ORIGINAL ARTICLE

Management of Sigmoid Volvulus: Options and Prognosis

Ghodratollah Maddah[1], Gholam Hossein Kazemzadeh[2], Abbas Abdollahi[3], Mostafa Mehrabi Bahar[3], Alireza Tavassoli[1] and Hossein Shabahang[1]

ABSTRACT

Objective: To describe the management of sigmoid volvulus with reference to the type of surgical procedures performed and to determine the prognosis of sigmoid volvulus.

Study Design: A case series.

Place and Duration of Study: Ghaem Hospital of Mashhad, University of Medical Sciences, Mashhad, Iran, from 1996 to 2008.

Methodology: A total of 944 cases of colon obstruction were reviewed. Demographic, laboratory and treatment results, mortality and complications were recorded. The data was analyzed using descriptive statistics as frequency and percentage for the qualitative variables and mean and standard deviation values for the quantitative variables. Also chi-square and Fisher's exact test were used for the association between the qualitative variables. SPSS statistical software (version 18) was used for the data analysis.

Results: In all patients except those with symptoms or signs of gangrenous bowel, a long rectal tube was inserted via the rectosigmoidoscope which was successful in 80 (36.87%) cases. Rectosigmoidoscopic detorsion was unsuccessful in 137 (63.13%) patients, who underwent an emergent laparotomy. The surgical procedures performed in these cases were resection and primary anastomosis in 40 (29.1%), Mikulicz procedure in 9 (6.6%), laparotomy detorsion in 37 (27.01%), Hartmann procedure in 47 (34.3%), mesosigmoidoplasty in 3 (2.19%) patients and total colectomy in one (0.73%) case. The overall mortality was 9.8% (22) patients.

Conclusion: In sigmoid volvulus, the most important determinant of patient outcome is bowel viability. The initial treatment of sigmoid colon volvulus is sigmoidoscopy with rectal tube placement.

Key Words: *Intestinal obstruction. Volvulus. Sigmoid. Laparotomy.*

INTRODUCTION

Sigmoid volvulus has been known since ancient times. This disease varies in different geographical areas. It is common in Africa, South America, Russia, India, Pakistan, Iran, Turkey, Eastern Europe and Scandinavia; and in Western countries. It is the third common cause for intestinal obstruction after cancer and diverticular disease and only 2 – 4% intestinal obstruction is caused by sigmoid volvulus.[1]

The cause of sigmoid volvulus is not known. Primary predisposing factors include a long congenital sigmoid with a short mesenteric base, chronic constipation, high fiber regimen, acquisitive mega colon, anticholinergic drugs, sedatives, and anti-Parkinson agents.[2]

[1] *Endoscopic and Minimally Invasive Surgery Research Center, Ghaem Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.*

[2] *Vascular and Endovascular Surgery Research Center, Imam Reza Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.*

[3] *Surgical Oncology Research Center, Imam Reza Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.*

Correspondence: Dr. Abbas Abdollahi, Surgical Oncology Research Center, Imam Reza Hospital, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran. E-mail: abdollahia@mums.ac.ir

Received: January 26, 2011; Accepted: September 09, 2013.

Clinical presentations include abdominal pain, constipation and abdominal distention. In older patients receiving psychotropic medications, pain is not usually common, although it would be associated with significant abdominal distention.[3]

The diagnosis is usually confirmed with abdominal X-ray examination. Plain abdominal films classically show massive colonic distention on the right or left side of the abdomen with or without small bowel dilatation. In patients with equivocal diagnosis, a gastrografin enema demonstrates a pathognomonic sign of sigmoid torsion (bird's beak or ace of spades signs).[4]

After hydration and resuscitation, it should be decided about type of management which include endoscopic detorsion or emergent laparotomy. The goals of therapy in sigmoid volvulus are relief of the acute torsion via sigmoidoscopic decompression, but in case of any sign of strangulated sigmoid loop, the patient should undergo an emergent laparotomy.[4]

The surgical procedures performed in these cases are primary resection and anastomosis, Mikulicz, laparotomy detorsion, Hartmann procedure, mesosigmoidoplasty and total colectomy.

The aim of this study was to describe the management of sigmoid volvulus, the type of surgical procedures performed and to determine the prognosis of sigmoid volvulus.

METHODOLOGY

This retrospective study was performed in the Ghaem Hospital of Mashhad, Iran, from 1996 to 2008. The source of information was patients' records and all information related to patients' demographic characteristics, radiological investigations, surgical procedures performed, para clinic tests as well as treatment response and course of their recovery or death were recorded in a questionnaire.

All patients with definitive diagnosis of sigmoid volvulus were included. Patients with missing data in their medical records were excluded.

According to the protocol of our centre for patients with sigmoid volvulus, rectosigmoidoscopy and rectal tube placement were considered, unless the patient had symptoms of peritonitis; then a surgical procedure was adopted. Surgical patients fell into four categories: those undergoing volvulus reduction only, intestinal resection and anastomosis, Hartmann procedure and other methods. The patients were followed-up for post-operative complications, recurrence and mortality. After discharge, patients were re-examined for possible complication on 10th day after surgery.

Finally, the data was analyzed using descriptive statistics as frequency and percentage for the qualitative variables, mean and standard deviation for the quantitative variables. Also, the chi-square and Fisher's exact test are used for the association between the qualitative variables. SPSS statistical software (version 18) was used for the data analysis.

RESULTS

One hundred and seventy one (78.8%) males and 46 (21.2%) females with the age range of 4 – 83 (mean = 50.8 ± 16.6) years were studied. The mean duration of symptoms prior to referral was 4.3 ± 1.9 (1 – 20) days, 4.5 ± 1.3 days in women and 4.3 ± 2.0 days in men.

In 6 (2.8%) cases, the factor to predisposing sigmoid volvulus was found to be Hirschsprung's disease, idiopathic mega colon, sigmoid cancer and hypothyroidism in one case each (16.7%) and pregnancy (n = 2, 33.3%). No predisposing factors were identified in the remaining 211 (97.2%) cases.

Recurrent sigmoid volvulus occurred in 28 (12.9%) of patients, which underwent sigmoid volvulus detorsion with laparotomy, and in 6 (21.4%) of them laparotomy was performed twice. Duration of the previous laparotomy varied from a week to 10 years. Recurrence after sigmoidoscopy detorsion was detected in 6 (21.4%) cases, meanwhile in 4 (66.7%) patients this procedure had been performed twice.

A variety of therapeutic procedures were carried out based on patients' situation and surgeon preference. If there were no symptoms of peritonitis, shock or rectal bleeding, an attempt to reduce the volvulus with rectosigmoidoscope was performed, and in case of failure of this method, a laparotomy procedure was done. Overall, in 80 (36.87%) cases of non-surgical volvulus sigmoid decompression, a rectosigmoidoscope guided rectal tube placement was successfully performed. In the other 137 (63.1%) cases, laparotomy was performed with the results shown in Table I. Based on the results, no significant association was found between mortality rate and procedures of primary resection anastomosis, Mikulicz technique, detorsion laparotomy, mesosigmoidoplasty and primary subtotal colectomy ($p > 0.05$). While, the association between Hartmann's procedure and mortality rate was identified significant at a ratio of 5% ($p = 0.009$).

All patients who underwent decompression with rectosigmoidoscopy were recommended for sigmoid elective resection. Only 18 (22.5%) cases agreed with the procedure; and 12 (66.7%) cases underwent sigmoid resection with local anaesthesia, while for other 6 (33.3%) cases, the sigmoid elective resection was performed under general anaesthesia. Patients who refused to consent to undergo another surgery (62, 77.5%) were discharged. Patients who underwent detorsion laparotomy procedure were recommended for sigmoid elective resection after 6 weeks, but no one returned.

In this study, 5 (2.3%) cases of intestinal knot were found in which the ileum and sigmoid suffered from real knot and gangrene. These patients underwent ileum primary resection and anastomosis and Hartmann surgery.

Table I: Contingency table for procedures performed at laparotomy for 137 patients with sigmoid volvulus and its death (p-value of the Fisher's exact test).

Performed procedures	Cases (%)	Death (%)	p-value
Primary resection anastomosis	40 (29.2)	4 (18.2) (2 cases with gangrene)	0.441
Mikulicz technique (Double barrel colostomy)	9 (6.6)	1 (4.5)	1.000
Detorsion laparotomy	37 (27.0)	3 (13.6)	0.288
Hartmann surgery (22 cases because of gangrene, 25 cases for first surgical procedure)	47 (34.3)	14 (63.6)	0.009
Mesosigmoidoplasty	3 (2.2)	0 (0.0)	1.000
Primary subtotal colectomy	1 (0.7)	0 (0.0)	1.000
Total	137	22	–

Table II: The contingency table of leukocyte count and prognosis of sigmoid volvulus in 180 patients and gangrene ($p < 0.001$).

White blood cell count	Count (%)	Gangrene (%)
5000 <	8 (4.4)	1 (2.90)
9999-5000	106 (58.9)	4 (11.76)
14999-10000	47 (26.1)	16 (47.06)
19999-15000	14 (7.8)	8 (23.53)
Up to 20000	5 (2.8)	5 (14.71)
Total	180	34 (18.9)

Because of some missing data, the white blood cell count results were available in 180 (82.9%) out of 217 patients. The frequencies of intestinal gangrene and white blood count are shown in Table II. The results showed that the association between prognosis of sigmoid volvulus and gangrene was significant ($p < 0.001$).

DISCUSSION

Sigmoid volvulus is the third major cause of colon obstruction in adults after cancer and diverticula. This disease is very common in specific regions such as Asia, Africa, Middle East, Eastern Europe, and South America. It is also more common in men and the elderly.[1]

According to reports, there is a considerable geographical difference in the prevalence of sigmoid volvulus. In America, 3 – 5% of all colon obstruction cases are because of colon volvulus in which 61% are related to sigmoid, 3% to cecum and 5% to transverse colon and curve of the spleen.[2] In this study of all 944 patients with colon obstruction, 217 (22.9%) of the cases were related to sigmoid volvulus.

Another issue is the higher prevalence of sigmoid volvulus in men than women. According to reports this preference exists in many developing countries, while in developed countries having an equal proportion of men and women or a little preference for men.[5] In this study, 78.8% patients were men and 21.2% were women.

Another matter of importance is the difference in age of the patients with sigmoid volvulus. In western countries, it mostly occurs at the age of 70 and 80 years, while in developing countries the age of occurrence is between 40 and 60 years.[6] The present study showed an average age of 51.8 years.

In the West, most patients who live in nursing home or mental health institutions, and those with high fiber food regimen are predisposed to sigmoid volvulus. These patients comprise 8% of cases with colon obstruction.[7]

Based on clinical presentations, sigmoid volvulus has been classically divided into two types of acute type in which the disease occurs with a sudden onset and the patients are admitted with colon obstruction; and subacute type in which mild symptoms are seen and the duration of the disease is longer. Symptoms such as ischaemia and gangrene are common in the first type, but in the second type which has been mostly seen in the elderly, symptoms are milder.[8]

Sigmoid volvulus treatment can be done with different types of therapies including non-surgical decompression or surgical treatments. However, the most acceptable method is sigmoid non-surgical decompression with a long rectal tube via sigmoidoscopy and elective sigmoid resection through open or laparoscopic approaches.[9,10] In this study, if there were no symptoms of peritonitis, shock and rectal bleeding, the patients underwent a rigid sigmoidoscopy as the first line treatment. Though, it was successful only for 80 (36.8%) cases. The reason for failure of sigmoidoscopy could be related to the lack of sufficient experience in performing this procedure by surgical residents.

Though primary resection and anastomosis has been recommended in several studies, because of risk of anastomotic leakage, it is still controversial. The incidence of anastomotic leakage following this surgery greatly varies in the literature.[11,12] In this study, primary anastomosis was performed in 40 (18.4%) cases while 4 (10.0%) cases died because of anastomotic leakage and 2 (5.0%) cases from them was sigmoid gangrene.

One of the most important causes of anastomotic leakage in patients who underwent primary anastomosis is the extension of gangrene beyond the anastomotic site.[13] The aggregation of feces in left obstructed colon is another important factor in anastomotic leakage. It seems that if the colon contains gas only and no feces, the gangrenous segment does not extend into the rectum and descending colon, the surgeon is experienced and there is no systematic factor like shock, diabetes, renal failure and steroid consumption, primary resection and anastomosis would be a fruitful procedure. However, if gangrene of sigmoid colon is noticed during laparotomy, the most appropriate method would be resection and end colostomy with Hartmann procedure.[14,15] Colon volvulus almost never occurs if the colon is filled with solid feces.[16]

Double barrel colostomy (Paul Mikulicz's procedure) was conducted in 9 (6.5%) patients and only in one (11.1%) case death occurred because of iatrogenic ileal perforation. The fault for this method is that patient needs a two-stage surgical procedure, although it seems that if the intestinal gangrene does not extend into the distal sigmoid colon, this method would be confident.

Subtotal colectomy is another procedure for treatment of sigmoid volvulus,[17] which was successfully done for one (0.7%) of these patients.

Mesosigmoidoplasty (broadening the base of the mesosigmoid and reduction of its length) was carried out in 3 (2.1%) patients. Mesosigmoidoplasty is a simple procedure, which takes little time (about 40 – 60 minutes); and it needs neither bowel preparation nor special skill. Having a low mortality and recurrence rate, it is a noticeable procedure.[18,19]

If sigmoid detorsion with sigmoidoscopy or conservative treatment is performed, it should be accomplished with a subsequent procedure of sigmoid elective resection; otherwise, there is a possibility of 50-60% recurrence in detorsion with sigmoidoscopy and 60% recurrence after conservative treatment.[20] In this study, 28 (20.4%) patients who underwent sigmoid detorsion by laparotomy, returned because of recurrence in one week to 10 days time.

In 12 (15.0%) patients, out of 80 (58.4%), in whom sigmoidoscopy detorsion was carried out, this procedure was followed by an elective sigmoid resection with local anaesthesia. If this surgery is done with minimal manipulation and under adequate anaesthesia by an experienced surgeon, it would be a safe and reliable procedure. It is especially recommended for patients who cannot tolerate general anaesthesia. The disadvantage is that a full laparotomy is not possible and there is a risk for missing the associated pathology.[21]

Colon volvulus is a rare presentation of Hirschsprung's disease, but late diagnosis may be associated with increased mortality and morbidity. In this disease, volvulus may involve different segments of colon. In Sarioglu *et al*. study of 302 patients with Hirschsprung's disease, 2 (0.66%) patients were admitted with colonic volvulus. They postulated that children who present with colonic volvulus should be suspected for underlying Hirschsprung's disease.[22] One of these patients was a 12-year-old boy with a history of 6 laparotomies for colon volvulus. In laparotomy, only some part of colon remained in the left side, which had suffered from volvulus and signs of previous resection was evident. Hirschsprung's disease was confirmed by rectum biopsy.

Another patient was a 13-year-old girl with abdominal distention 5 years ago, who was admitted because of sigmoid volvulus. Despite sigmoid resection carried out, the dilated colon remained intractable. A rectal biopsy ruled out Hirschsprung's disease, so she underwent subtotal colectomy and ileorectal anastomosis with diagnosis of idiopathic megacolon; and was discharged with no problem. It seems that in idiopathic megacolon, the nervous system of the rectum and colon was disarranged due to dilated colon. These patients usually suffer from intractable constipation and sigmoid volvulus.[23]

Sigmoid volvulus is the cause of colon obstruction in 44% of pregnant women and, therefore, the most common cause of colon obstruction is pregnancy.[24] In this study, 2 (0.9%) patients were pregnant.

This study showed a mortality rate of 9.8% (22 deaths). Based on the results, no significant association was found between mortality rate and procedures of primary resection anastomosis, Mikulicz technique, detorsion laparotomy, mesosigmoidoplasty and primary subtotal colectomy ($p > 0.05$). The reason for such a significant difference can be attributed to surgical procedure, i.e. the procedures with anastomosis are associated with high mortality rate (primary resection anastomosis), in contrast, those without anastomosis are usually associated with low mortality rate (Mikulicz technique, detorsion laparotomy, mesosigmoidoplasty). Since most of the procedures performed in this study include no anastomosis, so the mortality rate of these patients was not significant. Nevertheless, the association between Hartmann surgery and mortality rate was identified significant at the level of 5% ($p = 0.009$). Because, near half of the patients in this group presented with bowel gangrene which is considered high risk for outcome of surgery.

The most important risk factor for mortality is the delay in sigmoid decompression which eventually leads to intestinal ischaemia and gangrene.[25] Compared to other studies, the cause of low mortality in this study is probably due to younger age of these patients.

Another interesting finding in this study is the relationship between leukocyte count and prognosis of sigmoid volvulus. It is demonstrated that if the leukocyte count was below 5000 or upto 20000/mm^3 at the time of admission, the possibility of intestinal gangrene was 12.5% and 100%, respectively. The results showed that the association between prognosis of sigmoid volvulus and gangrene was significant. The significant association between prognosis of sigmoid volvulus and gangrene in this study indicated that in patient with leukocyte count upto 20000/mm^3 the surgeon must select an appropriate intervention. To authors' knowledge, there are no studies on the relationship between leukocyte count and prognosis of sigmoid volvulus.

CONCLUSION

Bowel viability is the most important determinant of the outcome in a patient with sigmoid volvulus. The initial treatment of sigmoid colon volvulus is sigmoidoscopy with rectal tube placement. If sigmoid detorsion with sigmoidoscopy is performed, it should be accomplished with a subsequent procedure of sigmoid elective resection; otherwise, there is a possibility of 50 – 60% recurrence in detorsion with sigmoidoscopy and 60% recurrence after conservative treatment.

REFERENCES

1. Jangjoo A, Soltani E, Fazelifar S, Saremi E, Afzal Aghaei M. Proper management of sigmoid colon volvulus: our experience with 75 cases. *Int J Colorectal Dis* 2010; **25**:407-9.
2. Fry RD, Mahmoud N, Maron DJ, Ross HM, Rombeau J. Colon and rectum. In: Sabiston textbook of surgery. *Saunders Elsevier:* 2008; 18th ed: 1369-71.
3. Hellinger MD, Steinhagen RM. Colonic volvulus. In: Wolff BG, Fleshman JW, Beck DE, Pemberton JH, Wexner SD, editors. The ASCRS textbook of colon and rectal surgery. New York: *Springer,* 2008; 2nd ed: 291-4.
4. Nivatvongs S. Volvulus of the colon. In: Gordon PhH, Nivatvongs S, editors. Principles and practice of surgery for the colon, rectum, and anus. *Informa Healthcare USA,* 2008; 3rd ed: 971-8.
5. Heis H, Bani-Hani K, Rabadi D, Elheis M, Bani-Hani B, Mazahreh T, *et al*. Sigmoid volvulus in the Middle East. *World J Surg* 2008; **32**:459-64.

6. Khan AN, Howat J, McDonald S. Sigmoid volvulus. http://www.emedicine.com/radio/topic636.htm/accessed: Accessed 22 April 2007.
7. Safioleas M, Chatziconstantinou C, Felekouras E, Stamatakos M, Papaconstantinou I, Smirnis S, *et al*. Clinical consideration and therapeutic strategy for sigmoid volvulus in the elderly: a study of 33 cases. *World J Gastroenterol* 2007; **13**:921-4.
8. Cirocchi R, Farinella E, La Mura F, Morelli U, Trastulli S, Milani D, *et al*. The sigmoid volvulus: surgical timing and mortality for different clinical types. *World J Emerg Surg* 2010; **5**:1.
9. Turan M, Sen M, Karadayi K, Koyuncu A, Topcu O, Yildirir C, *et al*. Our sigmoid colon volvulus experience and benefits of colonoscope in detortion process. *Rev ESP Enferm Dig* 2004; **96**:32-5.
10. Martínez Ares D, Yáñez López J, Souto Ruzo J, Vázquez Millán MA, González Conde B, Suárez López F, *et al*. Indication and results of endoscopic management of sigmoid volvulus. *Rev Esp Enferm Dig* 2003; **95**:544-8, 539-43.
11. Tiah L, Gon SH. Sigmoid volvulus. *Eur J Emerg Med* 2006; **13**: 84-7.
12. Oren D, Atamanalp SS, Aydinli B, Yildirgan MI, Basoglu M, Polat KY, *et al*. An algorithm for the management to sigmoid colon volvulus and the safety of primary resection experience with 827 cases. *Dis Colon Rectum* 2007; **50**:489-97.
13. Khanna A, Kumar P, Khanna R. Sigmoid volvulus study from a North Indian hospital. *Dis Colon Rec* 1999; **42**:1081-4.
14. Bhatnagar BN, Sharma CL, Gautam A, Kakar A, Reddy DC. Gangrenous sigmoid volvulus: a clinical study of 76 patients. *Int J Colorectal Dis* 2004; **19**:134-42.
15. Raveenthiran V. Restorative resection of unprepared left-colon in gangrenous vs. viable sigmoid volvulus. *Int J Colorectal Dis* 2004; **19**:258-63.
16. Bhuiyan MM, Machowski ZA, Linyama BS, Modiba MC. Management of sigmoid volvulus in Polokwane-Mankweng Hospital. *S Afr J Surg* 2005; **43**:17-9.
17. Chung RS. Colectomy for sigmoid volvulus. *Dis Colon Rect* 1997; **40**:363-5.
18. Bach O, Rudloff U, Post S. Modification of mesosigmoidoplasty for non-gangrenous sigmoid volvulus. *World J Surg* 2003; **27**: 1329-32.
19. Munir A, Khan I. Management of viable sigmoid volvulus by mesosigmoidoplasty. *Gomal J Med Sci* 2009; **7**:7-9.
20. Daneil IR, Simon JN. Minimizing recurrence after sigmoid volvulus. *Br J Surg* 1999; **86**:966-7.
21. Devine RM. Colonic volvulus. ASCRS 1998 core subjects. http://www.fascrs.org/physicians/education/core_subjects/1998/colonic_volvulus. Accessed: 30 June 2012.
22. Sarioglu A, Tanyel FC, Büyükpamukçu N, Hiçsönmez A. Colonic volvulus: a rare presentation of Hirschprung's disease. *J Pediatr Surg* 1997; **32**:117-8.
23. Atamanalp SS, Yildirgan MI, Basoglu M, Kantarci M, Yilmaz I. Sigmoid colon volvulus in children: review of 19 cases. *Pediatr Surg Int* 2004; **20**:492-5.
24. Lau KC, Miller BJ, Schache DJ, Cohen JR. A study of large-bowel volvulus in Urban Australia. *Can J Surg* 2006; **49**:203-7.
25. Bhatnagar BN, Sharma CL, Gautam A, Reddy DC. The changing survival scenario in gangrenous sigmoid volvulus: a four-decade study. *J Indian Med Assoc* 2006; **104**:292, 294-7.