Volvulus

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The term volvulus refers to the twisting of an organ along a pedicle. This can involve nearly any portion of the gastrointestinal tract and even other organs such as the gallbladder and spleen. Colonic volvulus is a relatively uncommon condition, but can lead to vascular congestion. When left untreated, this can progress to ischemic necrosis and perforation. Therefore, it warrants immediate identification and treatment. The cecum and sigmoid colon are the most common portions of the large intestine affected by volvulus [1, 2]. It is important for the acute care surgeon to readily recognize each condition and be aware of the proper treatment plan.

Colonic volvulus has been described for thousands of years. The *Papyrus Ebers*, written around 1500 BC, described the "rotting" of the colon unless spontaneous reduction occurred. It was later recognized that reduction of the volvulus could be induced by either placement of a rectal tube or with passage of air into the rectum. Hippocrates described each method, including the passage of a 22 cm suppository to produce detorsion [3]. It was in the nineteenth century that Gay performed a cadaver study in which he found that the insertion of a rectal tube could produce detorsion of a sigmoid volvulus. He therefore concluded that all patients with volvulus should receive rectal tube decompression, which then became the standard of care [4]. Given the ease of the procedure, operative intervention was all together avoided at that time. Later on during the twentieth century, surgeons began to note a high recurrence rate after rectal tube decompression when used as monotherapy. Therefore, a transition to surgical management began. Techniques such as open detorsion, sigmoidopexy, and sigmoidectomy were all utilized [5]. However in 1947, Bruusgaard recognized the high mortality rate associated with surgery and therefore advocated the return to nonoperative detorsion [6]. He was able to successfully demonstrate the use of proctoscopy with rectal tube placement to provide detorsion. However a high recurrence rate was again noted with nonoperative management. Therefore, the general consensus eventually became that immediate nonoperative detorsion, if possible, should be attempted and followed soon thereafter by definitive surgical therapy.

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Cecal Volvulus Epidemiology/Etiology

The cecum is the second most common portion of the large intestine to volvulize. While the vast majority of patients present with volvulus of the sigmoid, the cecum accounts for 15–30 % of all colonic volvuli. The incidence has been reported to range from 2.8 to 7.1 per million people annually [1]. Of all adult intestinal bowel obstructions, cecal volvulus is an infrequent cause. Patients with cecal volvulus are relatively young, with a mean age of 35–55 years [7]. Two types of cecal volvulus exist, the classic cecal volvulus and the less common "cecal bascule." In the classic case there is an axial twisting of the terminal ileum, cecum, and right colon usually in a clockwise direction along a mesenteric pedicle. With a cecal bascule there is actually no twisting or truly volvulized bowel. Instead there is an anterosuperior folding of a mobile and redundant cecum upwards along the fixed ascending colon. This is less likely to cause vascular compromise or ischemic changes.

The etiology of cecal volvulus is unclear and likely multifactorial. One theory is the embryonic failure of the right colon mesentery to fixate to the retroperitoneum [8]. This incomplete mesenteric fusion allows for a freely mobile right colon, which predisposes to the eventual formation of a volvulus. One cadaver study demonstrated an 11 % incidence of a completely unattached right colon [1]. Other factors thought to contribute include chronic constipation, high fiber diet, distal colonic obstruction, and previous abdominal surgery. In one case series, previous surgery was a significant finding and present 68 % of the time [9]. The thought is that an adhesive band forms a point of fixation for an already predisposed mobile cecum to volvulize around.

L.J. Moore, S.R. Todd (eds.), *Common Problems in Acute Care Surgery*, DOI 10.1007/978-3-319-42792-8_33

Pregnant women form a unique subgroup of patients with volvulus. During pregnancy, up to 40 % of large bowel obstructions are due to volvulus [7, 9, 10]. The enlarged uterus of a gravid patient actually pushes a mobile cecum upwards, causing an obstruction where the cecum kinks against its own fixed attachment. Diagnosis is often delayed because of the hesitation to use radiographic imaging and oftentimes is made only upon surgical exploration [11].

Clinical Presentation

Patients with cecal volvulus present with intermittent obstruction and abdominal pain or discomfort. A history of similar episodes is common. Abdominal distension may occur, but is much less pronounced than a more distal volvulus. Because of the involvement of the terminal ileum, a small bowel obstruction may be present and the patient may present with significant nausea and emesis. The "mobile cecum syndrome" is a condition that involves the spontaneous resolution of symptoms and the intermittent recurrence of an incomplete volvulus. These patients are particularly challenging to appropriately diagnose because of the quick resolution and frequent recurrence. A small portion of cases of cecal volvulus may progress to bowel strangulation and ischemia. These patients will present with an acute abdomen and peritonitis requiring emergent surgical exploration. They will have systemic signs of sepsis such as fever, tachycardia, and hypotension. Lab work may demonstrate a significant leukocytosis and acidosis. Otherwise in a non-strangulated case, labs are often nonspecific.

Diagnosis

The diagnosis of cecal volvulus can readily be made via radiographic imaging. Plain film abdominal radiographs will demonstrate the volvulized colon. The largely distended cecum will be evident and is typically found directed towards the left upper quadrant. This classic finding is the "coffee bean" sign. Although quite impressive when seen on X-ray, plain films will correctly diagnose a cecal volvulus only about 20 % of the time and has a specificity of only 60 % [9]. Barium enema is another study available to assist in diagnosis. The enema will display the "bird's beak" sign at the site of colonic torsion. In cases of mobile cecum syndrome, the barium enema is especially useful in identifying the volvulus. Computed tomography (CT) scan is very sensitive and clearly identifies the obstruction. Both the coffee bean and bird's beak signs can be observed. In addition, a swirl sign indicative of mesenteric twisting may be seen [12, 13] (Figs. 33.1 and 33.2). CT has a specificity approaching 100 % and therefore is considered the gold standard for the diagnosis of a cecal volvulus [14].

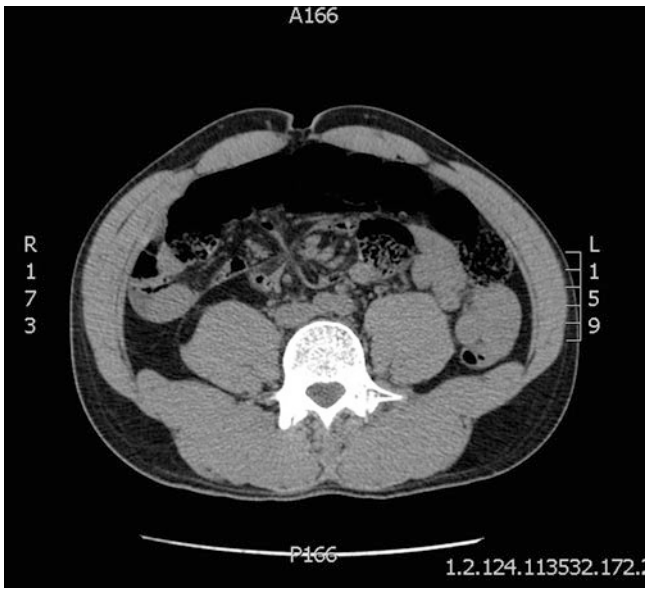

Fig. 33.1 CT demonstrating mesenteric twisting found in patient with cecal volvulus

Fig. 33.2 CT demonstrating mesenteric swirl sign found in patient with cecal volvulus

Management

Unlike sigmoid volvulus, a case of cecal volvulus requires immediate surgical intervention. This should occur soon after the diagnosis is made, even in the otherwise well-appearing patient. Given the distance from the rectum, tube decompression is not feasible and blind passage may result

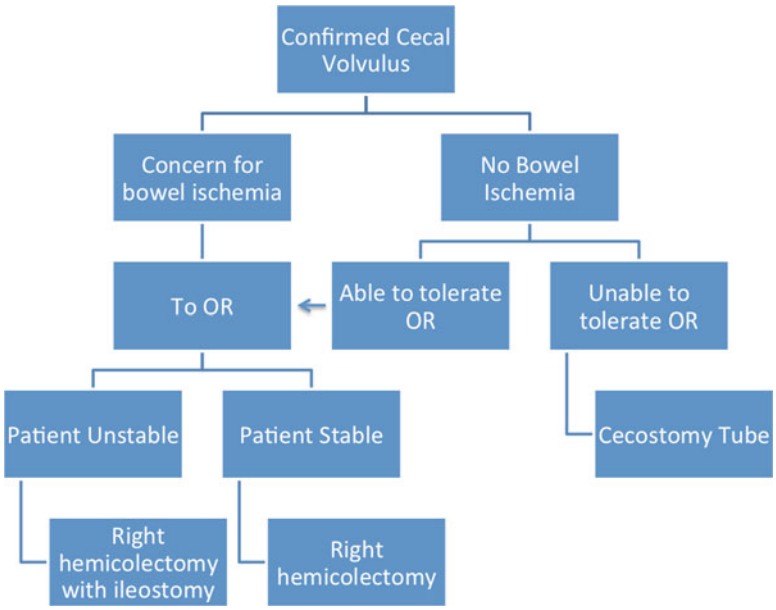

Fig. 33.3 Algorithm for cecal volvulus management

in perforation. Colonoscopic reduction has been attempted but with poor results. We recommend against routine endoscopic management, because it is only occasionally successful, and represents an increased risk of perforation. Contrast enema reduction has been shown to have similarly poor results and is essentially a relic of the past [15, 16].

Given the lack of temporizing maneuvers, the definitive treatment of cecal volvulus should not be delayed. These patients should be urgently taken for surgical intervention. Either an open or laparoscopic approach is appropriate, depending on the experience of the surgeon and clinical state of the patient. Upon surgical exploration, the volvulized colon should be grossly evaluated for viability. Any ischemic, gangrenous or necrotic changes will necessitate resection. Also in frankly necrotic cases it may be best to avoid detorsing the colon prior to taking the blood supply as this can lead to a significant inflammatory response.

A right hemicolectomy with primary anastomosis is the operation of choice. The decision to perform primary anastomosis should be made based upon the patient's physiologic state, tissue quality, and overall clinical picture. For patients who cannot tolerate re-anastomosis, an end ileostomy is an acceptable alternative. Even if the colon appears viable, it is still advisable to proceed with resection. Less radical nonresective fixation procedures have also been proposed in the setting of a viable colon. Fixation techniques include cecopexy or placement of cecostomy tube. However, these procedures have been shown to have increased complication rates and mortality when compared to resection [17]. Mortality rates for cecopexy and cecostomy tube has been reported to be as high as 14 % and 33 %, respectively [9, 16]. Therefore these fixation techniques have largely been abandoned. One instance when a cecostomy tube can be considered is the patient who cannot tolerate general anesthesia. A cecostomy tube can be placed with local anesthesia and moderate sedation. Given the recurrence rate of up to 70 % and the poor outcomes of alternative approaches, current practice recommends right-sided colon resection whenever possible [18].

Summary

Cecal volvulus is the second most common type of large bowel volvulus, but overall is a rare cause of intestinal obstruction. It warrants immediate recognition and prompt surgical treatment. Patients are younger than those with sigmoid volvulus but present similarly with abdominal pain, distension, and emesis. Unlike a distal volvulus, one occurring in the cecum is not amenable to endoscopic detorsion. Therefore these patients require immediate surgical intervention and resection of the ascending colon (Fig. 33.3).

Sigmoid Volvulus

Etiology/Epidemiology

In the USA, sigmoid volvulus is relatively rare and accounts for less than 10 % of all intestinal obstructions [19]. In other parts of the world, however, sigmoid volvulus is responsible for up to 50 % of intestinal obstruction [19]. This is explained by the prevalence of Chaga's disease and the resultant megacolon, which is rare in developed countries. The sigmoid is the most common portion of large bowel to become volvulized and is involved 60–80 % of the time [1]. Most patients are in

the 7th decade of life and are commonly institutionalized, debilitated, or afflicted by a neuropsychiatric disorder. In addition, chronic constipation and an elongated sigmoid are thought to contribute to the development of volvulus [19, 20].

Although the exact etiology of sigmoid volvulus is not well established, the pathophysiology of the disorder is believed to be multifactorial [21]. The most important factor necessary to produce a volvulus is excessive colonic mobility. The sigmoid colon is inherently predisposed to develop a volvulus secondary to the adjacent attachments at the rectum and descending colon, leaving a relatively mobile central sigmoid. Chronic constipation then produces an elongation and dilatation of the colon, further contributing to the mobility of the sigmoid [22]. Low-fiber Western diets have also been implicated and may contribute to colonic distension. This dilated and redundant colon is then predisposed to developing a volvulus, especially when coupled with an elongated and narrow mesenteric attachment. A less common group of patients who develop sigmoid volvulus are those with an inherent colonic dysmotility disorder [2]. One example includes Hirschsprung's disease. These patients can develop a volvulus as early as 4 h of age and anytime thereafter. Congenital anatomic variations may allow for a redundant sigmoid with a lengthened mesentery, these patients may develop a volvulus at any age.

Clinical Presentation

Patients with sigmoid volvulus will present with a similar clinical picture to that of a typical acute bowel obstruction. Symptoms include abdominal pain, distension, nausea, emesis, and constipation. The pain associated with sigmoid volvulus is first slowly progressing but then becomes severe and continuous. Due to its progressive nature, patients commonly present several days after the onset of initial complaints. The associated abdominal distension can be quite impressive and the patient will have an obviously tympanic abdomen. Cases of volvulus have been reported with abdominal distension so severe it leads to cardiac and respiratory compromise [23]. Since this condition affects mainly elderly institutionalized patients, it is not uncommon for presentation to be delayed several days until a primary caretaker notices symptoms. It is also possible for spontaneous reduction of the volvulized colon to occur. This may lead to a cycle of resolution followed by frequent recurrences. Rarely, a patient will present with evidence of ischemic bowel secondary to prolonged volvulus. This is evident by the presence of systemic signs including fever, tachycardia, hypotension, abdominal rigidity and guarding or rebound tenderness. These are obvious signs of peritonitis and should greatly increase the concern for bowel necrosis or perforation.

Two distinct clinical presentations of sigmoid volvulus have been previously described [24]. First is the "acute fulminant type" in which the patient is typically younger and the onset of symptoms is rapid. The patient presents with acute nonspecific complaints of severe abdominal pain. Distension may not be as evident in this case. Progression to gangrene and perforation is rapid. Oftentimes diagnosis is not apparent clinically and is made only upon surgical exploration. The "subacute progressive" variation is the second and more common type of sigmoid volvulus. This is the classic case of a slow progressive worsening of abdominal discomfort. A history of chronic constipation in an elderly institutionalized patient is a hallmark of the disease and should increase the index of suspicion. There is associated abdominal distension and the diagnosis can be made easily with radiographic imaging.

Diagnosis

Upon initial evaluation and thorough history and physical exam, there should be a high clinical suspicion for volvulus. The differential of large bowel obstruction includes conditions such as toxic megacolon, colonic pseudo-obstruction, and malignancy. In order to confirm the presumed diagnosis of volvulus, several tests are of use. Most patients with volvulus will present with nonspecific labs and in fact will often show no abnormalities at all. However, in the severe case, a profound leukocytosis or lactic acidosis can be indicative of bowel ischemia. A plain film abdominal X-ray can usually identify the volvulized colon. The distended sigmoid will be evident and seen as a large loop directed towards the right upper quadrant. This has been described as the "bent inner tube" or "omega" sign and is diagnostic of a sigmoid volvulus (Fig. 33.4). Typically the small bowel will be normal appearing, except in cases with an incompetent ileocecal valve. Abdominal X-ray is able to diagnose between 60 and 75 % of cases with sigmoid volvulus [20]. Concerning features evident on plain film include linear pneumatosis or "thumb-printing" and free air, which represent bowel necrosis and perforation, respectively.

In addition to abdominal plain films, a water-soluble contrast enema can be performed in cases that remain unclear. The combination of contrast enema along with abdominal X-ray can increase the sensitivity of volvulus identification to approach 100 % [25]. The enema will reveal a bird's beak deformity at the site of colonic twisting and a lack of contrast proceeding proximally beyond the obstruction. Also, it is possible to reduce the volvulus using a contrast enema. However, this is not typically necessary and should be performed under fluoroscopy by an experienced radiologist. There is a risk of perforation during attempted reduction

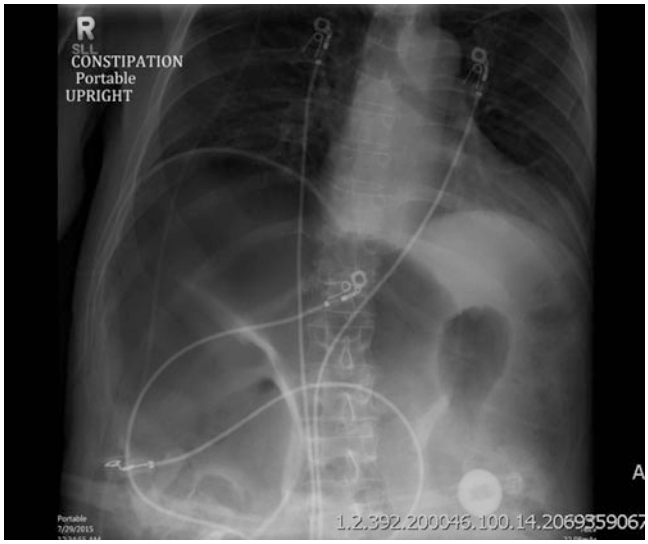

Fig. 33.4 "Bent inner tube" sign on KUB of patient with sigmoid volvulus

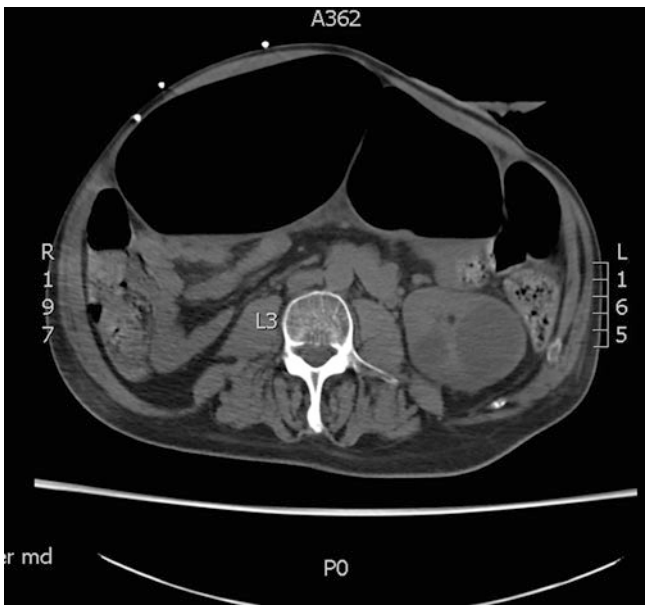

Fig. 33.5 CT of sigmoid volvulus

with contrast enema, and therefore this practice is not commonly recommended.

Abdominal CT can readily identify a sigmoid volvulus and rule out other causes of large bowel obstruction [26]. The CT will reveal the dilated sigmoid and the point of obstruction along the twisting of the colonic mesentery where a swirl sign is normally found (Figs. 33.5 and 33.6). An advantage of CT is the ease of identifying concerning features such as pneumatosis, portal venous gas, and poor bowel wall enhancement.

Management

After the diagnosis of sigmoid volvulus is made, prompt treatment is necessary. Historically the management has centered on reduction of the volvulized bowel. Today this dogma still rings true. In fact, the two primary goals for the treatment of a sigmoid volvulus are to reduce the volvulus and prevent recurrence. Due to the high incidence of recurrence, the acute reduction is only a temporizing maneuver and a definitive intervention should be pursued soon thereafter.

Once the volvulus is diagnosed, the clinician should rule out evidence of an intra-abdominal catastrophe as this would mandate immediate laparotomy. However, the vast majority of cases will present with a relatively benign course. In these cases, a thoughtful reduction of the volvulized colon with a subsequent plan for delayed definitive surgical intervention is advised. Detorsion can be accomplished by several techniques. Barium enema under fluoroscopic guidance is one method of both confirming the diagnosis and reducing the volvulus, however is not typically recommended due to the risk of perforation. Most often, the bowel is reduced via placement of a rectal tube beyond the point of obstruction either blindly or with endoscopic assistance [27]. Adequate reduction will be evident with the passage of large amounts of stool and gas. Endoscopic evaluation with rigid proctoscopy, flexible sigmoidoscopy or colonoscopy is a useful tool that not only allows reduction and rectal tube placement, but also provides a visual evaluation of the colonic mucosa in

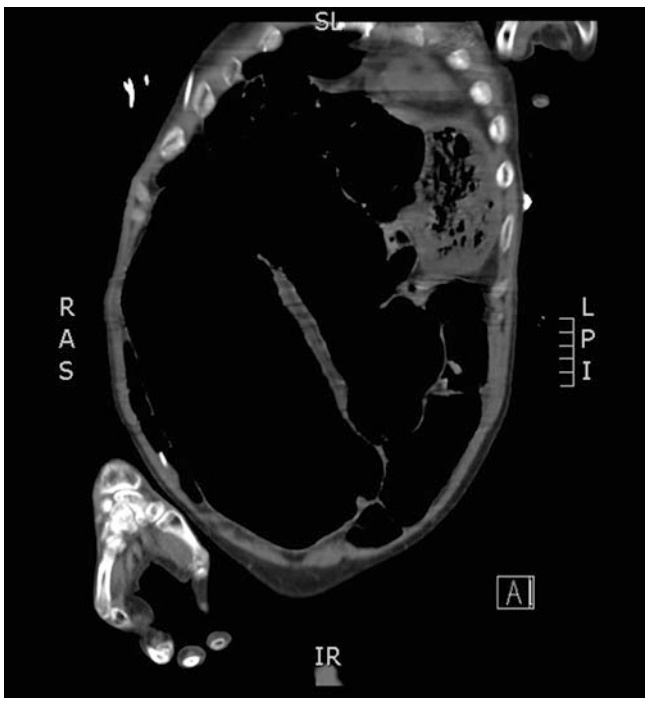

Fig. 33.6 Largely distended sigmoid colon located in the right upper quadrant of a patient with sigmoid volvulus

order to evaluate for ischemic changes. If frank necrosis is evident, this necessitates an immediate surgical intervention. Endoscopic evaluation will be able to identify the site of obstruction and with gentle pressure the scope will pass beyond revealing obviously dilated colon and the return of stool/gas. At this time, the direct placement of a rectal tube beyond the site of obstruction is easily accomplished. Care should be taken to selectively perform endoscopy only in those patients without sepsis and little concern for risk of perforation, as insufflation of an already distended colon can lead to perforation. It is not uncommon for these patients to present with electrolyte disturbances or dehydration; therefore, the patient will require IV fluid resuscitation. The patient must be observed closely with serial exams in order to ensure the rapid identification of any potential complications such as peritonitis or bowel perforation. The rectal tube can be left in place for several days if necessary while the patient is prepared for operative intervention. Occasionally the colon will re-volvulize or the rectal tube may slip out of place, it is appropriate to simply replace the tube and reduce the colon again. In fact, multiple decompressions are sometimes necessary. Up to 80 % of cases can be successfully reduced via tube decompression; however nearly 90 % of cases will eventually recur after initial tube decompression [28]. Therefore a definitive surgical intervention is always recommended and can/should be undertaken during the same hospital admission.

The surgical management revolves around the principle of preventing recurrence and the mainstay of this is resection of the sigmoid colon. However, other options exist and are usually reserved for those patients that are deemed too high risk to undergo surgical resection. The value of delayed intervention after tube decompression is that the patient can often undergo standard bowel preparation which may allow for a primary anastomosis during sigmoid resection. Either laparoscopic or open sigmoid resection can safely be performed, depending on the experience of the surgeon. A loop ileostomy can also be added in cases with an anastomosis requiring extra protection; however, this is rarely necessary and should be considered on a case-by-case basis. In the stable patient who successfully underwent decompression, sigmoid resection is the standard of care.

In most cases the patient can undergo delayed sigmoidectomy, however this is not always the case. If tube decompression is unsuccessful or the patient develops signs of peritonitis or sepsis, then the concern for gangrenous bowel should prompt immediate surgical exploration. The sigmoid colon will require resection and proceeding with either primary anastomosis or Hartmann's procedure is appropriate depending upon the clinical judgement of the operator and the clinical status of the patient. Anastomosis is not recommended in the hypotensive acidotic patient who may benefit from damage control and subsequent resuscitation in the intensive care unit. It is important to note the functional status of the patient, because in the elderly institutionalized patient a Hartmann's colostomy will often prove to be permanent. Otherwise the decision to perform an anastomosis in this setting should be made based upon standard surgical principles. A patient who presents in septic shock may benefit from a staged procedure. This consists of resection without reestablishing continuity followed by resuscitation. The patient may then return to the operating room 24–48 h later for either anastomosis or formal Hartmann's procedure.

For patients who undergo immediate laparotomy and are found to have a viable colon, the possibility exists to perform a nonresective procedure. This strategy should be reserved for the patient who is deemed unable to tolerate a formal surgical resection. Nonresective options include rectopexy, extraperitonealization of the sigmoid colon, and mesosigmoidoplasty [29]. These are viable but not ideal options and come with an increased risk of morbidity and mortality. Therefore, sigmoid resection remains the standard of care and a nonresective procedure should only be considered in unique cases.

Summary

Sigmoid volvulus, although an uncommon cause of large bowel obstruction, is a surgical emergency that requires prompt recognition and treatment. Institutionalized elderly patients with a history of a neuropsychiatric disorder are most commonly affected. Clinically the patients will present with abdominal pain and a significantly distended abdomen. Diagnosis can be readily made with abdominal radiographs and CT scan, if necessary. Treatment relies upon decompression and is followed up with surgical resection of the sigmoid colon. Less commonly a patient will present with signs concerning for bowel perforation, these cases demand immediate surgical exploration (Fig. 33.7).

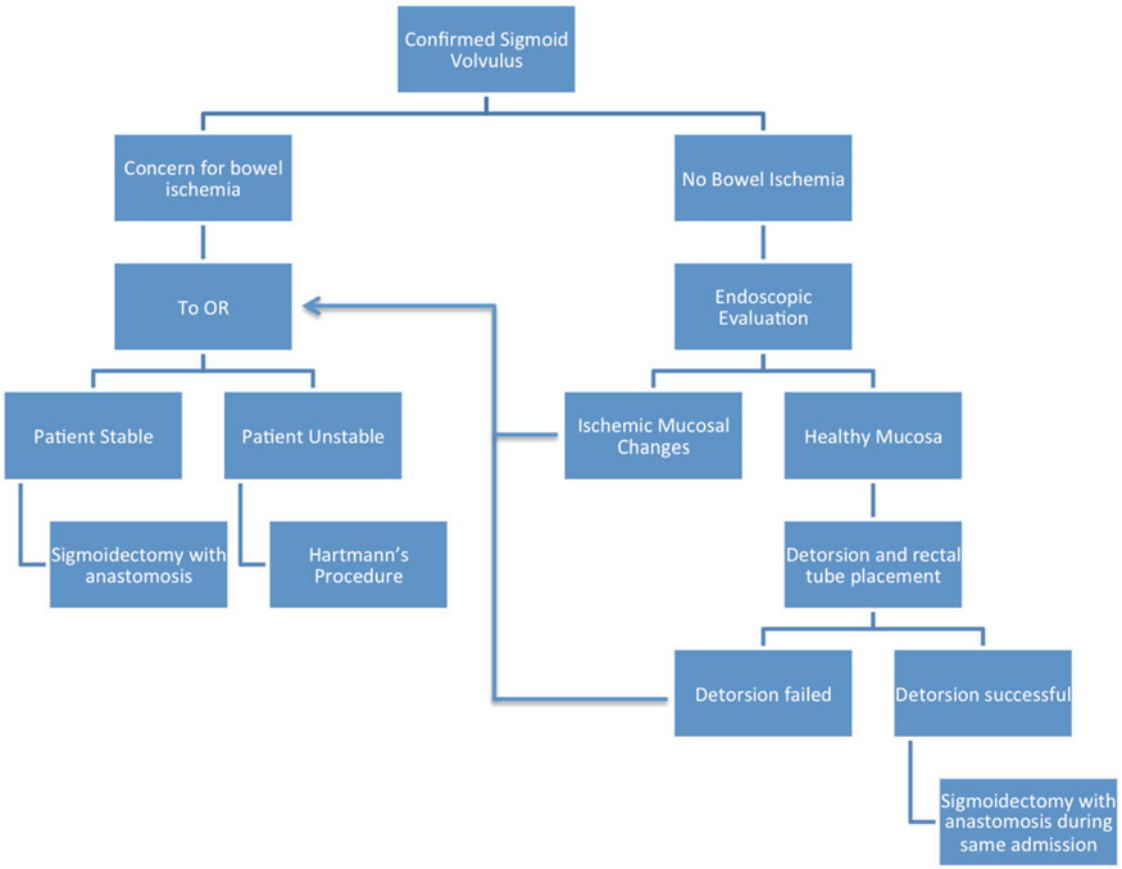

Fig. 33.7 Algorithm for sigmoid volvulus management

References

1. Ballantyne GH. Volvulus of the colon: incidence and mortality. Ann Surg. 1985;202:83–92.
2. Friedman JD. Experience with colonic volvulus. Dis Colon Rectum. 1989;32(5):409.
3. Ballantyne GH. Review of sigmoid volvulus: history and results of treatment. Dis Colon Rectum. 1982;25(5):494–501.
4. Gay J. Fatal obstruction from twisting of the meso-colon. Trans Pathol Soc Lond. 1859;10:153–4.
5. Senn N. The surgical treatment of volvulus. Med News. 1889; 55:590–8.
6. Bruusgaard C. Volvulus of the sigmoid colon and its treatment. Surgery. 1947;22:466–78.
7. Donhauser JL. Volvulus of the cecum. Arch Surg. 1949;58: 129–47.
8. Corman ML. Volvulus. Colon and rectal surgery. New York: Lippincott; 1984. p. 711–6.
9. Rabinovici R. Cecal volvulus. Dis Colon Rectum. 1990;33:765–9.
10. Jain BL. Volvulus of the intestine. A clinical study. Indian J Surg. 1968;30:239–46.
11. Rogers RL. Mobile cecum syndrome. Dis Colon Rectum. 1984; 27(6):399.
12. Moore C. CT of cecal volvulus: unraveling the image. Am J Roentgenol. 2001;177:95–8.
13. Delabrousse E. Cecal volvulus: CT findings and correlation with pathophysiology. Emerg Radiol. 2007;14(6):411.
14. Rosenblat JM. Findings of cecal volvulus at CT. Radiology. 2010;256(1):169.
15. Schwab FJ. Reduction of cecal volvulus by multiple barium enemas. Gastrointest Radiol. 1985;10(2):185.
16. Madiba TE. The management of cecal volvulus. Dis Colon Rectum. 2002;45(2):264–7.
17. Shoop SA. Laparoscopic cecopexy for cecal volvulus. Case report and a review of the literature. Surg Endosc. 1993;7(5):450–4.
18. Meyers JR. Cecal volvulus: a lesion requiring resection. Arch Surg. 1972;104:594–9.
19. Halabi WJ. Colonic volvulus in the United States: trends, outcomes, and predictors of mortality. Ann Surg. 2014;259(2):293–301.
20. Mangiante EC. Sigmoid volvulus. A four-decade experience. Am Surg. 1989;55(1):41.
21. Margolin D. The pathogenesis and etiology of colonic volvulus. Semin Colon Rectal Surg. 2007;18:79–86.
22. Treves F. Intestinal obstruction. Philadelphia: HC Lea's; 1884. p. 135.
23. Jones IT. Colonic volvulus etiology and management. Dig Dis. 1989;7:203–9.
24. Hinshaw D. Surgical management of acute volvulus of the sigmoid colon. Ann Surg. 1956;146(1):52–60.
25. Ballantyne GH. Sigmoid volvulus: high mortality in county hospital patients. Dis Colon Rectum. 1981;24(7):515–20.
26. Catalano O. Computed tomographic appearance of sigmoid volvulus. Abdom Imaging. 1996;21(4):314.
27. Anderson JR. The management of acute sigmoid volvulus. Br J Surg. 1981;68(2):117.
28. Hines JR. Recurrence and mortality rates in sigmoid volvulus. Surg Gynecol Obstet. 1967;124:567–70.
29. Bhatnagar BN. Nonresective alternative for the cure of nongangrenous sigmoid volvulus. Dis Colon Rectum. 1998;41(3):381–8.