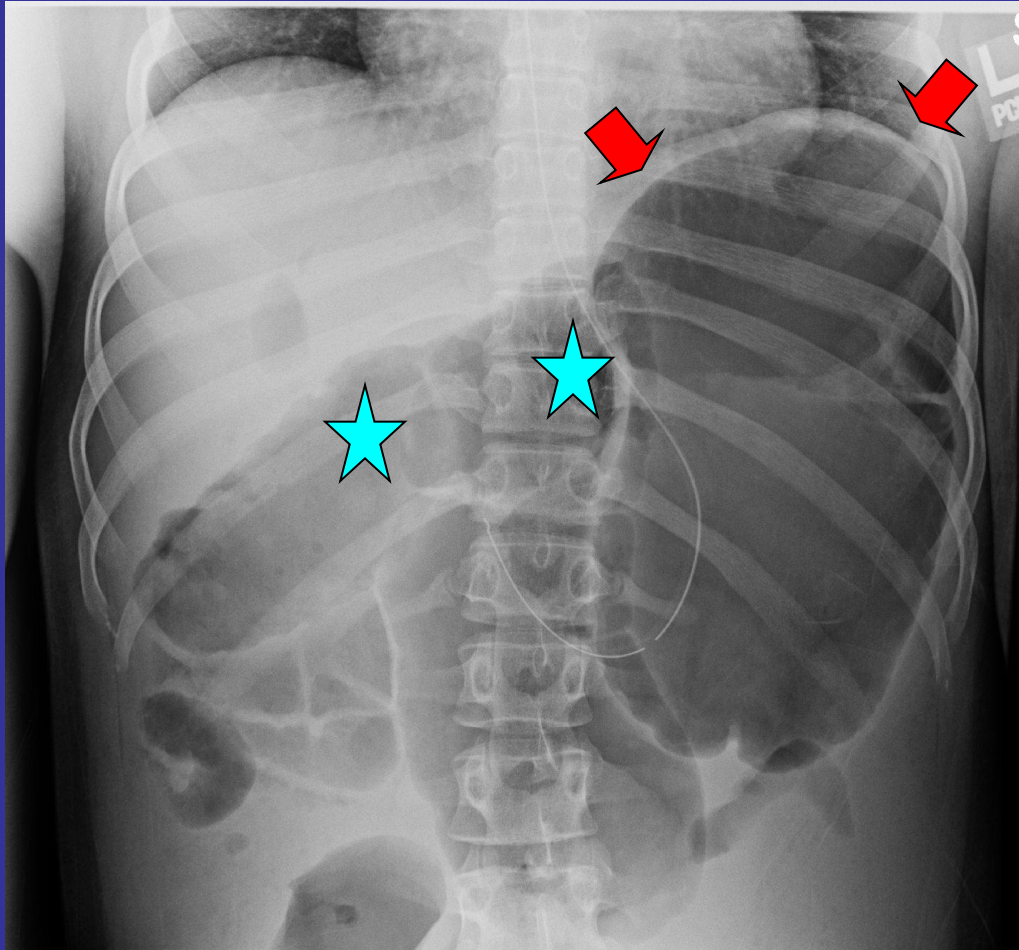
The shape of the dilated, displaced sigmoid colon with intervening walls is reminiscent of a coffee bean

# “Northern exposure” sign in sigmoid volvulus



- The “northern exposure” sign represents a dilated sigmoid colon (arrows) that extends cranial to the transverse colon (stars)
- Recently described, 86% sensitivity and 100% specificity for sigmoid volvulus in adults
- Not yet evaluated in children

# “Northern exposure” sign in sigmoid volvulus



- 17 year old girl with acute abdominal pain and chronic constipation
- Dilated sigmoid colon (arrows) displaced into LUQ
- Classic “coffee bean” appearance not seen
- Has “northern exposure” sign, with dilated sigmoid colon (arrows) cranial to transverse colon (stars)

# Free air in sigmoid volvulus

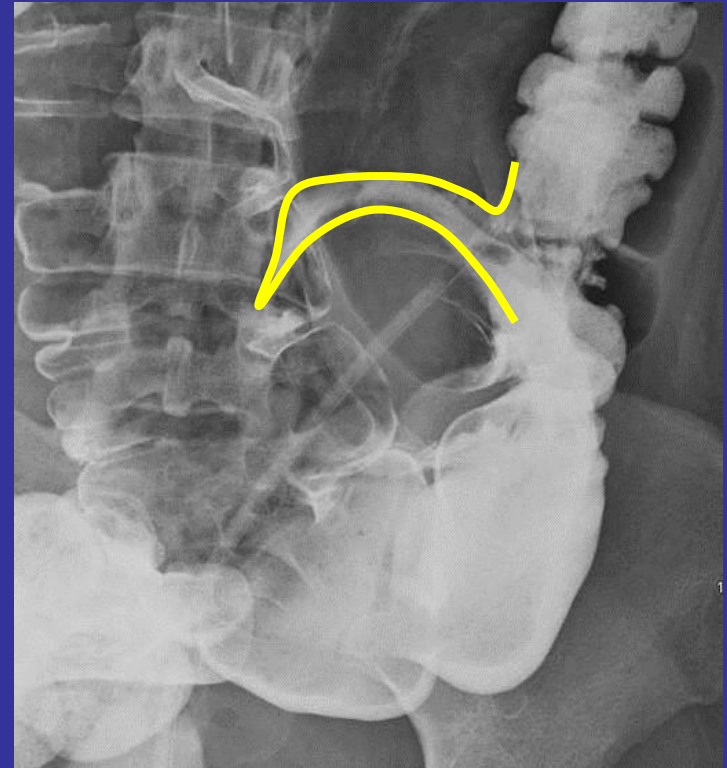
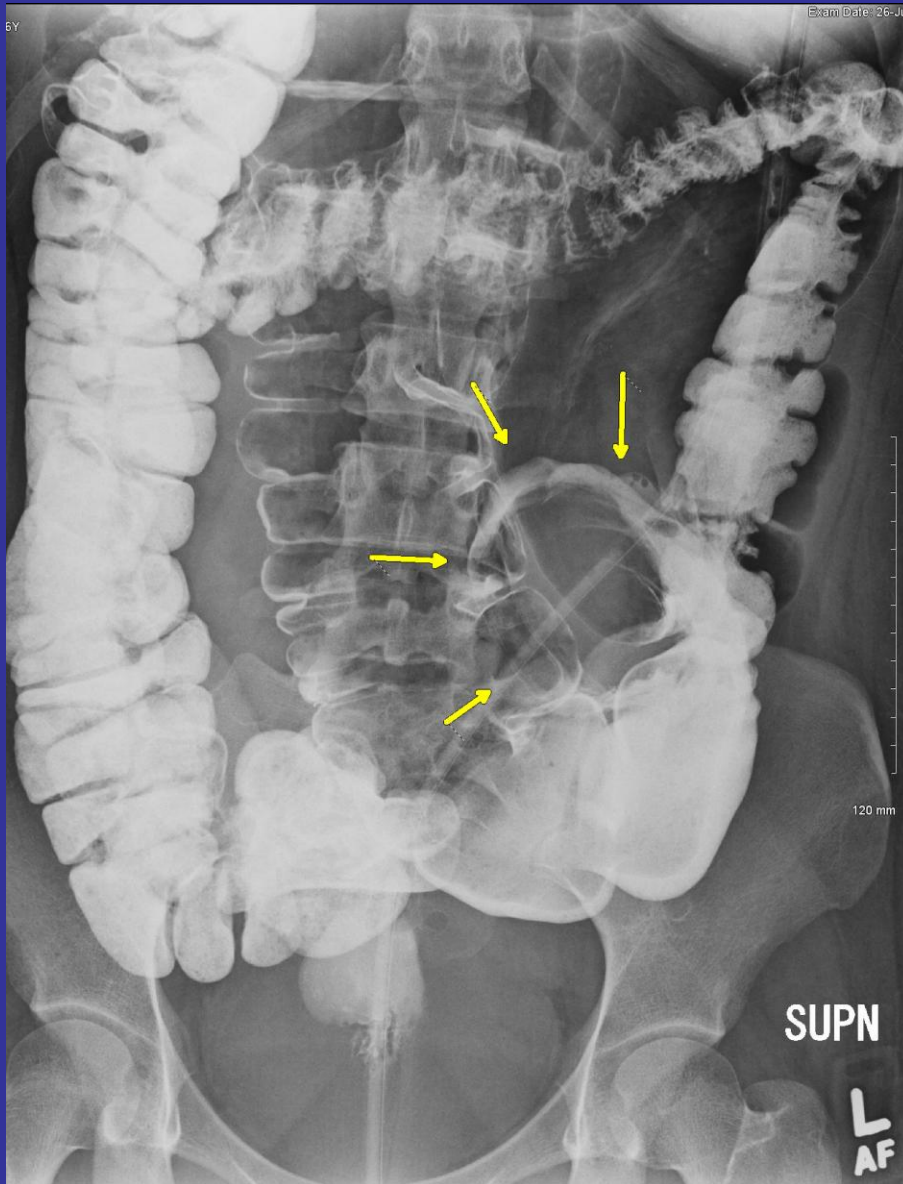


- Young girl with acute abdominal pain
- Upright radiograph demonstrates intraperitoneal free air (arrows)
- Uncommon complication due to ischemia of volved segment

# Contrast enema in sigmoid volvulus

- Contrast enema is performed to diagnose and often reduce sigmoid volvulus
- Enema is at least 71-82% sensitive
- Contrast enema may successfully reduce sigmoid volvulus in up to 77% of pediatric patients
- Classic “bird beak” sign seen at the distal point of twist

# “Bird beak” sign in sigmoid volvulus



16 year old girl with recurrent sigmoid volvulus and rectal tube. The twisted segment of sigmoid assumes the shape of a bird beak

# CT findings in sigmoid volvulus

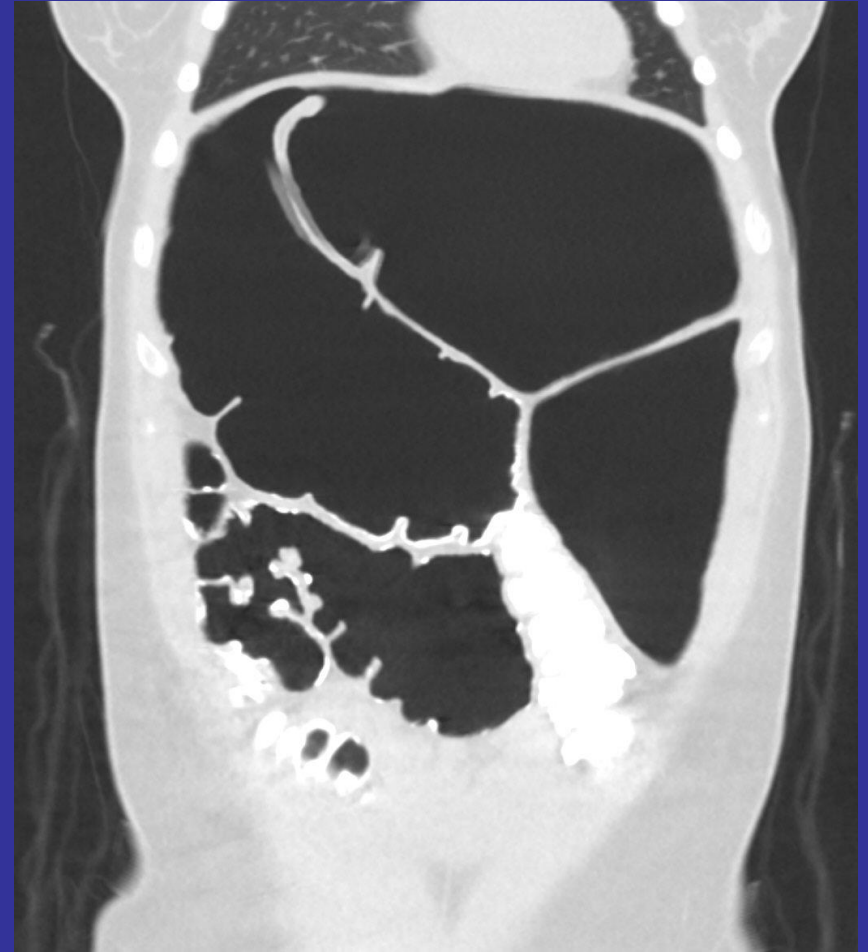
- Axial images with coronal and sagittal reconstructions are performed
- The dilated sigmoid colon is often seen in midline or in LUQ (as opposed to RUQ in adults)
- Classic “coffee bean” sign can be seen on coronal images
- Classic “swirl sign” of twisted mesenteric vessels is diagnostic

# CT in sigmoid volvulus



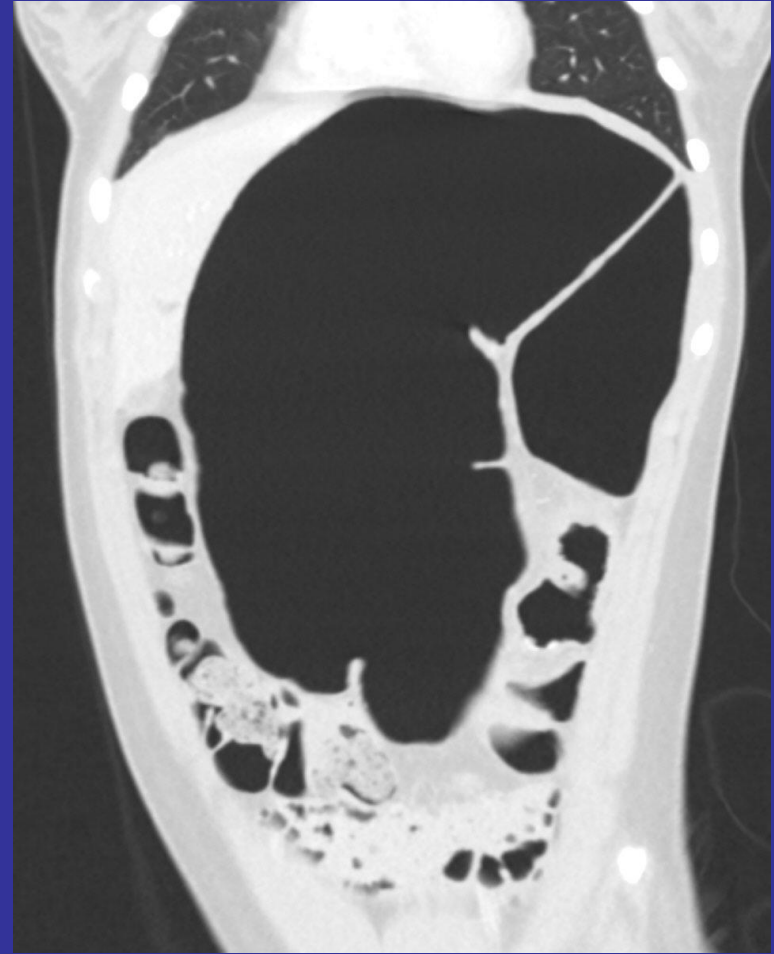
- Localizer image in 17 year old girl with acute abdominal pain
- Dilated sigmoid colon displaced into LUQ (arrows)
- Stomach decompressed via G-tube
- Positive “northern exposure” sign

# “Coffee bean” sign on CT



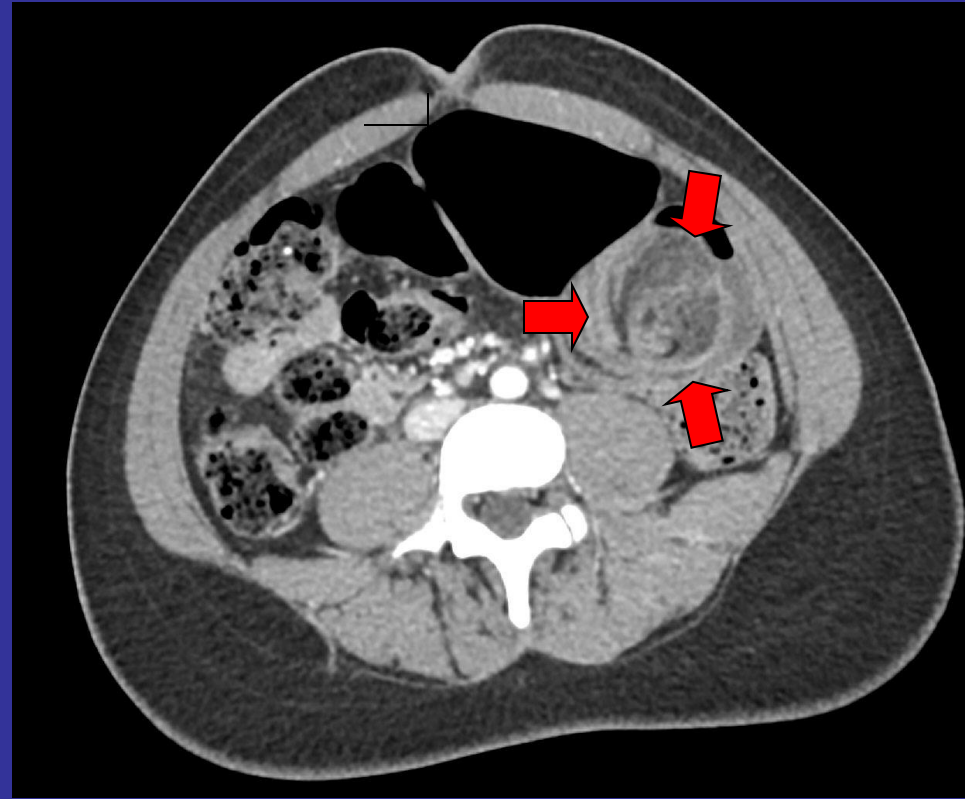
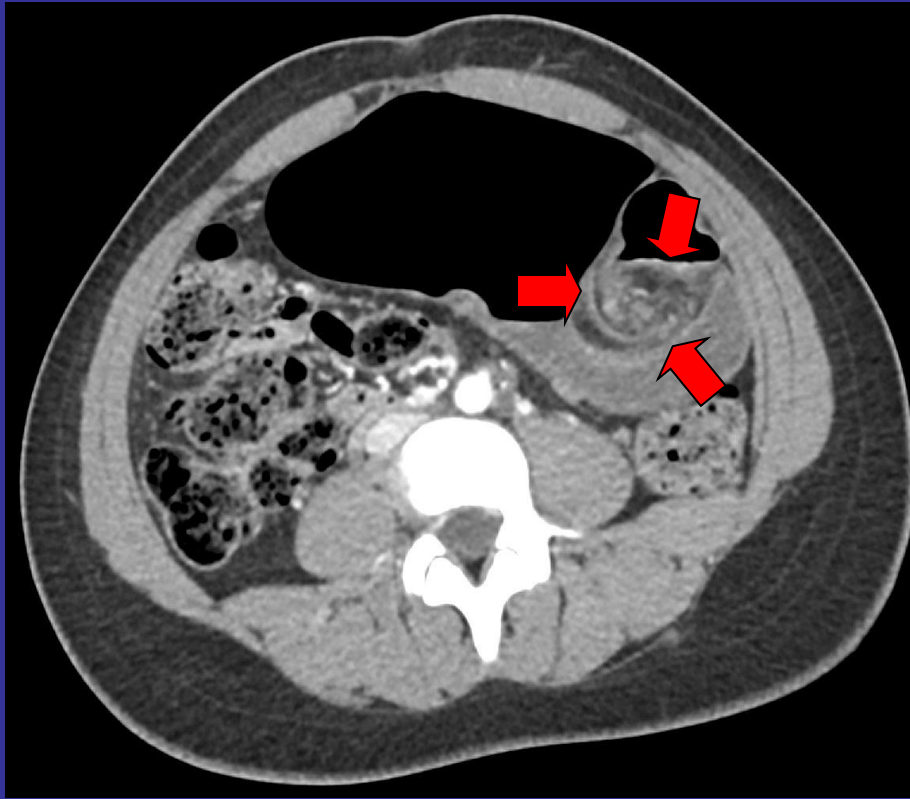
16 year old girl with sigmoid volvulus. CT shows classic “coffee bean” sign in RUQ

# “Coffee bean” sign on CT



Coronal CT with soft tissue (left) and lung windows (right) showing “coffee bean” sign within upper midline and LUQ

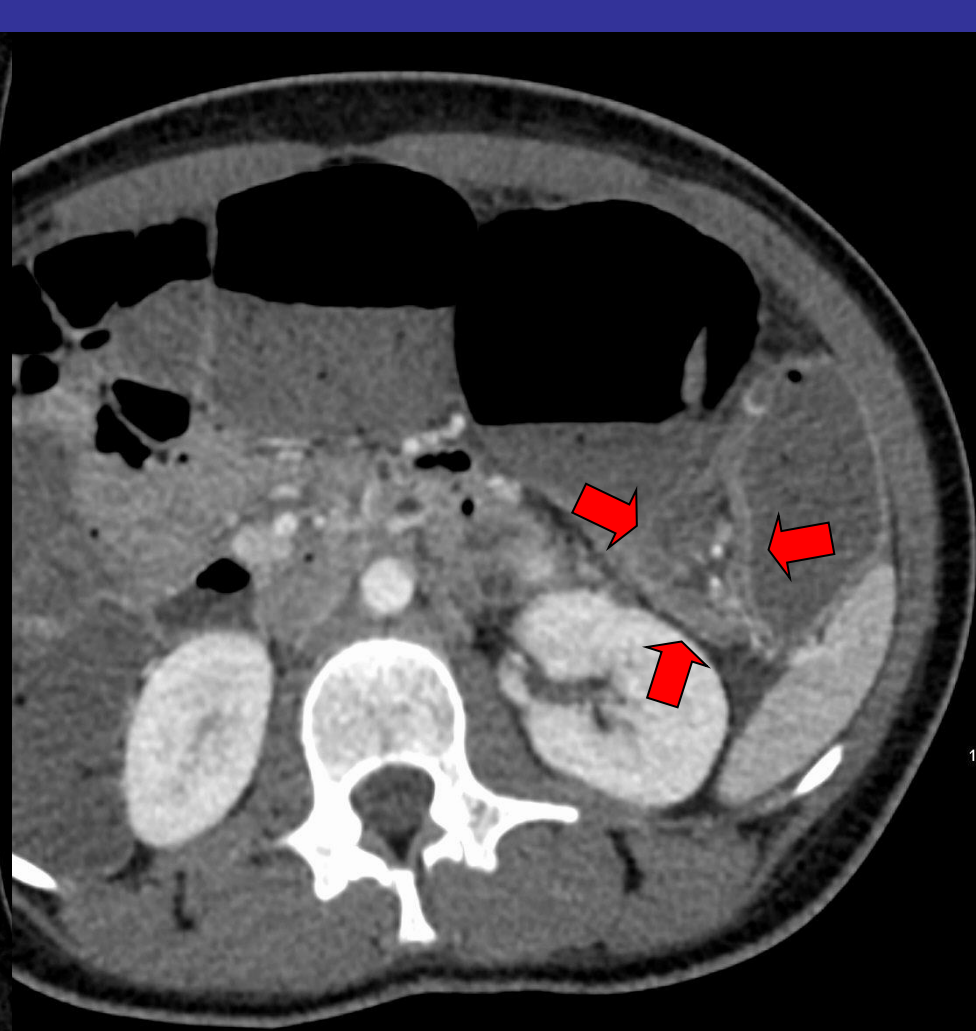
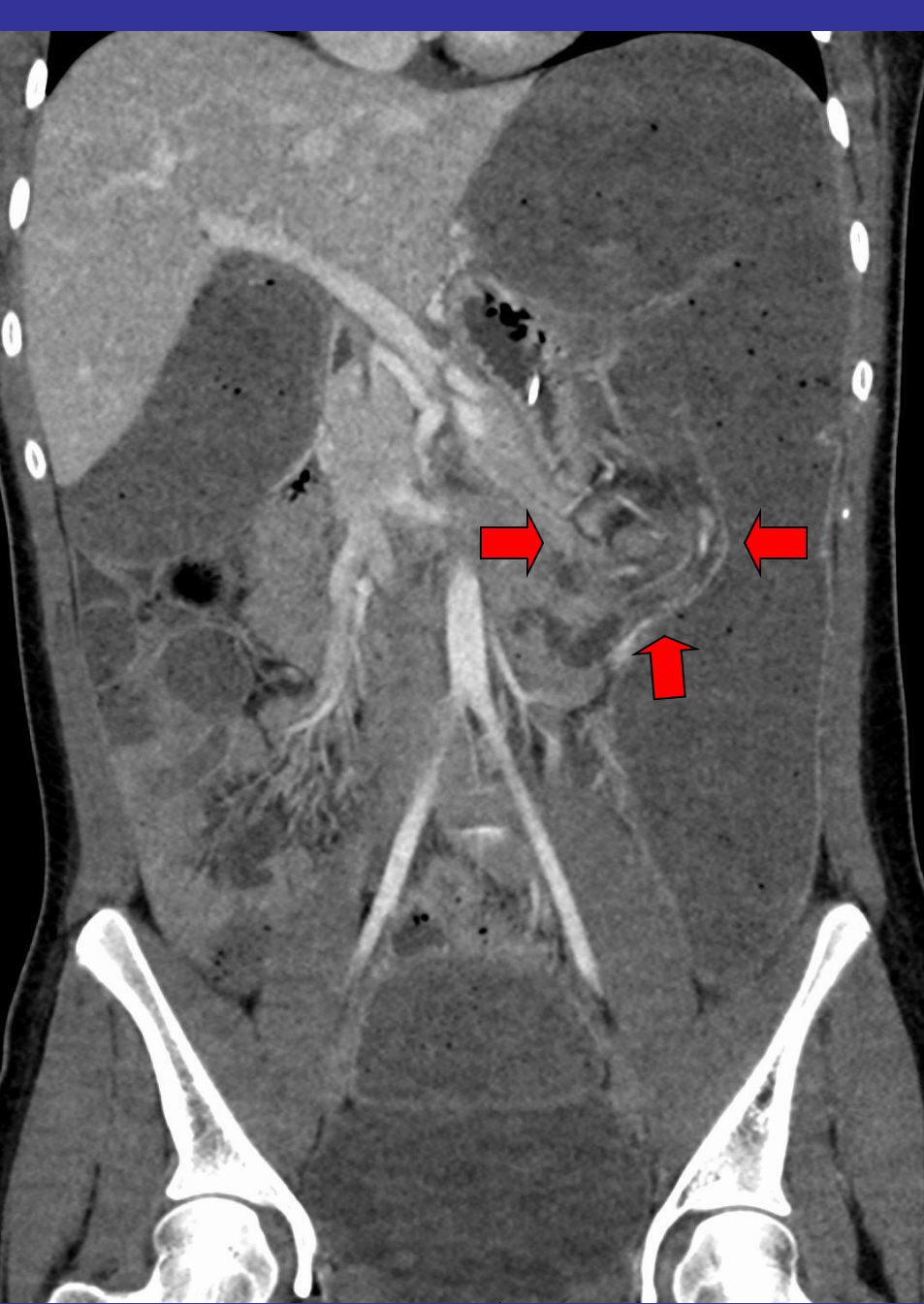
# “Whirlpool” or “swirl” sign in sigmoid volvulus



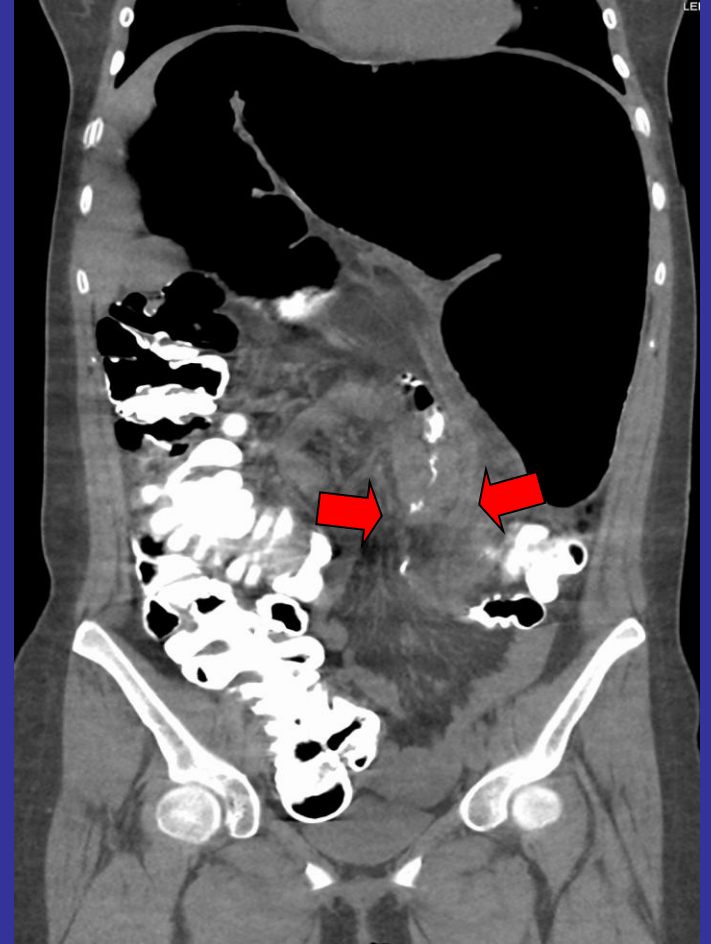
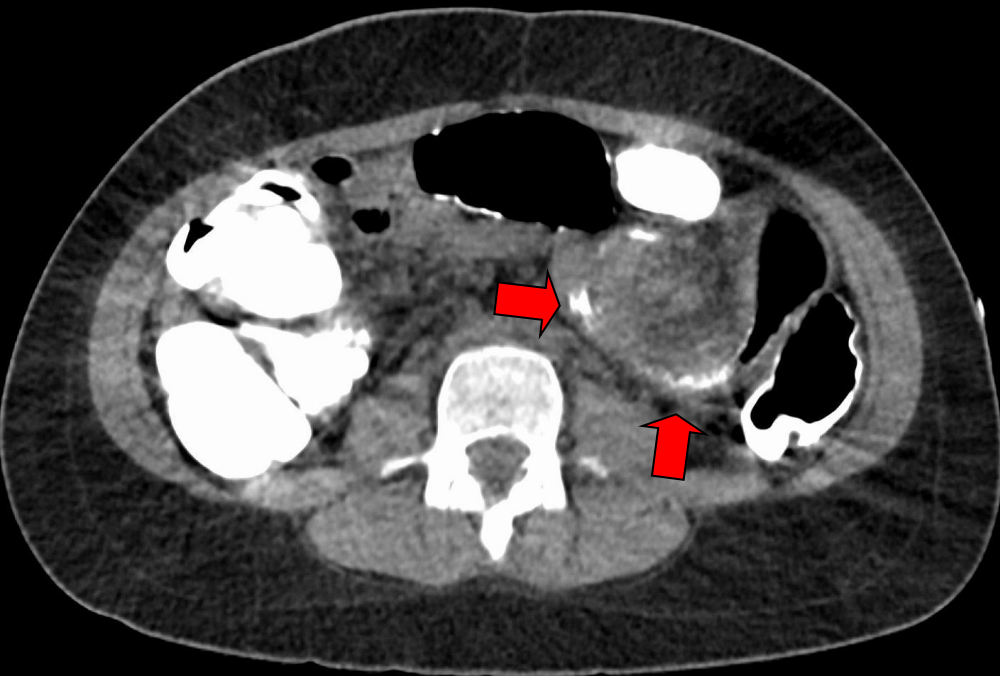
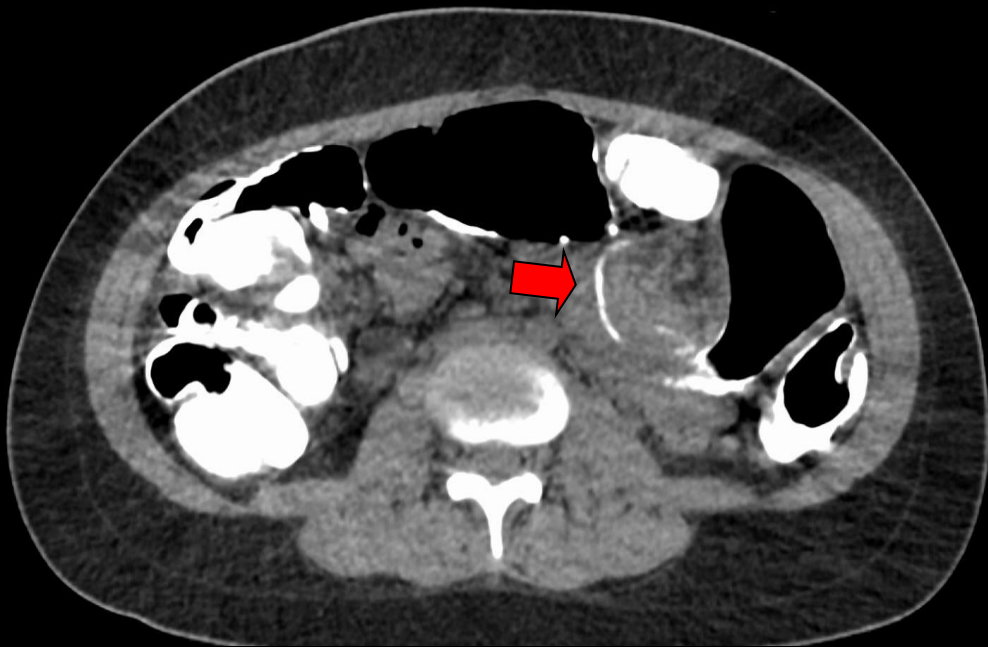
14 year old girl. Axial CT images with IV contrast demonstrate the “whirlpool” or “swirl” sign in the lateral left abdomen diagnostic of volvulus (arrows)



Coronal CT images in same patient showing volvulus with twisting of vessels and bowel in left abdomen (arrows)



The “whirlpool” or “swirl” sign (arrows) may be difficult to appreciate in presence of liquid-filled bowel. Multiplanar reformatted images are often quite helpful

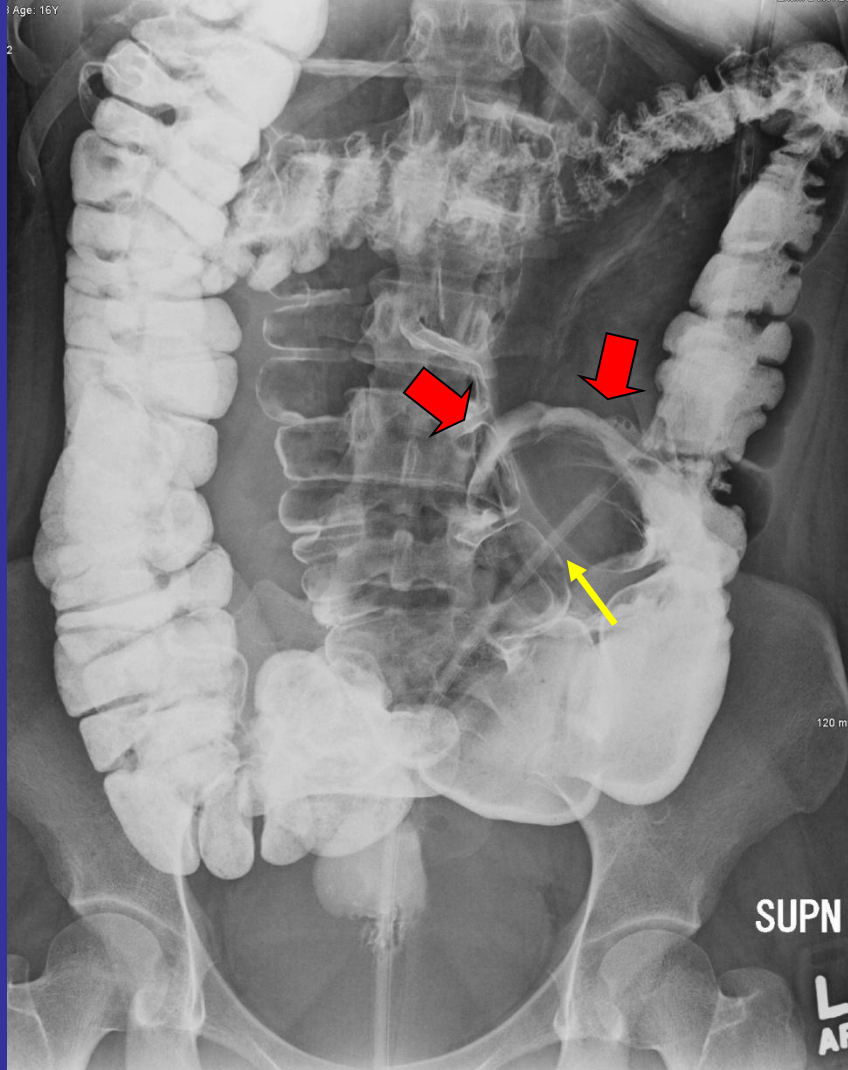


•CT images without IV contrast on 16 year old girl after outside contrast enema.

•There is twisting of the mesentery with narrowed colonic lumen (arrows) and edema of mesentery within the volvulus

# Treatment of sigmoid volvulus

- In the stable patient, contrast enema is indicated in attempt to reduce the volvulus – is up to 77% successful.
- Endoscopic reduction may also be performed
- Reduction is followed by advancement of large rectal tube proximal to volvulus
- If volvulus cannot be reduced, immediate surgery with sigmoidectomy with or without colostomy is indicated



Contrast enema shows sigmoid volvulus (large arrows). Large rectal catheter (small arrow) could not be advanced proximal to volvulus



Postoperative enema in same patient after resection of 1m of redundant sigmoid colon

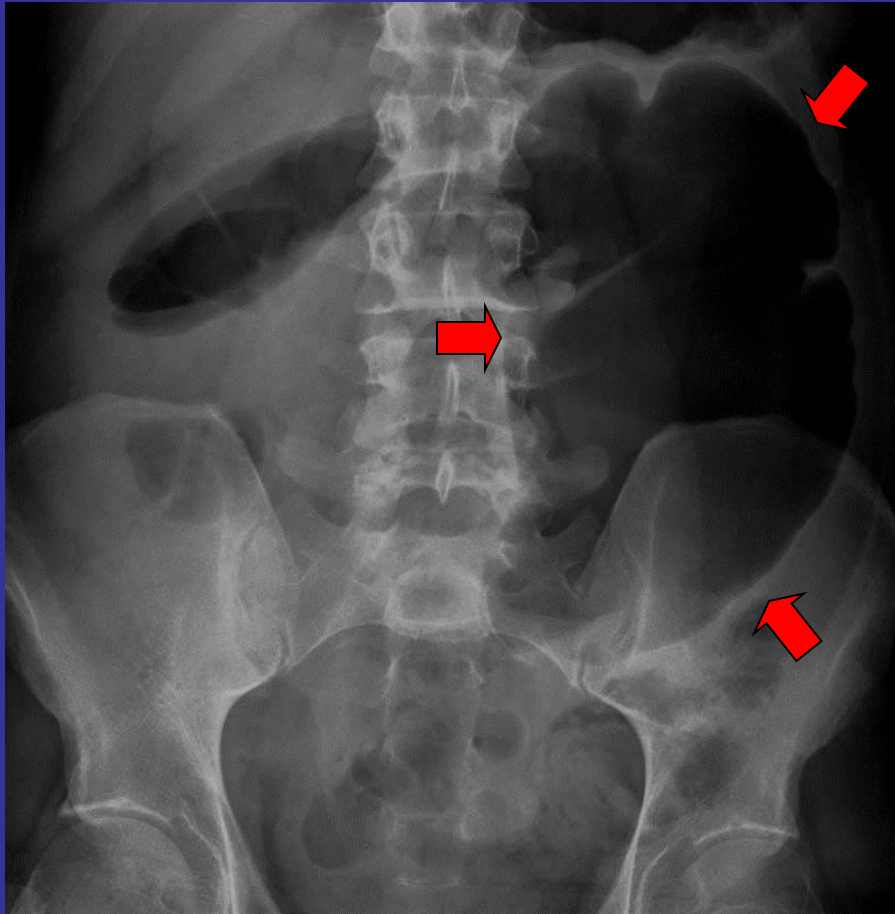
# Cecal volvulus in children

- Much less common than sigmoid volvulus
- Represents 25%–40% of all colonic volvulus
- Defective peritoneal fixation of the ascending colon and cecum is seen in 10% of the population
- Abnormal fixation permits abnormal mobility of the ascending colon and cecum
- Contributing factors:
  - Malrotation
  - Adhesions
  - Chronic constipation
  - Developmental delay
  - Hirschprung disease

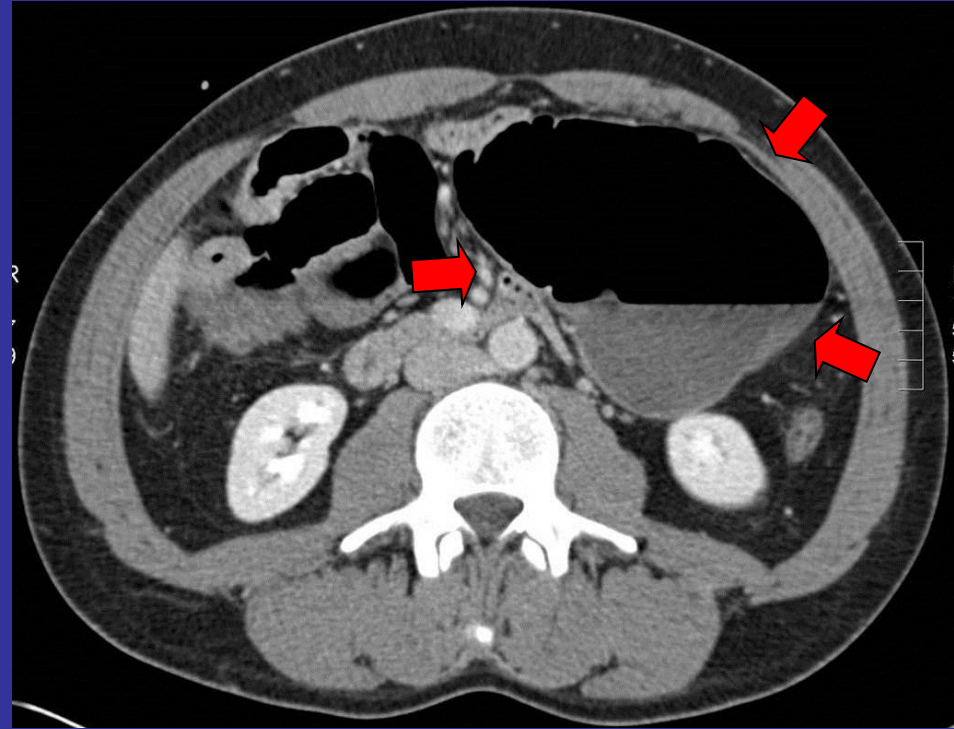
# Imaging in cecal volvulus

- Radiographs are often nonspecific, unlike in the adult
- Generalized small bowel dilatation
- May see a classic “coffee bean” sign with displacement of a markedly dilated cecum into the LUQ (as in adults)
- Single air-fluid level often seen within markedly dilated cecum
- Contrast enema can show “bird beak” sign, may reduce the volvulus
- CT will demonstrate classic “whirlpool” or “swirl” sign in right abdomen

# Adult with cecal volvulus

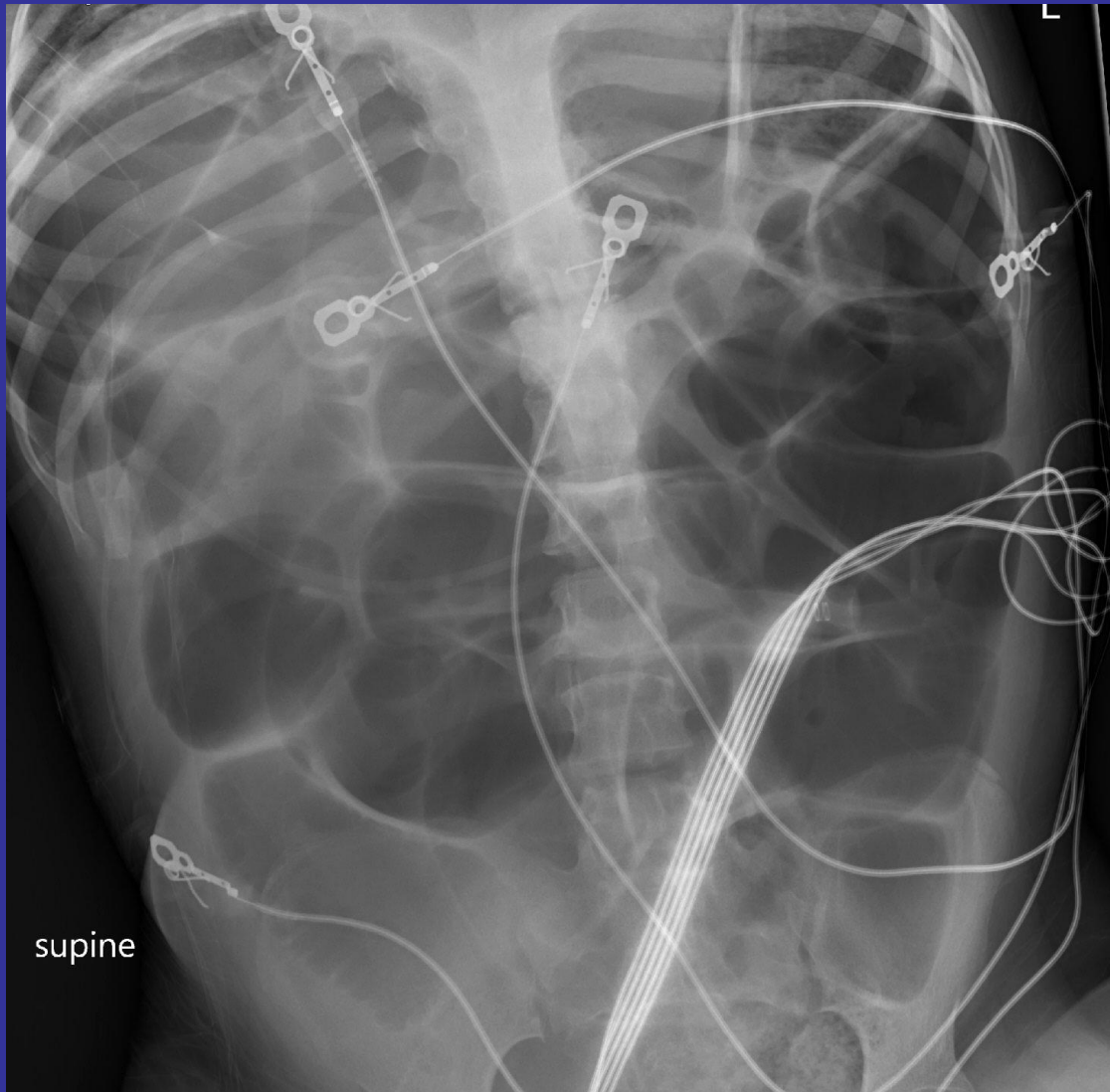


Supine radiograph demonstrating "coffee bean" sign in LUQ (arrows)

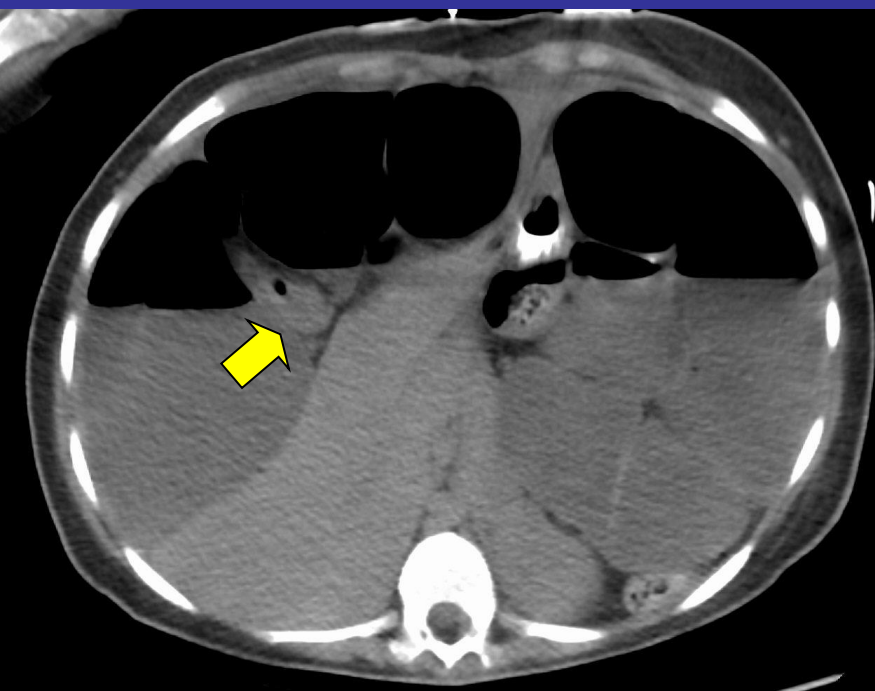
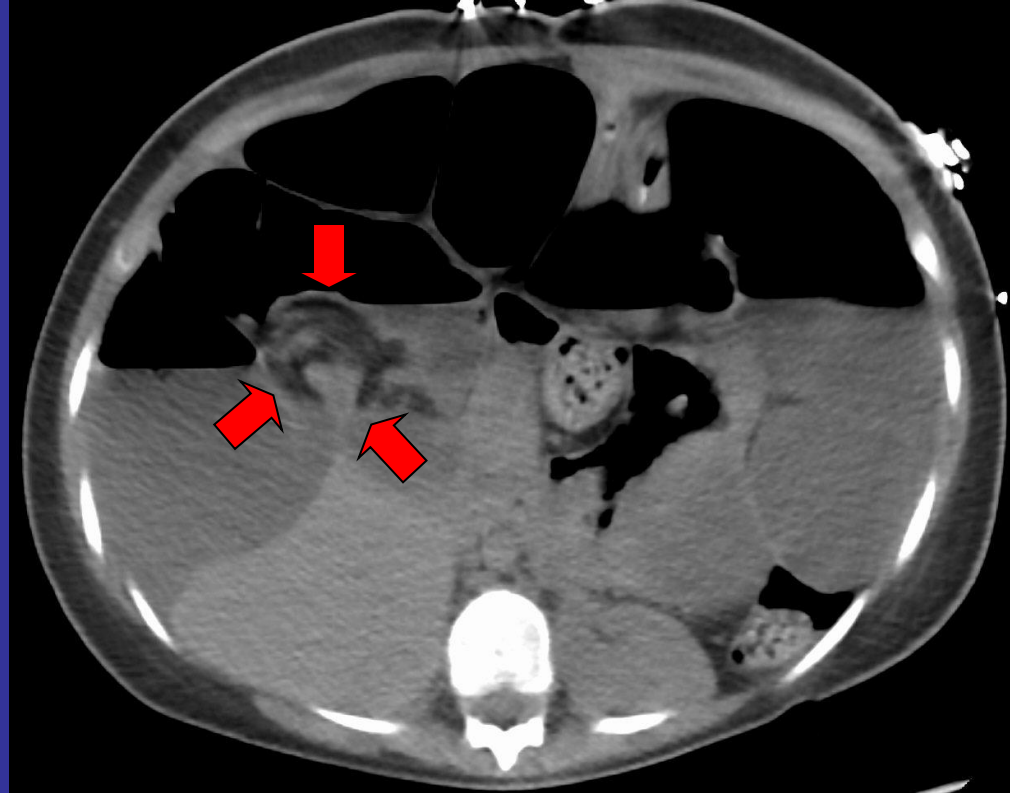
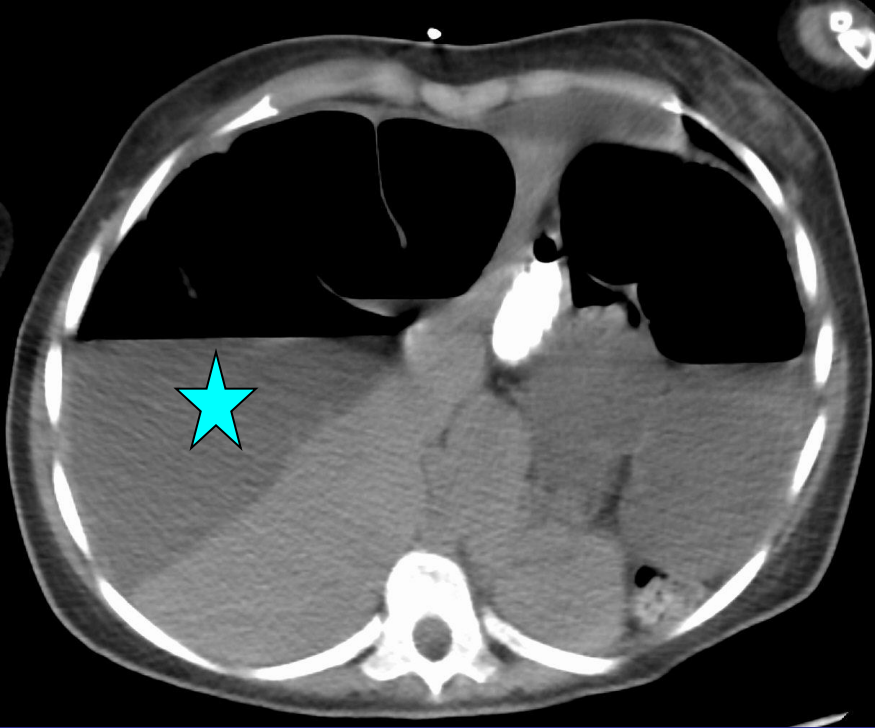


Axial CT image showing markedly dilated cecum (arrows) located within the LUQ, demonstrating a prominent air-fluid level proximal to the site of volvulus

# Older child with cecal volvulus



- 20 year old girl with Cornelia de Lange syndrome, abdominal pain and distension
- Radiograph shows generalized dilatation without definite “coffee bean” sign



- Axial CT without IV contrast shows dilated cecum in RUQ (star)
- Small amount of gas seen within distal ileum just distal to volvulus (yellow arrow)
- Classic “swirl” sign is seen in right abdomen (red arrows), diagnostic of volvulus

# Treatment of cecal volvulus

- In the stable patient, water-soluble enema may be attempted for reduction
- Irreducible cecal volvulus is a surgical emergency and is treated with attempt at derotation with fixation
- Ischemic bowel is resected with or without primary reanastomosis

# Transverse colon volvulus

- Rarest type of colonic volvulus in adults and children
- Predisposing factor is abnormally elongated transverse mesocolon
- Can twist at splenic or hepatic flexure regions
- Plain films usually nondiagnostic
- Contrast enema will show “bird beak” sign
- CT with coronal and sagittal reformatted images can depict the volvulus

# Conclusions

- Volvulus of the sigmoid, transverse, or cecal regions of colon may present as an acute abdomen in children
- Plain radiographs may be suggestive of the diagnosis, but definitive diagnosis may be made with contrast enema or CT
- Prompt and accurate imaging diagnosis is paramount for appropriate surgical management of these patients

# References

- O'Keefe LM, Hu Y-Y, Thaker S, Finck C. Sigmoid volvulus: a pediatric case report and review of management. *J Ped Surg Case Reports* 7: 4-7, 2016.
- Weeratunga ND, Samarakoon LB, Lamaheewage AK. Sigmoid volvulus causing intestinal obstruction in a child – a case report and review of literature. *J Pediatr Neonatal Care* 2(2): 00067. DOI:10.15406/jpnc.2015.03.00067, 2015.
- Kirks DR, Swischuk LE, Merten DF, Filston HC. Cecal volvulus in children. *AJR* 136: 419-422, 1981.
- Mellor MFA and Drake DG. Colonic volvulus in children: value of barium enema for diagnosis and treatment in 14 children. *AJR* 162: 1157-1159, 1994.
- Peterson CM, Anderson JS, Hara AK, Carezza JW, Menias CO. Volvulus of the gastrointestinal tract: appearances at multimodality imaging. *RadioGraphics* 29: 1281-1293, 2009.