

Sigmoid Volvulus in the Developing Countries: The Lack of Resources Might be a Blessing in Disguise

Atef MEJRI (✉ atef.mejri@hotmail.com)

Tunis El Manar University: Universite de Tunis El Manar <https://orcid.org/0000-0001-6497-8882>

Khaoula Arfaoui

University of Tunis El Manar: Universite de Tunis El Manar

Sarra Saad

Tunis El Manar University: Universite de Tunis El Manar

Jasser Rchidi

Tunis El Manar University: Universite de Tunis El Manar

Ahmed Omri

Tunis El Manar University: Universite de Tunis El Manar

Mohammed Ali Mseddi

Tunis El Manar University: Universite de Tunis El Manar

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Abstract

Background

Sigmoid volvulus is the most common type of volvulus. Its epidemiological features as well as its management differ between developed and developing countries. This work aims to analyze the epidemiological features and to assess the surgical management of sigmoid volvulus in Tunisia, which is a developing country from North Africa and where there is a paucity of information regarding sigmoid volvulus.

Methods

This is a retrospective review of 64 patients with sigmoid volvulus treated in the General Surgery department of Jendouba Hospital in Tunisia from January 2005 to December 2019. In the absence of endoscopic management, all patients underwent surgical treatment.

Results:

64 patients were treated for acute sigmoid volvulus. There were 54 (84.4%) men with a male to female ratio of 5.4/1. The mean age was 62 years. The classic triad of abdominal pain, abdominal distention and constipation was reported in 56 (87.5%) patients. The mean duration of symptoms was 4.2 days. The accurate preoperative diagnosis was made in 58 (90.62%) cases. Forty patients (74%) had viable bowel obstruction and all of them had resection and primary anastomosis. Sixteen patients had gangrenous bowel obstruction of which 6 patients had resection-primary anastomosis and 10 had Hartmann's procedure. Out of the total five deaths reported, there were only two among patients who had resection-primary anastomosis for gangrenous bowel obstruction. The commonest post-operative complication was surgical site infection in 5 cases (35.71%). The median length of hospital stay following surgery was 8 days (range 5 – 18 days). None of the patients had recurrences of volvulus after median follow up of 11 months.

Conclusion

Although Tunisia belongs to the volvulus belt, the epidemiologic features of sigmoid volvulus are not similar to those reported in the other African countries and tend rather to be similar to those of developed countries. Our results show that the absence of non-operative treatment can be tolerable and surgical management should be advocated as much as possible.

Background

Colonic volvulus is an uncommon cause of intestinal obstruction wherein a long and redundant colonic segment rotates around an elongated mesentery with a narrow base (1). Sigmoid volvulus is the most common cause of colonic volvulus, accounting for 50–90% of all cases (1). Sigmoid volvulus' etiology is multifactorial and controversial (2). Several predisposing factors have been suggested (3): Advanced age,

a high-fibre diet, chronic constipation, previous abdominal surgery, neurological disorders, living at high altitude and megacolon (1, 4–6). Sigmoid volvulus occurs most frequently in Africa, Asia, Middle East, Eastern Europe and Latin America. It causes as many as 50% of bowel obstructions in these areas (1, 2, 7). Diagnosis is based on clinical and radiological findings combined (8). Abdominal computed tomography is the imaging method of choice allowing precise accurate evaluation of such a condition (9). It usually show a whirled sigmoid mesentery associated with a dilated sigmoid loop and small or large intestinal air-fluid levels (7, 10). There is no current consensus on the choice of treatment, but it is widely admitted that the preferred management of uncomplicated cases is endoscopic reduction with delayed elective surgery (11–14). In case of peritonitis, perforation, early recurrence or unsuccessful non-operative decompression, emergency surgical procedures are indicated (3, 10, 15). Despite textbooks referring to Africa as part of the “volvulus belt”, there is a paucity of information regarding sigmoid volvulus in North Africa and particularly the study area. The aim of this work is to describe our experience in managing sigmoid volvulus without endoscopic decompression; which is the daily fare of almost all hospitals in the less economically developed countries.

Methods

Study design and setting

The study design was based on a descriptive retrospective analysis. It included patients operated for sigmoid volvulus at the “General surgery department of Jendouba hospital” (located in North-West Tunisia) from January 2005 to December 2019. The “General surgery department of Jendouba hospital” is a tertiary care and teaching department attached to the Faculty of Medicine of Tunis (El Manar University). It is the referral general surgery department of the region serving over 500.000 people. It is a 35 bed-capacity unit.

Study Population, Data Collection And Analysis

The records of all patients who were hospitalized for large bowel obstruction were reviewed. Only files of patients with definitive diagnosis of sigmoid volvulus that was made based upon radiography, sigmoidoscopy or surgery were included. Data of these patients were obtained from surgical ward, patient’s charts and operation registry books. Exclusion criteria were missing data (information), patients who have not been operated and patients under the age of 16. Three cases were excluded. Data were collected using a data collection tool and it included: Age, gender, body mass index, American Society of Anaesthesiologists physical status classification system type (ASA), comorbidities, previous admissions for sigmoid volvulus, previous abdominal surgery, complementary exams, operative and non-operative treatment, the emergency status of the procedure, the utilization of an anastomosis, recurrences, 30-day post-operative complications and 30-day mortality. Statistical analyses were performed using the SPSS Statistical package for Windows version 20. Univariate analysis was performed and Statistical significance was accepted at a $p < 0.05$.

Ethical Clearance

The permission to conduct the study was obtained from the Jendouba Hospital ethical committee : JH46Y20.

Results

During the period of the study, 978 patients with bowel obstruction were admitted to general surgery department of Jendouba Hospital. Among them, 67 (6.8%) patients with sigmoid volvulus were managed at our surgical ward. Sixty-four patients were included in this study (data retrieval rate of 95.5%). Forty-nine (76.56%) patients lived in rural areas. The mean age of patients was 62 years with extreme ranging from 42 years to 95 years. The highest incidence was in the age group of 61–70 years with 26 (40.62%) patients. There were fifty-four (84.4%) males and ten (15.6%) females with a male to female ratio 5,4 / 1. Thirty (46.87 %) patients had concomitant medical illness including hypertension in 18 patients, diabetes mellitus in 12 patients, neurological diseases in 4 patients and chronic obstructive pulmonary disease in 4 patients. According to ASA classification, 14 (21.87%) patients were classed as ASA class I, 36 (56.25%) as ASA class II, 10 (15.62%) as ASA class III and 4 (6.25%) as ASA class IV. The classic triad of abdominal pain, abdominal distention and constipation was reported in 56 (87.5%) patients. The mean duration of symptoms was 4.2 days and ranges from 6 hours to 10 days. Table 1 shows distribution of patients according to anamnesis and clinical features. The correct preoperative diagnosis was made in 58 (90.62%) cases based on clinical and radiological findings. In six patients, the diagnosis was made intraoperatively. All patients had performed abdominal x-ray, which showed distended sigmoid loop filling the abdomen and/or “coffee bean sign” with air fluid levels. Computed tomography was performed in 12 (18.75%) patients and demonstrated a dilated sigmoid colon and a whirl pattern in the mesentery (Figs. 1, 2). Sigmoidoscopy was not performed in any of our patients. None of our patients was managed non-operatively due to lack of detorsion endoscopic facility at our hospital. All the 64 patients underwent laparotomy and they were operated during their initial hospital stay. During surgery, sigmoid volvulus was confirmed in all cases. Table 2 shows operative findings in operated patients. Resection and primary anastomosis was performed in 46 (71.87%) patients, among those, six patients had gangrenous colon. The remaining 18 (28.125%) patients underwent Hartman's intervention, of which 2 patients presented intraoperatively with ileosigmoid knotting. Fourteen (21.87%) patients developed postoperative complications: Ten patients among those managed by resection-primary anastomosis and four among those who had Hartman's procedure. The commonest post-operative complication was surgical site infection in 5 cases (35.71%). Other complications were intraabdominal abscess in 3 cases (21.43%), pulmonary infection in 3 cases (21.43%), anastomotic leak in 2 cases (14.28%) and wound dehiscence in 1 case (7.14%). Re-laparotomy was performed for 5 patients (2 anastomotic leakage, 2 intraabdominal abscess, and 1 wound dehiscence). The median length of hospital stay following surgery was 8 days (range 5–18 days). There were five deaths (Fig. 1) and the Mortality rate was 7.81%. Among those managed with colostomy, 13 had their colostomies closed and 5 patients were lost to follow up. None of the patients had recurrences of volvulus after median follow up of 11 months (range 4–20 months).

Table 1
Anamnesis symptoms and clinical signs in patients with sigmoid volvulus

All patients, n = 64			
		Frequency	Percentages
Duration of symptoms	≤24 h	14	21.87
	> 24 h - ≤72 h	12	18.75
	>72 h	38	59.37
Anamnesis	Obstipation	60	93.75
Symptoms	Colicky abdominal pain	64	100
	Vomiting	16	25
	Fever	18	28.12
	Abdominal distention	58	90.62
	Clinical	Abdominal tenderness	38
Signs	Abdominal guarding	22	34.37
	Abdominal contracture	4	6.25
	Empty rectal	56	87.5
	Melanotic stool	10	15.62
	Toxic/hypovolemic shock	6	9.37
	Emptiness of the left iliac fossa	13	20.31

Table 2
Operative findings in patients with sigmoid volvulus

All patients, n = 64		
Operative findings	Frequency	Percentages
Redundant sigmoid colon	64	100%
Mesosigmoiditis with mesenteric fibrosis	8	12.5%
Gangrenous colon	16	25%
Ileosigmoid knotting	3.125%	
peritonitis	6	9.375%

Discussion

Sigmoid volvulus is an abnormal twist of the sigmoid colon around its own mesenteric axis of more than 180 degrees (8). The geographic distribution of this disease describes a “volvulus belt” that includes Africa, Asia, Middle East, Eastern Europe and Latin America (16–18). Over there, sigmoid volvulus represents 20–50% of large bowel obstruction (2) and reaches nearly 80% in Ethiopia and Andes (8, 19). In this study, sigmoid volvulus accounted for 6.8%, which is similar to the results reported in Western countries where its prevalence does not exceed 6–7% (1, 3, 8). In fact, North Africa is a cultural subcontinent of the African continent. This is what can explain these findings. The incidence rate reported by Hussein et al in the study entitled “Sigmoid volvulus in the Middle East” was also close to the results previously mentioned and it did not exceed 9,2% (7) despite the fact that the Middle East is classified among the “volvulus belt”. Sigmoid volvulus is frequent in adults, but, it can occur at any age even the neonatal period (2, 20). The age of onset of this disease varies markedly between developed countries and developing countries. In developing countries, the mean age varies between 40 and 60 years, whereas in developed countries, the mean age is between 60 and 70 years (2, 21). In this study, the median age was 62 years, which seems comparable to that of developed countries. Overall, it appears that, the geographical distribution of sigmoid volvulus depends little on the territorial affiliation, but, closely on the eating habits and geographical features. Indeed, Tunisia, which belongs to the African continent but resembles more the European countries by food habits, climate and altitude, describes results closer to developed countries. Revision of the “volvulus belt” may be considered.

Although the etiology of sigmoid volvulus is multifactorial and controversial (9), the main factors, mentioned in the majority of studies, still: - The dolichomesentery described as « mesentery that is wider than long », associate a redundant sigmoid and a narrowing of the base of sigmoid mesentery (5). It may be congenital or acquired. Acquired dolichomesentery can arise from to a high-fiber diet habit, or to living at high-altitude (4, 6). It also may be the result of chronic constipation especially found in people with neurologic, psychiatric or metabolic diseases. (1) - Some situations, which may constitute an anchoring point or inflammatory fixation for the sigmoid colon, such as internal herniations, intussusceptions, appendicitis, carcinomas or omphalo-mesenteric abnormalities (4, 6). Furthermore, some geographic specificities are reported, as Chagas disease in Brazil (7, 22). The sex ratio in our study was 5.4/1 and it corroborates with results reported in literature. All studies report that this disease is more frequent in men with a sex ratio ranking from 1,4/1 to 13,5/1 (8, 16, 20, 23). The more flared pelvis as well as the often “brachymesocolic” (wider than long) sigmoid females might explain these findings (7, 24).

More than half of patients in this study (78.12%) reached the hospital after 24 h following the onset of symptoms which is similar to other studies (8). Diagnostic delay is divided into “prehospital delay” that is common in low-resource communities and “hospital delay” mainly related to diagnostic imaging difficulties (2, 17). Patients with sigmoid volvulus usually present with colicky abdominal pain and obstipation. In acute cases, patients present with a triad of abdominal pain, constipation and abdominal distention, like most patients with large bowel obstruction (2). In subacute cases, additional complaints like vomiting, nausea and diarrhea can be reported (16). A thoroughly physical examination can relate

emptiness of the left iliac fossa (Fig. 2). In this study, this sign was recorded in 13 (20.62%) patients and Raveenthiran reported that the positive predictive value of this sign was 100% (25). Furthermore, blood on digital examination, melanotic rectal stools and muscular defense may be indicators of bowel gangrene and/or perforation with peritonitis (8, 16). Radiological investigations are the cornerstone of the diagnosis and classification of the disease. The abdominal CT usually reveals a dilated colon with an air/fluid level and the “whirl sign” (Fig. 3) which represents twisted colon and mesentery. (20, 26).

Management of sigmoid volvulus involves relief of obstruction and the prevention of recurrent attacks. The ultimate judgment regarding the propriety of any specific procedure must be made by the physician in light of all of the circumstances presented by the individual patient (12). So, adapting the choice of treatment to the population on a case-by-case basis improves the outcome (7, 27). In peritonitis and/or perforation, Emergency surgery must be performed, Hartmann’s procedure is recommended (2, 6, 11, 28) and endoscopic detorsion is contraindicated (7, 11, 20). Besides, in our department, we opted for two-staged resection (Hartmann’s procedure) in the ileo-sigmoid knot, which is a rare but serious condition progressing rapidly to gangrene of both ileum and sigmoid colon (2). In these cases, we have satisfactory outcomes and the majority of surgical teams adopted the same attitude in ileo-sigmoid knotting (2, 29–31). Hartmann’s procedure is also the most appropriate choice for hemodynamically unstable patients or those with concomitant risk factors such as: increased ASA, coagulopathy, acidosis or hypothermia add prohibitive risk to the integrity of a colorectal anastomosis. (11, 32, 33). In sigmoid volvulus with gangrenous colon, Hartmann’s procedure should be considered although some authors perform resection and primary anastomosis (2, 11, 28, 34). Indeed, it was found that the highest mortality usually occurs in cases of resection and primary anastomosis of gangrenous sigmoid colon (2, 34). In addition, postoperative complications are more frequent in the primary resection anastomosis patients’ group than in the Hartmann’s procedure group when the colon is gangrenous (35). Chalya and Mabula demonstrated that delayed symptoms (≥ 24 hours) and a high ASA score were independent predictors of gangrenous bowel (2). Moreover, Bhatnager et al found that an age over 60 years, the presence of shock at initial admission, and a history of previous episodes of volvulus are significant risk factors of gangrenous colon (33). This means that gangrenous colon is, most often, associated with underlying factors worsening the prognosis. Therefore, Hartmann’s procedure that allows to avoid the risk of anastomotic leak, is highly advocated whenever the colon is gangrenous, if there is a large amount of mismatch in bowel diameter, or in case of an urging need to decrease the operative time in a potentially infirm and septic patient (1, 36). In this study, among the 18 Hartmann’s procedure, mortality rate for gangrenous colon was 10 % (1 death /10 gangrenous colon) while, among the 46 Resection and primary anastomosis, mortality rate for gangrenous colon was 16.66% (1 death /6 gangrenous colon) and zero for viable colon (0 death /40 viable colon). In sigmoid volvulus with viable colon, Resection and primary anastomosis should be the first choice treatment and endoscopic detorsion should be the exception. Indeed, endoscopic detorsion is only a temporary solution and it is a bridge to elective surgery (37). However, this bridge: - Might be Risky, in fact, in the last few decades, a strong trend towards decompression with flexible endoscopy has been adopted for the treatment of sigmoid volvulus (37). Flexible endoscopy improved visualisation of the colon to assess for ischaemia, but, it requires an endoscopy slot, the additional associated staffing and

the potential delay to decompression that goes along with this (37). This delay may significantly worsen the condition of a patient who must be operated urgently, if endoscopic untwisting is unsuccessful (2, 7, 10, 20, 38). Furthermore, even if endoscopic untwisting succeeded: Following derotation, ischemia-reperfusion injuries aggravate intestinal dysfunction, and even intestinal ulcer and perforation. Peritoneal exudate, high intestinal fluid accumulation, electrolyte disturbances, and hypoproteinemia lead to serious adverse consequences (20). - Might leads nowhere, if patients are content with detorsion and refuse surgery during the same hospitalization and cannot afford to come back for interval sigmoid colectomy (2, 38). Even worse, it should be noted that the recurrences are high, and without planned surgery, recurrence occur after 55%-84% of successful non-operative decompressions (3, 7, 10) and each time with a more serious recurrence.

Besides, as mentioned above, there is a close relationship between gangrenous colon and delayed presentation (≥ 24 hours) and/or high ASA score and/or shock on admission (2, 33). It can be deduced that when colon is viable, frequently, hemodynamic state is stable, ASA score is low and the patient consulted early. In this study, there was 40 sigmoid volvulus with viable colon. All of them were operated urgently and have a resection and primary anastomosis with uneventful surgical outcomes. On the whole, operative management outcome for sigmoid volvulus with primary resection and anastomosis depends on the viability of the bowel (2). In all instances, it is highly recommended that Colectomy should be performed with minimal manipulation to prevent release of endotoxin, potassium, and bacteria into the general circulation and to avoid perforation of the colon. If the sigmoid colon is gangrenous, resection should be done without detorsion (12). In addition, using the mechanical stapling devices considerably reduces the operative time.

The most common post-operative complication in this study was surgical site infection (5/14 patients) 35.71% followed by intra-abdominal abscess (3/14 patients) 21.43%. The duration of hospital stay in this study ranged from 5 to 18 days (mean 8). Our findings are in agreement with the data in the literature.

Through this work, an attempt has been made to elicit an objective reconsideration for sigmoid volvulus by highlighting the convergences and divergences between developed and developing countries. We report an experience from North Africa (Tunisia) where we find similarities with both classes of countries. We estimate that the approach adopted in our center is concise, clear and realistic. It offers the advantage of avoiding the risk of losing patients for elective surgery after the success of endoscopic detorsion, of minimizing the number of recurrences, and of performing a single intervention in all cases, which is of great value especially for elderly vulnerable patients. A perfectly accomplished colopexy significantly reduces the risk of recurrence (38). Regarding the group of patients with Contraindications to anaesthesia, poor general condition, bed-ridden and elderly we highly recommend an endoscopic decompression associated with percutaneous endoscopic colopexy. For the others we advocate Hartmann's procedure in case of peritonitis, perforation, gangrenous colon or ileosigmoid knotting and Resection and primary anastomosis if case of a viable colon (See Fig. 4). This strategy can always be modulated, and will depend on the general condition of the patient, the local condition during the operation, the technical means available and the surgeon.

Conclusion

Almost all published studies insist on post-detorsion surgery and tend to minimize the period between non-operative management and surgery. No study has attempted to emphasize that for sigmoid volvulus, endoscopic decompression should only be considered in exceptional cases instead of emergency surgery (with or without anastomosis). Through our study; which reflects the predominantly accepted strategy for sigmoid volvulus in developing countries. We have tried to demonstrate that the absence of non-operative treatment can be tolerable and should, even, be encouraged as much as possible.

Abbreviations

ASA

American Society of Anaesthesiologists physical status classification

SPSS

Statistical Package for the Social Sciences

CT

Computed tomography

Declarations

Ethical approval and consent to participate: An ethical approval was obtained from the Jendouba Regional Hospital Medical Ethics Committee N° JH46Y20: We confirm that all methods were performed in accordance with the ethical guidelines of the 1975 Declaration of Helsinki.

Consent for publication: A written informed consent for the publication of personal/ clinical data has been obtained from each patient.

Availability of Data and materials: There are no additional data available to share with the readers. The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interest: The authors declare that they have no conflicts of interest

Funding: None

Authors' contributions: AM contributed to the work conception, SS collected data, JR, AO and MAM analyzed clinicopathological data and KA wrote the manuscript. The final version of manuscript was read and approved by all authors.

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Figures

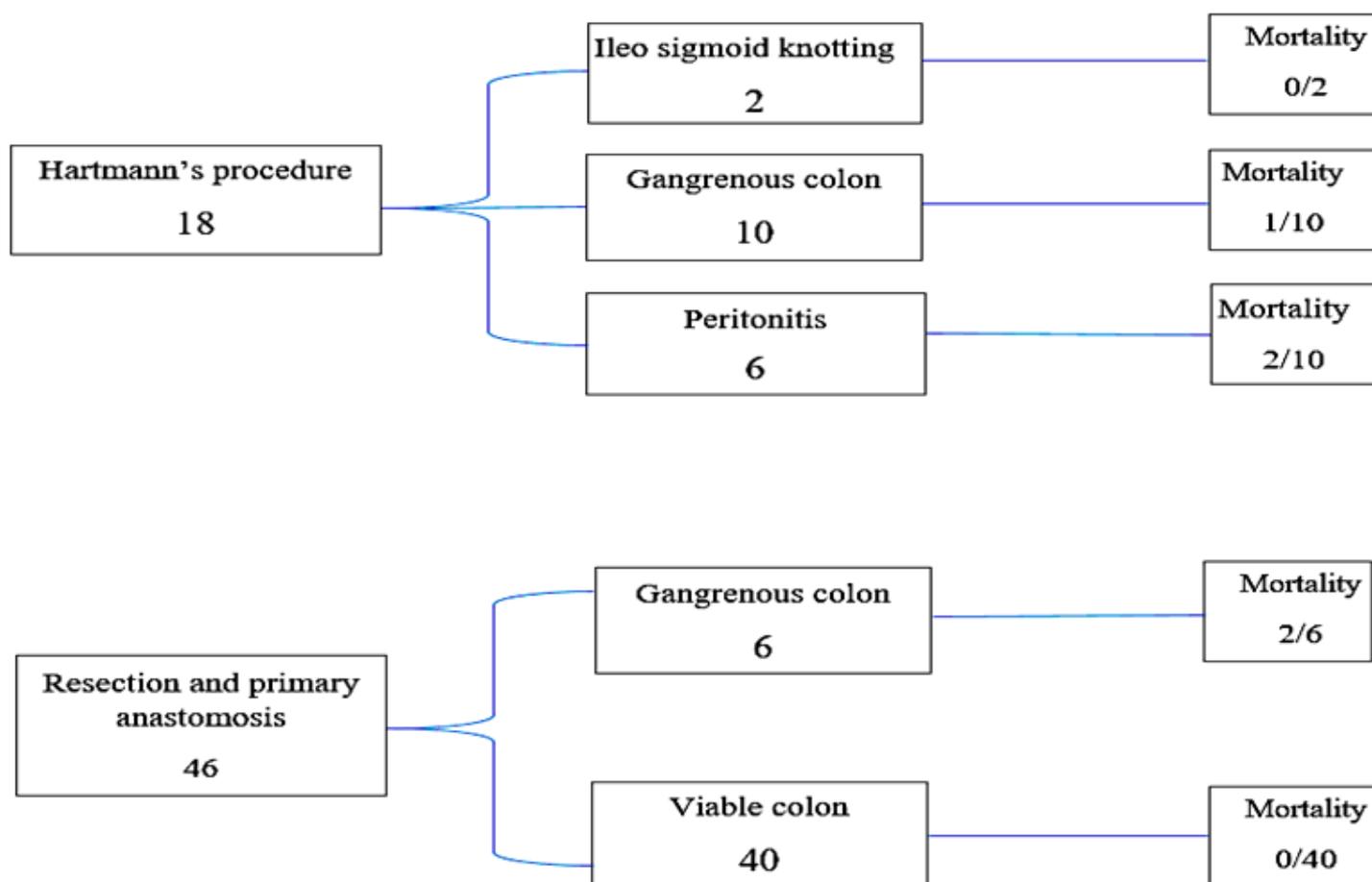


Figure 1

Summary of the different intraoperative findings, the performed surgical procedures and their corresponding outcomes



Figure 2

Physical examination showing emptiness of the left iliac fossa

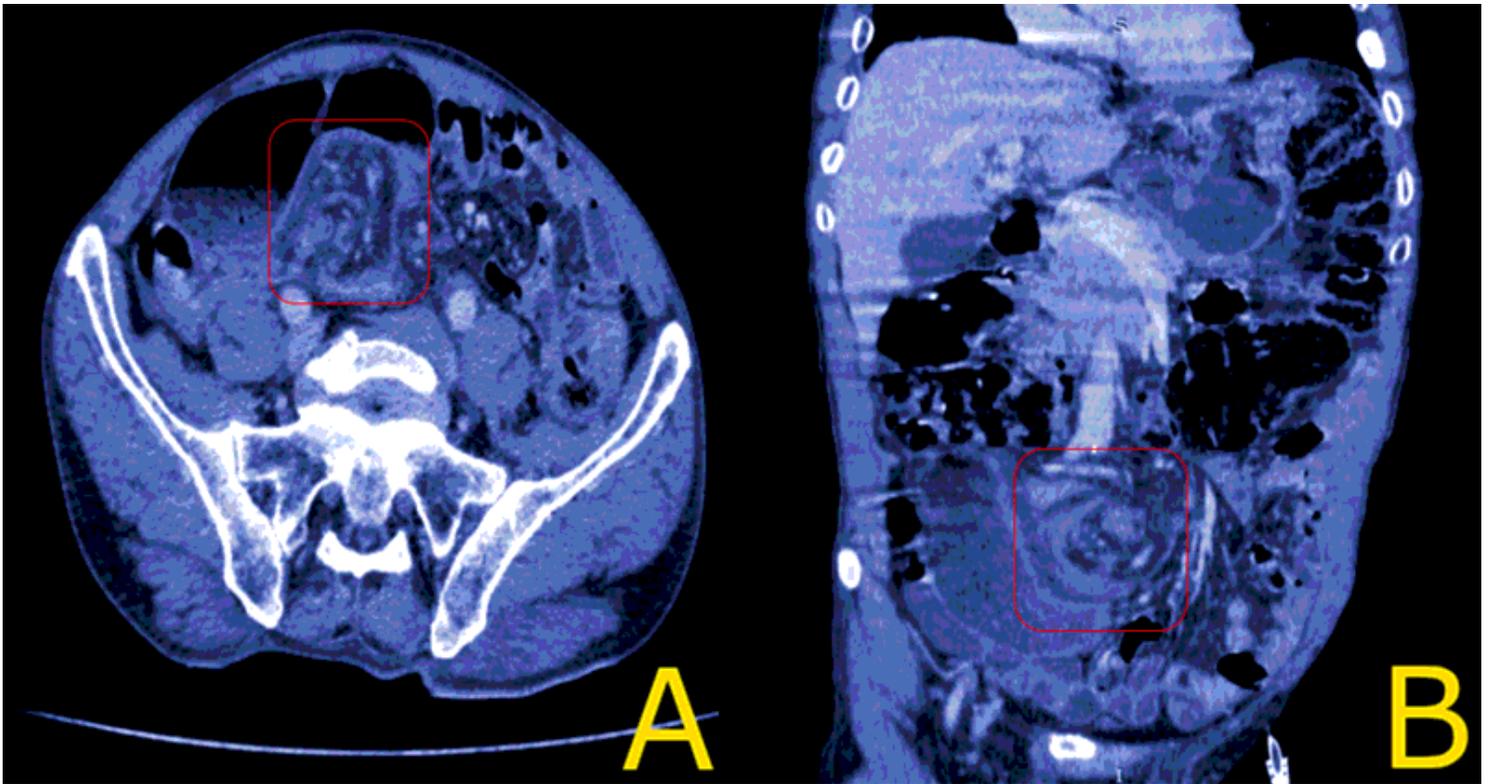


Figure 3

Axial CT scan view (A) and coronal CT scan view (B) both showing the “Whirl sign”

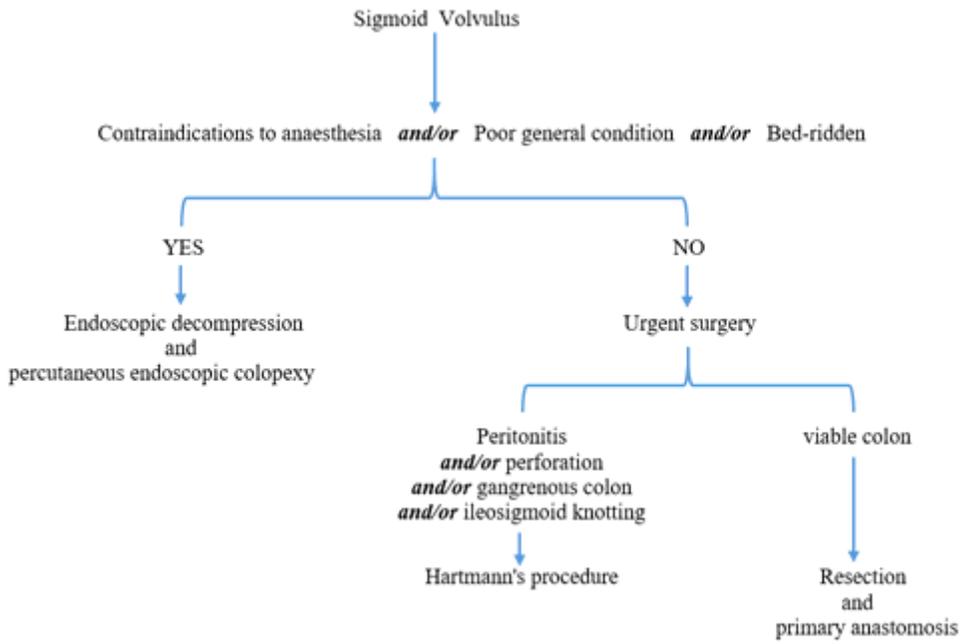


Figure 4

Flowchart of treatment for patients with sigmoid volvulus.