

Cecal Volvulus Diagnosed on CT in Two Distinct Clinical Settings

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Figure 1. CT topogram demonstrates a dilated stool filled bowel loop in the mid abdomen (arrow) with preserved haustral markings (arrowhead).

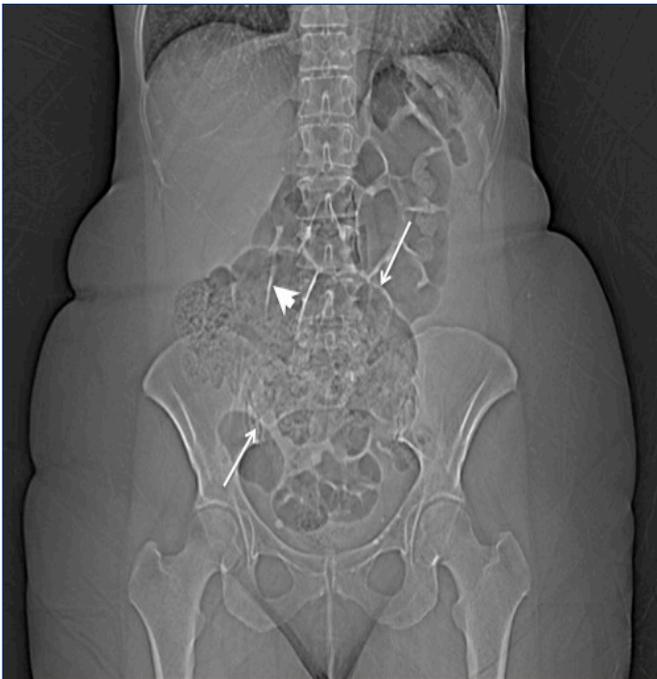
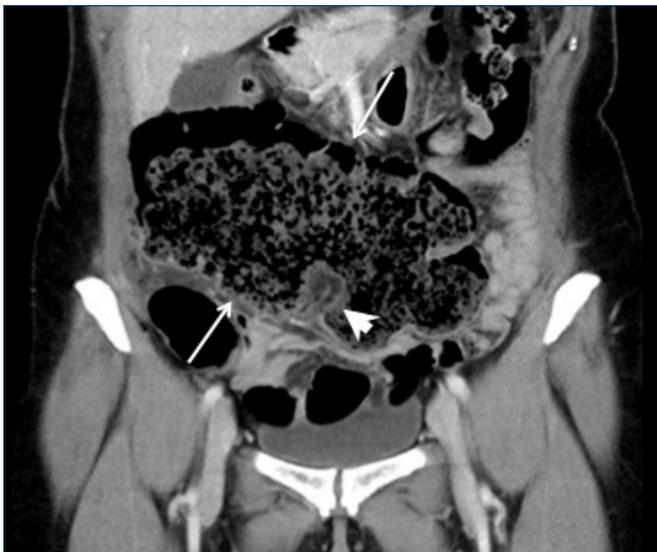


Figure 2. Coronal CT image at the level of the ileocecal valve (arrowhead) confirms a dilated, stool filled cecum (arrows).



CASE 1

A 55-year-old white female presented to the emergency department in moderate distress with sudden onset severe lower abdominal pain, progressive over twelve hours with a “twisting” character that worsened with movement. She denied nausea or vomiting and reported having a normal bowel movement just prior to symptom onset. Her past medical history included a distant history of breast cancer but was otherwise negative. Her vital signs were normal. Her abdomen was mildly tender at the lower quadrants, as well as mildly distended and tympanic without peritoneal signs. Bimanual exam was normal. Laboratory analysis was non-revealing. A contrast-enhanced CT of the abdomen and pelvis was obtained. The CT topogram (**Figure 1**) revealed a loop of dilated, stool-filled bowel in the mid abdomen, confirmed to represent dilated cecum on coronal CT imaging (**Figure 2**). Axial CT imaging (**Figure 3**) demonstrated a decompressed ascending colon with transition to cecal dilation at the level of a CT whirl sign. The patient proceeded to emergent exploratory laparotomy where a torsed and markedly dilated cecum was encountered. A right hemicolectomy with functional side-to-side end ileocolostomy was performed. The patient experienced an uncomplicated post-operative course and was discharged on day 5 following the procedure.

Figure 3. Axial CT demonstrates a whirl sign (curved arrow) at the level of the dilated cecum.



CASE 2

A 17-year-old wheel chair-bound female with a history of spina bifida and congenital hydrocephalus presented to the emergency department after failing outpatient treatment for a presumed viral gastroenteritis with two days of anorexia, extensive vomiting, diarrhea and fever. She reported one episode of bright red blood per rectum and her temperature at home was elevated up to 104°F. Additional past medical history included recurrent urinary tract infections likely related to daily routine self-catheterization. On physical exam her abdomen was distended and markedly tender at the epigastrium. She was febrile to 100.8°F with mild hypotension, marked tachycardia and tachypnea. Her oxygen saturation remained normal on room air. Her laboratory analysis was remarkable for mild hyponatremia (sodium 131) and leukocytosis (white blood cell count 13.3). An abdominal radiograph showed a dilated viscus in the left upper quadrant containing a single air fluid level. A subsequent CT examination (Figures 4, 5) revealed midgut malrotation with a dilated cecum twisted on its mesentery in the left abdomen. The patient was immediately taken to the operating room for emergent exploratory laparotomy with a presumed diagnosis of cecal volvulus. This was confirmed intra-operatively along with midgut malrotation. The cecum and terminal ileum were both necrotic and therefore resected. A primary end-to-end ileocecostomy with a diverting loop ileostomy was performed. The patient recovered rather uneventfully and was discharged on post-operative day 10. Unfortunately, she has since developed multiple recurrent small bowel obstructions.

Figure 4. Supine (a) and lateral decubitus (b) views of the abdomen demonstrate a dilated viscus in the left upper quadrant (arrow) containing a single air fluid level (arrowhead)..

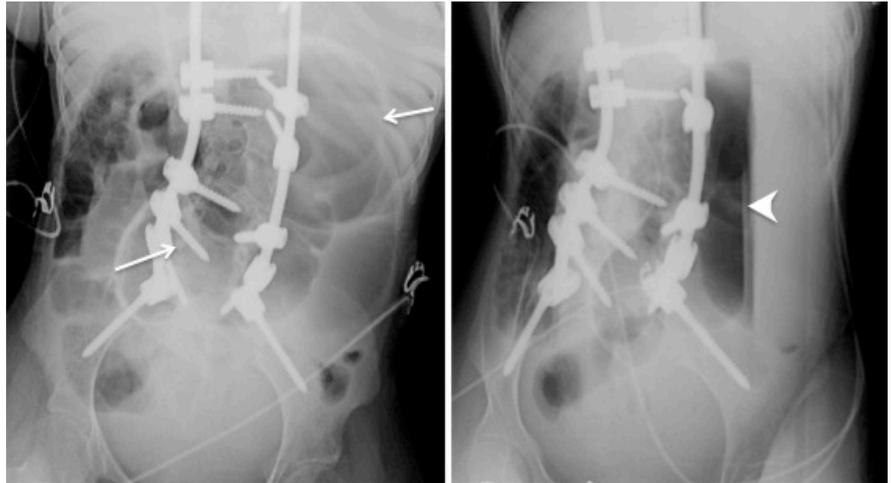
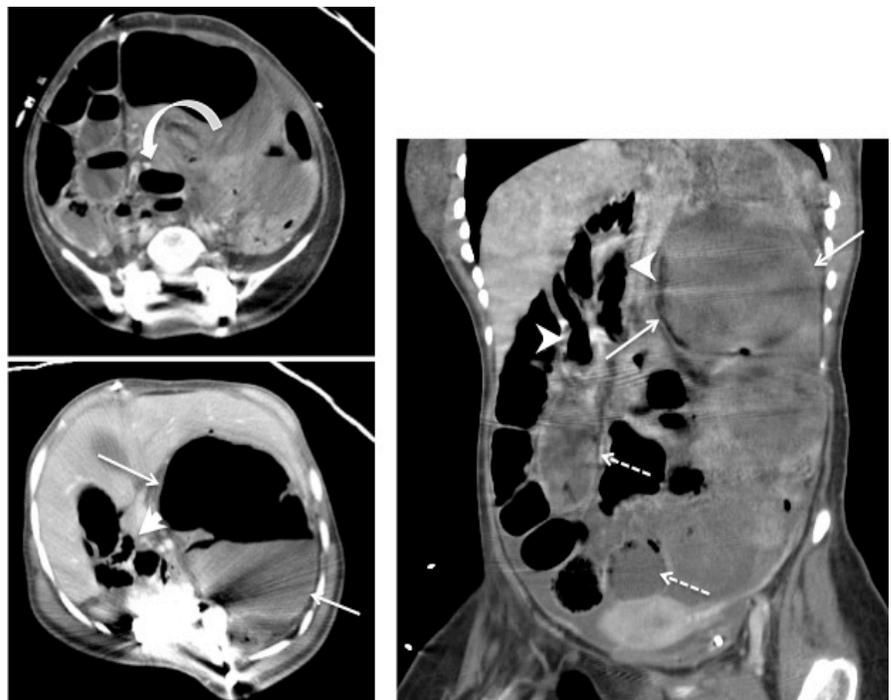


Figure 5. Axial (a and b) and coronal (c) CT images of the abdomen demonstrate a markedly dilated cecum located in the left upper quadrant (arrows) that is twisted with a whirl sign (curved arrow) in the mid abdomen. Note the predominance of bowel loops in the right abdomen (arrowheads) with distal small bowel dilation (dashed arrows).



DISCUSSION

Cecal volvulus is a rare gastrointestinal condition that presents with nonspecific symptoms, has historically been diagnosed at laparotomy or barium enema and more recently by computed tomography (CT). Emergent surgery is required to prevent colonic ischemia and perforation. It was first described by Rokitansky as “intestinal strangulation” of the cecum in 1837.⁸ Pathophysiology is related to a combination of an abnormally fixated or rotated right colon and risk

factors that can include anything acting as a fulcrum at the cecum (colonic mass, adhesion, etc) or colonic distension (chronic constipation, ileus, distal obstructing lesion, colonoscopy, etc).⁹ While 10-25% of the general population has an abnormally fixed ascending colon,^{10,11} cecal volvulus is rare, accounting for only 1% of bowel obstructions.¹² It can occur in one of three types: axial, loop and bascule. The axial and loop type require a twist of the cecum along its long axis

while in the bascule type, the cecum does not twist but folds anteriomedially along a fibrotic band, acting as a flap valve mechanism.¹³ All three types of volvulus result in a closed loop obstruction at risk of mesenteric ischemia according to Laplace's law. In addition, the axial and loop-type volvuli have an underlying mesenteric twist that causes vascular strangulation and higher rates of mesenteric ischemia. With all types of cecal volvulus patients present acutely with non-specific symptoms of bowel obstruction, including generalized abdominal pain, nausea, vomiting, constipation and abdominal distension. The acute presentation can be preceded by a recurrent intermittent pattern of symptoms in 50% of patients, referred to as the mobile cecum syndrome.¹⁴ On physical exam patients classically present with a tympanic mass; however, this is rarely encountered clinically.³ Although several "classic" plain film findings have been described, their sensitivity and specificity are low, frequently necessitating a contrast enema. More recently, computed tomography has been used to make the diagnosis non-invasively, much quicker and with greater diagnostic accuracy, replacing contrast enema for diagnosis. Management of acute volvulus is surgical, most commonly with right hemicolectomy, regardless of underlying bowel viability. A subsequent primary ileocolonic anastomosis is performed in most cases, unless there is evidence of free perforation in which case temporary colonic diversion is advocated.¹⁵

IMAGING

Cecal volvulus can be encountered at several imaging modalities, including radiography, contrast enema and computed tomography. Classic radiographic findings include a single dilated, comma-shaped colonic loop ectopically located in the left upper quadrant containing a single air fluid level with preservation of haustral markings.¹ In contrast, sigmoid volvulus presents with two colonic limbs that take an inverted U or coffee bean appearance with two separate air-fluid levels and loss of haustral markings.² Despite the classic imaging appearance, findings are relatively insensitive and very nonspecific with the diagnosis made in only 17% of cases.³ The location and presence of cecal dilatation is highly variable and small bowel dilatation can oftentimes obscure underlying colonic abnormalities, confusing the diagnosis.^{3,4} Contrast enema increases both sensitivity and specificity with findings that include distal colonic decompression with beak-like tapering at the level of the volvulus.⁵ However, contrast enema can delay diagnosis.

In comparison, CT is much quicker, non-invasive and has several imaging signs with superior sensitivity and specificity. Nearly all cases of axial or loop-type volvulus demonstrate a whirl sign, defined as a twisting of mesenteric vessels and bowel loops around central mesenteric fat. Most cases are accompanied by distal colonic decompression.⁶ By "running the bowl" in a retrograde fashion starting at the rectum, one can usually identify the anatomic site of the whirl sign and

in turn distinguish sigmoid from cecal volvulus. When a redundant mesentery or scant intra-abdominal fat makes this determination difficult, the location of the whirl sign in the right or left abdomen can reliably diagnose cecal and sigmoid volvulus respectively.⁷ A very rare exception to this search pattern and algorithm occurs with midgut malrotation, as presented above, where cecal volvulus is very difficult or impossible to distinguish from sigmoid volvulus. In addition, the whirl sign is not seen in the bascule type, therefore making this diagnosis more challenging. However, this type represents a minority (approximately 10%)¹³ of cases and its diagnosis is still suggested by abnormal cecal configuration, cecal dilatation and distal colonic decompression. In all, CT provides excellent diagnostic utility and should be regarded as the test of choice for the diagnosis of cecal volvulus.

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