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CLINICAL CASE REPORTS

Endoscopic Decompression, Detorsion, and Reduction of Sigmoid Volvulus[☆]

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Received 11 August 2013; received in revised form 26 October 2013; accepted 31 October 2013

KEYWORDSSigmoid volvulus;
Endoscopy;
Endoscopic decompression, detorsion and reduction (EDDR);
Endoscopic decompression;
Endoscopic reduction;
Video**Abstract**

Background: Colonic volvulus is a loop of bowel twisted around the site of mesenteric attachment leading to bowel obstruction. The sigmoid colon is involved in a majority of these cases. If untreated, sigmoid volvulus leads to bowel ischemia, perforation, sepsis, and potential death.

Patients and methods: In this video manuscript, we present two patients with uncomplicated sigmoid volvulus that were successfully managed by emergent endoscopic decompression, detorsion, and reduction (EDDR) and temporary colon decompression tube placement as a bridge therapy to elective and definitive surgical interventions. Detailed endoscopic evaluation and techniques are described. In addition, classic radiological findings such as the “coffee bean” sign on plain radiograph and the “whirl” sign on computed tomography are shown.

Results: After successful EDDR with subsequent bowel preparation and medical resuscitation, both patients underwent elective surgical resection of the sigmoid colon with primary anastomosis without post-operative complications.

Conclusions: Sigmoid volvulus is a medical emergency and diagnosis requires a high index of suspicion. Emergent EDDR and decompression tube placement should be utilized as a first line treatment for patients with uncomplicated sigmoid volvulus.

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rwu@umc.edu (R. Wu).**Video related to this article**Video related to this article can be found online at <http://dx.doi.org/10.1016/j.vjgien.2013.10.003>.

1. Case reports

- Both patients, a 70-year-old and a 75-year-old man presented with abdominal distension, cramps, and nausea.
- On abdominal examination, there was no peritoneal signs and the abdomen was tympanic on percussion.
- Blood white blood cell count was within normal limits.
- Abdominal plain radiograph showed markedly distended ahaustral sigmoid loop arising from the left lower quadrant and extending towards the diaphragm (Figure 1).
- Computed tomography of the abdomen and pelvis revealed spiraled loops of collapsed bowel and mesentery which were twisted around their vascular supply (Figure 2).
- Emergent surgery and gastroenterology consults were obtained.
- Both patients were diagnosed with sigmoid volvulus and emergency endoscopic intervention was requested.
- Emergent endoscopic decompression, detorsion, and reduction (EDDR) was successfully performed and the procedure is described below.

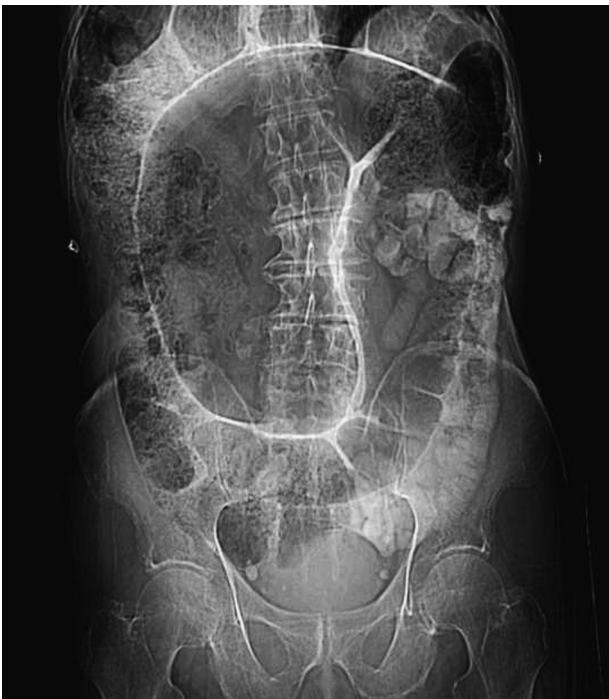


Figure 1 Plain radiographic image of abdomen showing the markedly distended ahaustral sigmoid loop arising from the left lower quadrant and extending towards the diaphragm, a “coffee bean” or “bent inner tube” sign.

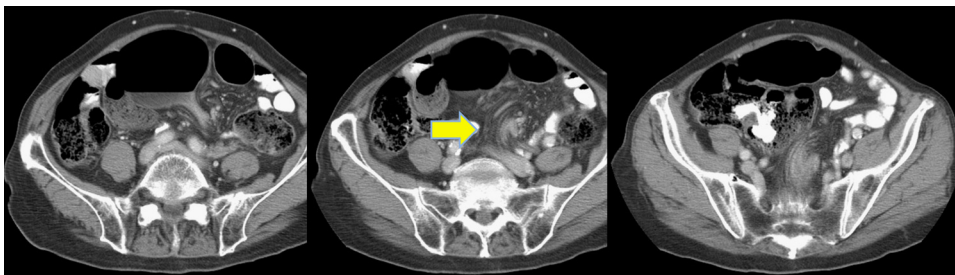


Figure 2 Selected images of computed tomography showing spiraled loops of collapsed bowel and mesentery which are twisted around their vascular supply, a “whirl” sign (arrow).

- After 2-3 days of hospital stay, the patients underwent elective sigmoid colon resection with primary anastomosis after colon preparation and medical treatment.
- Their post-operative course was uneventful and they both enjoy no recurrence of volvulus up-to-date.

2. Materials

- Pediatric colonoscope (Olympus PCF-Q180AL, Olympus America, Center Valley, PA).
- Colon depression set (Cook Medical, Winston-Salem, NC).
 - The colon decompression set includes:
 - A drainage catheter: 14 French × 175 cm (has 10 side ports).
 - A guiding catheter: 6 French × 182 cm.
 - A wire guide: 0.035 in. × 480 cm.

3. Endoscopic procedure

3.1. Endoscopic decompression, detorsion and reduction (EDDR) through flexible sigmoidoscopy

- Use intermittent and low air insufflation through the endoscope during endoscopy.
- The rectum was empty and not dilated.
- Spirally twisted or converging colon mucosa (a “whirl” sign) was seen at the rectosigmoid junction signifying the distal point of torsional obstruction (Figure 3).
- The endoscope was gently advanced through the apex of the converging mucosa into the dilated sigmoid colon.
- Mild mucosal ischemic changes (loss of vascular patterns, patchy erythema, edema, and erosions) were noticed within the volvulus (Figure 4).
- Immediate and aggressive endoscopic evacuation of air and fluid stool was performed in order to decompress the dilated sigmoid colon.
- After the dilated sigmoid colon was decompressed, the endoscope was advanced through the sigmoid colon toward the proximal point of torsional obstruction.
- Spirally twisted sigmoid or descending colon mucosa was observed signifying the proximal point of torsional obstruction.

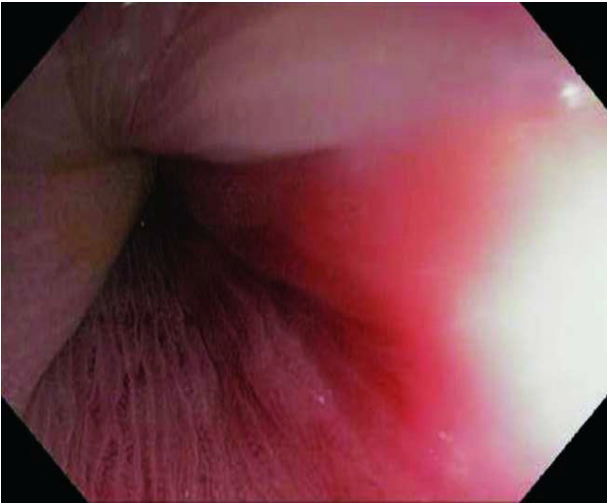


Figure 3 Endoscopic image showing the spirally twisted rectal or converging mucosa (a “whirl” sign) at the rectosigmoid junction signifying the distal point of torsional obstruction.

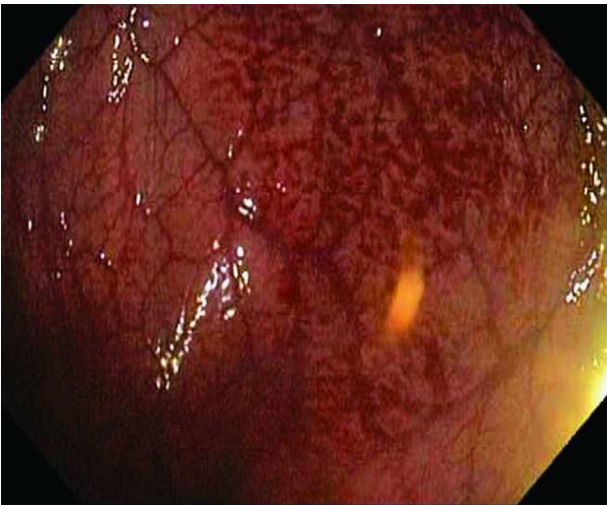


Figure 4 Endoscopic image showing dilated colon segment proximal to twisted segment with endoscopic evidence of mucosal ischemia.

- Between the proximal and distal points of obstruction, the sigmoid colon was significantly dilated from a close-loop obstruction.
- Once the dilated colon was decompressed and the endoscope was in the descending or distal transverse colon, endoscopic *detorsion* (untwisting) of the decompressed volvulus was performed by clockwise rotation and shortening of the endoscope using the right hand.
- Endoscopic *reduction* of the volvulus and redundant sigmoid colon was achieved by repeated attempts to further shorten the sigmoid and descending colon loops.

3.2. Colon depression tube placement (optional)

- The guide wire and guiding catheter from the colon decompression set (Cook Medical) were advanced through

the endoscopic cannal into the descending or transverse colon.

- Endoscopic exchange was performed by gently pulling back the endoscope over the guide wire while advancing the guide wire in tandem.
- The drainage catheter was then advanced over the guide wire past the point of an obstruction (**Figure 5**).
- The guide wire were then removed through the drainage catheter.
- The drainage catheter has multiple (10) side ports for optimal venting.
- The drainage catheter was taped over the perianal skin and left in place for 1-3 days.

3.3. Rectal tube placement (if the colon decompression tube is not placed) (**Figure 6**)

- If a long rectal tube is placed, regular water flushing is highly recommended in order to maintain the tube patency.

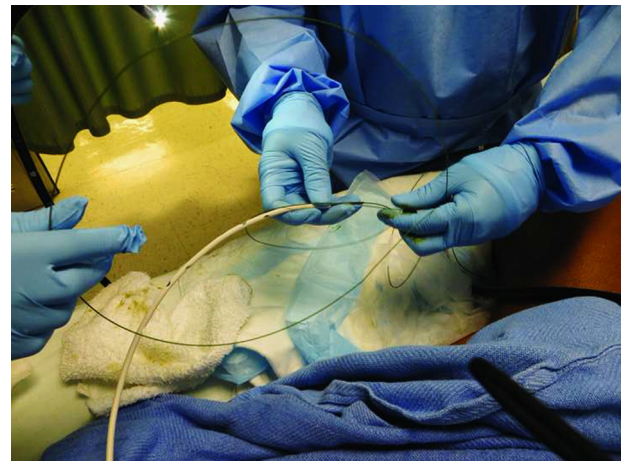


Figure 5 Image showing a colon decompression drainage tube (white colored) being advanced over the guide wire into the untwisted and decompressed sigmoid colon.

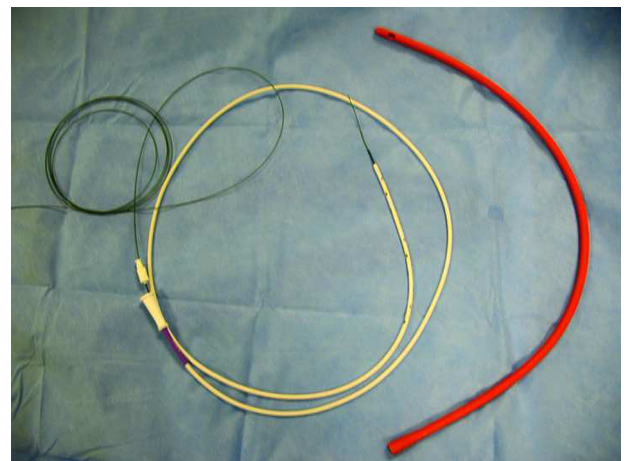


Figure 6 Image showing a colon decompression drainage tube (white colored) with a wire guide inside and a long rectal tube (orange colored).

4. Discussion

The term volvulus is derived from the Latin word *volvare* (to twist). Colonic volvulus is a loop of bowel twisted around the site of mesenteric attachment leading to bowel obstruction. In developed countries, colonic volvulus accounts for up to 7% of cases of colonic obstruction [1-11]. The sigmoid colon is involved in a majority of these cases. Sigmoid volvulus is the third most common cause of colonic obstruction in the United States after cancer and diverticulitis. In certain parts of Africa, South Asia and South America, sigmoid volvulus is a leading cause of acute colonic obstruction [4]. Sigmoid volvulus is generally an adult condition and it is exceedingly rare in the pediatric age population [12]. If untreated, sigmoid volvulus can lead to bowel ischemia, perforation, sepsis, and potential death.

The etiology of sigmoid volvulus is not completely understood. Based on current knowledge, primary prevention is not possible. The proposed etiologies and/or predisposing factors include: male sex, nursing home residency, bedridden or debilitating status, redundant sigmoid loop, chronic constipation, neurologic disease, Chagas' disease, congenital megacolon, Hirschsprung's disease, and pregnancy [1-15].

The symptoms of sigmoid volvulus are suggestive of bowel obstruction, but presentation can be acute or indolent:

- Abdominal distension and pain.
- Constipation.
- Post-obstruction diarrhea.
- Symptoms of peritonitis and sepsis in advanced stage.

Sigmoid volvulus is a medical emergency and diagnosis requires a high index of suspicion. Abdominal plain radiographs, computed tomography, and magnetic resonance imaging are commonly utilized imaging modalities [1-11].

- Plain abdominal radiograph:
 - The classic “coffee-bean” or “bent inner tube” sign (Figure 1):
 - Markedly distended ahaustral sigmoid loop arising from the left lower quadrant and extending towards the diaphragm.
 - Absence of distal air or stool.
 - Not routinely performed, installation of rectal contrast may demonstrate the “bird's beak” sign at the site of the torsion.
- Computed tomography scan of the abdomen and pelvis:
 - A “whirl” sign (Figure 2): spiraled loops of collapsed bowel and mesentery are twisted around their vascular supply.
 - CT provides the ability to evaluate the bowel as well as the surrounding tissue for signs of ischemia or perforation.

These classic radiological signs are not always present. Occasionally, the diagnosis can only be made on laparotomy.

Management of sigmoid volvulus focuses on relief of obstruction, prevention of bowel ischemia and recurrence

[3,4,15-17]. Compared to elective operation, emergency surgical intervention carries higher post-operative mortality and complication rates. Endoscopic detorsion, reduction and tube decompression of sigmoid volvulus allows surgery to be performed electively when these patients become medically more stable and with prepared bowel. Temporary reduction can also be achieved by barium enema. However, this radiological intervention fell out of favor due to a higher risk of perforation. Bruusgaard first described endoscopic decompression in 1947 and it quickly has become a standard initial treatment for sigmoid volvulus [18].

- 80-90% of the patients can be managed by emergent non-operative decompression followed by elective resection of the sigmoid colon.
- Intravenous fluid resuscitation to correct fluid deficits and hypovolemia.
- Broad-spectrum antibiotics with anaerobic coverage for patients with signs of peritonitis, sepsis, or bowel ischemia.
- Emergency endoscopic decompression, detorsion and reduction (EDDR) aims to decompress the dilated colon and untwist the volvulus. EDDR is the treatment of choice in uncomplicated patients.
 - The patients should not have signs of peritonitis.
 - No per-oral bowel preparation.
 - EDDR through flexible sigmoidoscopy.
 - Use intermittent and low air insufflation through the endoscope during endoscopy.
 - The rectum is generally empty and not dilated due to a closed-loop obstruction.
 - Spirally twisted or converging colon mucosa (a “whirl” sign) at the rectosigmoid junction signifies the distal point of torsional obstruction.
 - Gently advance the endoscope through the apex of the spiral colon mucosa into the dilated sigmoid colon.
 - Possible mucosal ischemic changes (loss of vascular patterns, edema, erosions, and ulcerations) within the volvulus. Endoscopic biopsy is generally not recommended within the volvulus.
 - Immediate endoscopic evacuation of air and liquid stool in order to *decompress* the dilated sigmoid colon.
 - After the dilated sigmoid colon is decompressed, gently advance the endoscope through the sigmoid colon toward the proximal point of torsional obstruction.
 - Spirally twisted sigmoid or descending colon mucosa signifies the proximal point of torsional obstruction.
 - Significantly dilated sigmoid colon between the proximal and distal points of obstruction.
 - Once dilated colon is decompressed and the endoscope is in the descending or distal transverse colon, endoscopic *detorsion* can be achieved by clockwise rotation and shortening of the endoscope using the right hand.
 - Endoscopic *reduction* is performed by repeated attempts to further shorten the

- decompressed and detorsed volvulus and redundant sigmoid colon.
- Optional colonic depression tube placement during endoscopy
 - Pass the point of obstruction.
 - Leave for 1-3 days.
- Long rectal tube placement if colonic depression tube is not placed.
- Post-procedure abdominal plain radiograph to document immediate success and to rule out perforation.
- The non-operative management of sigmoid volvulus is associated with a high recurrence rate (50-70%) and is only a temporizing procedure.
- Elective definitive operative treatment after adequate resuscitation and bowel preparation:
 - Resection with primary anastomosis
 - Primary anastomosis is performed if the divided bowel ends are viable.
 - Peritoneal contamination is absent.
 - Hartmann's procedure
 - Resection with proximal diversion followed by subsequent takedown.
 - Ischemic bowel or gross peritoneal contamination is present.
 - Reduction and mesosigmoidopexy
 - Associated with a recurrence rate of 40-50%.
- Emergency surgery is required for a minority of patients:
 - Signs of peritonitis or perforation.
 - Inability to detorse the sigmoid volvulus endoscopically.
 - Unsuccessful tube decompression.
 - Signs of gangrenous bowel on endoscopy.

5. Scripted voiceover

Voiceover Text

Both patients, a 70-year-old and a 75-year-old man presented with abdominal distension, cramps, and nausea. On abdominal examination, there was no peritoneal signs and the abdomen was tympanic on percussion.

On abdominal plain radiograph, there is a significantly distended sigmoid loop arising from the left lower quadrant and extending towards the diaphragm.

On CT scan of the abdomen and pelvis, there are loops of collapsed bowel and mesentery that are twisted around their vascular supply.

Emergent surgery and gastroenterology consults are obtained. Both patients are diagnosed with sigmoid volvulus and emergency endoscopic intervention is requested.

The rectum is empty and not dilated. Spirally twisted or converging mucosa (a "whirl" sign) is seen at the rectosigmoid junction signifying the distal point of torsional obstruction.

The endoscope is gently advanced through the apex of the converging mucosa into the dilated sigmoid colon.

Voiceover Text

Intermittent and low air insufflation should be used during endoscopy. Once the endoscope enters the dilated sigmoid colon, immediate and aggressive endoscopic evacuation of air and liquid stool is performed in order to decompress the dilated sigmoid colon.

The sigmoid colon loop is being aggressively decompressed. Mild mucosal ischemic changes such as loss of vascular patterns, patchy erythema, edema, and erosions are noticed within the volvulus.

After the dilated sigmoid colon is decompressed, the endoscope is advanced through the sigmoid colon toward the proximal point of torsional obstruction.

The endoscope is gently advanced through the converging mucosa into the proximally dilated colon.

Immediate air and liquid stool evacuation is performed. Once the dilated colon is decompressed and the endoscope is in the descending or transverse colon, endoscopic detorsion (or untwisting) of the decompressed volvulus is performed by clockwise rotation and shortening of the endoscope using the right hand.

Endoscopic reduction of the volvulus and redundant sigmoid colon is achieved by repeated attempts to further shorten the sigmoid and descending colon loops.

After endoscopic reduction, either a colon decompression tube or a long rectal tube should be placed for venting and drainage.

In this case, the guide wire from the colon decompression set is advanced through the endoscopic channel into the descending colon.

Endoscopic exchange is being performed by gently pulling back the endoscope over the guide wire while advancing the wire guide in tandem by the assistant.

The drainage catheter is then advanced over guiding catheter and guide wire pass the point of an obstruction.

The drainage catheter has multiple (10) side ports for optimal venting. The drainage catheter is taped over the perianal skin and left in place for 1-3 days.

In the second case, the rectum is empty and not dilated. Spirally twisted or converging colon mucosa is again seen at the rectosigmoid junction signifying the distal point of torsional obstruction.

The endoscope is gently advanced through the apex into the dilated sigmoid colon. Immediate and aggressive endoscopic evacuation of air and liquid stool is performed to decompress the colon.

This is the proximal point of torsional obstruction. The endoscope reaches the splenic flexure.

In this patient, a colon decompression tube is being placed as well.

This is a colon decompression tube with a wire guide inside. Multiple side ports can be seen for optimal venting and drainage.

Alternatively, a long rectal tube can be placed for colon decompression. Frequent flushing is needed to maintain the patency of the tube

During endoscopic decompression tube placement, the wire guide is advanced through the endoscopic channel, crossed the stricture, into the proximal colon.

The endoscope is then withdrew over the wire guide.

Voiceover Text

The drainage catheter is advanced over the wire guide into the proximally dilated colon.

Sigmoid volvulus is a medical emergency and the diagnosis requires a high index of suspicion. Classic radiological signs include the “coffee bean” or “bent inner tube” sign on plain x-ray and the “whirl” sign on computed tomography.

Endoscopic detorsion, reduction and tube decompression of sigmoid volvulus allows surgery to be performed electively when these patients become medically more stable and with prepared bowel. Emergent EDDR and decompression tube placement should be utilized as a first line treatment for patients with uncomplicated sigmoid volvulus.

Conflict of interest

The authors have nothing to declare and we have no conflict of interests.

Human and Animal Rights

All authors certify that this work described in our article has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans <http://www.wma.net/en/30publications/10policies/b3/index.html> and Uniform Requirements for manuscripts submitted to Biomedical journals <http://www.icmje.org>.

Funding source

No funding was available for this study and manuscript.

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