

Original Article

A Randomized Controlled Trial on Primary Resection and Anastomosis of Acute Non-Complicated Sigmoid Volvulus

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M Reazul Alam^{1*}, Koushik Sikder², Md Ferdoush Rayhan³, Mohammad Imrul Hasan Chowdhury⁴, Ashrafur Rahman⁵, Md Tarek Hasan⁶

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*Corresponding Author

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ABSTRACT

Introduction: A volvulus is a twisting or axial rotation of a portion of bowel about its mesentery. In case of Sigmoid Colon volvulus, the term refers to Sigmoid volvulus. Worldwide, colonic volvulus is the third leading cause of large bowel obstruction. Proper diagnosis with appropriate operative approach such as one stage operation (primary resection and anastomosis) two stage operation (Resection and double barrel colostomy, Hartmann's procedure, primary resection and anastomosis with defunctioning loop ileostomy) is lifesaving. **Objective:** The aim of this study was to determine the effectiveness of primary resection and anastomosis of acute non complicated sigmoid volvulus in terms of outcome. **Methods and materials:** It was a randomized control trial study between May 2015 and October 2015. 50 patients were selected by random sampling and were divided into two groups. Group I (experimental group=25) received one stage operation and group II (control group=25) received two stage operation. **Results:** Two stage operation patients faced 24% stomal complication

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1. Junior Consultant (Surgery), OSD (DG Health) Deputed to National Institute Cancer Research and Hospital, Dhaka, Bangladesh
 2. Junior Consultant (Surgery), OSD (DG Health) Deputed to Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh, Dhaka, Bangladesh
 3. Junior Consultant (Surgery), 250 Bed General Hospital, Manikgonj Sadar, Manikgonj, Bangladesh
 4. Registrar, Sheikh Russel National Gastroenterology Institute & Hospital, Dhaka, Bangladesh
 5. Assistant Professor (Surgery), National Institute Cancer Research and Hospital, Dhaka, Bangladesh
 6. Junior Consultant (Surgery), OSD (DGHS) Deputed to BSMMU, Shahbagh, Dhaka, Bangladesh
- (bleeding, prolapsed, retraction, parastomal hernia etc.) while one stage operation (primary resection and anastomosis) patients did not experience any late complication ($p=0.009$).

Conclusion: *By overall assessment one stage operation was better than two stage operation in context of post-operative wound infection and systemic complications. At two stage operation patient had an inevitable readmission to the surgical indoor for reversal of the stoma which may add post-operative complications and other operative hazards. Hence it can be said that patients with acute non complicated sigmoid volvulus may undergo one stage operation.*

Keywords: *Sigmoid volvulus, Primary resection, Anastomosis, Conservative management, Randomized controlled trial, Recurrence, Morbidity, Mortality, Quality of life.*

INTRODUCTION

A volvulus is a twisting or axial rotation of a portion of bowel about its mesentery. The term “volvulus” originates from the Latin *volvere*, or “to twist.” In the case of colonic volvulus, the term refers to the twisting of colon [1]. When completed it forms a closed loop of obstruction with resultant ischemia secondary to vascular occlusion [2]. The usual sites are the sigmoid colon, cecum, descending colon and transverse colon though the lesion occurs most often in large redundant loops of sigmoid colon [3]. Worldwide, colonic volvulus is the third leading cause of large bowel obstruction. Populations most affected reside in the “Volvulus Belt” of Africa, the Middle East, India, and Russia [4-5]. In these regions, sigmoid volvulus accounts for 20–50% of all bowel obstructions [5-7]. In the United States, colonic volvulus accounts for 10 to 15% of all colon obstructions ranking behind cancer and diverticulitis, and between 1 to 20% of all intestinal obstructions [8]. Sigmoid volvulus is commonly occurred in middle aged or elderly males. In 2011 a case control study was done by Adesola Akinkuotu et al. in Lilongwe, Malawi where they found the mean age of the patients with sigmoid volvulus was 57.4 years [9]. Overall ill, debilitated and malnourished with prior history of colonic dysmotility,

chronic constipation, and laxative dependency is more sufferer [10]. The main predisposing factor to sigmoid volvulus is a long, redundant sigmoid colon with an elongated mesentery, which is prone to twisting on itself. There are many other etiological factors like chronic constipation, loaded faecal mass, high fiber diet and systemic and neurological disease. Studies have shown that the condition is associated with a high fiber diet, megacolon, former abdominal surgery, high altitude, chronic constipation and neurological diseases [11-16]. Generalized abdominal tenderness and peritonitis point towards the presence of an underlying gangrenous segment in sigmoid volvulus. Americo Assan and Ivan Slivanov while doing their research on 82 patients in the year between 1996 and 1999 found that abdominal distension was present in 100% cases followed by constipation and nausea and vomiting [17-18]. So diagnosis is made from the history of abdominal pain, distension, constipation and large bowel obstruction, plain film abdomen and barium enema. On plain film abdomen “omega” or “coffee bean” sign can be seen, while barium enema shows pathognomonic “bird’s beak” or “ace of spades” deformity due to spiral narrowing of the upper end of the lower segment [19-20].

METHODS & MATERIALS

A randomized controlled trial was conducted, and 50 patients were selected through random sampling. The participants were divided into two groups: one undergoing primary resection and anastomosis and the other receiving conservative management. Data collection, analysis, interpretation, and presentation were carried out over a six-month period.

This study design in which people were allocated at random (by chance alone) to receive one of the two clinical interventions - one stage and two stage operation. The patients received two stage procedure was in the control group and who received one stage procedure was in the experimental group. 25 cases were treated by one stage procedure (primary resection and anastomosis) – it was experimental group and rest of the 25 cases were in control group and treated by two stage procedure – (Hartmann’s procedure / resection and anastomosis with de-functioning loop ileostomy / resection and double barrel colostomy). As the study was conducted, the only difference between the control and the experimental groups in a randomized control trial was the outcome variables which being studied.

Inclusion criteria encompassed patients preoperatively diagnosed with sigmoid volvulus, ensuring a targeted study population. Per-operative findings were crucial in confirming the absence of complications, such as ischemic changes, gangrene, or perforation, ensuring that only cases with a viable segment of the sigmoid colon were included. Exclusion

criteria were carefully defined to exclude patients treated conservatively, those presenting with nonviable or gangrenous gut, perforated gut associated with sigmoid volvulus, and those incidentally diagnosed during laparotomy. Additionally, patients not providing informed consent were excluded, emphasizing the importance of ethical considerations in the study.

Data collection methods involved a comprehensive approach, combining patient-reported information through questionnaires, thorough physical examinations, and assessments during both the per-operative and post-operative phases. This multi-faceted approach aimed to capture a holistic understanding of the patient's condition, treatment, and outcomes, ensuring a robust dataset for analysis and interpretation.

Data was incorporated in Microsoft excel and analysis was done by software package SPSS. χ^2 test and t-test were done whenever and wherever applicable. For the safety of validity informed written consent was taken from all study subjects. Ethical clearance was taken from appropriate authority.

RESULTS

The mean age of the patients observed in **Table I** shows that one stage operation was done was 49.4 ± 19.08 years while patients to whom two stage operation was done their mean age was 50.96 ± 13.96 years. There was no significant age difference between the two groups ($p=0.69$).

Table I: Age of the patients (Mean \pm SD)

Type of operation		t, p
One stage	Two stage	
49.4 ± 19.08	50.96 ± 13.96	0.41, 0.69

While looking at the sex of the patients in **Figure 1** it was found that 82% of the patients were male and the rest were

female. When the two groups were looked separately no major difference was found in case of sex of the patients.

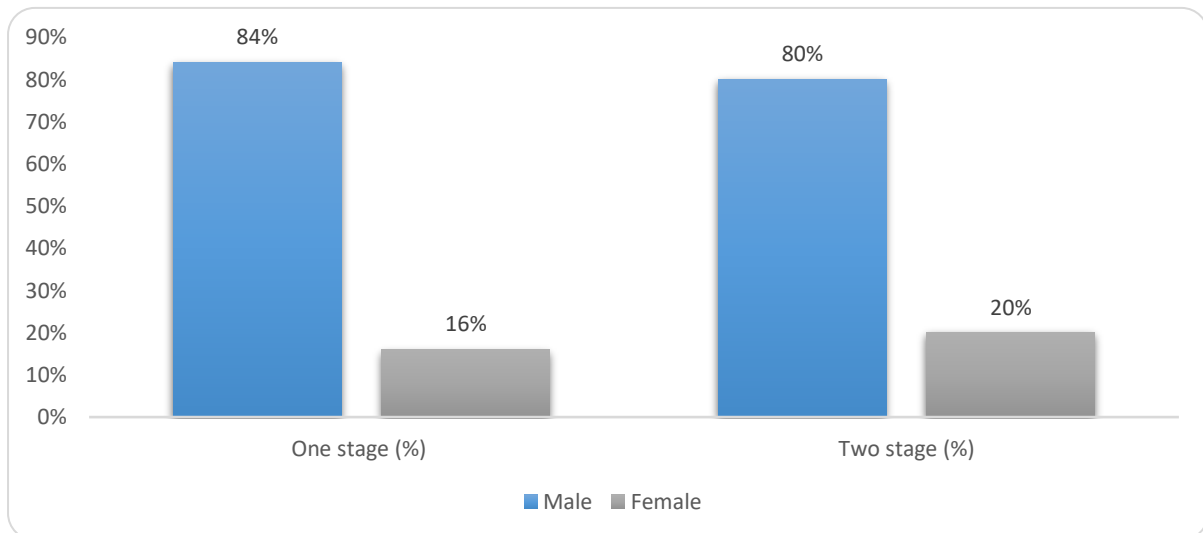


Figure 1: Gender of the patients

Previous medical history was taken and are shown in **Table II**. Patients in whom one stage operation was done 36% of them had no medical abnormality, 28% had diabetes mellitus, 20% had hypertension

and 16% had other diseases. In case of second stage operation these percentages were 16%, 20%, 28% and 36% respectively.

Table II: Medical history of the patients (Co-morbidity)

Medical history	Type of operation		Total (%)
	One stage (%)	Two stage (%)	
No abnormality	9 (36.0)	4 (16.0)	13 (26.0)
Diabetes mellitus	7 (28.0)	5 (20.0)	12 (24.0)
Hypertension	5 (20.0)	7 (28.0)	12 (24.0)
Others	4 (16.0)	9 (36.0)	13 (26.0)

Total	25	25	50
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While looking at surgical history which is shown in **Table III**, 84% patients had never undergone any kind of surgery before this and 16% patients had history of different types of surgery. Among the patients who underwent one stage operation, two patients had history of open

cholecystectomy and one patient had history of appendicectomy and in two stage operation, two patients had history of open cholecystectomy, two patients had history of appendicectomy and one patient had history of nephrolithotomy.

Table III: Surgical history of the patients

Surgical history (Abdominal surgery)	Type of operation		Total (%)
	One stage (%)	Two stage (%)	
No	22 (88.0)	20 (80.0)	42 (84.0)
Yes	3 (12.0)	5 (20.0)	8 (16.0)
Total	25	25	50

Pre-operative vital signs are shown in **Table IV**. Mean pulse, systolic BP, diastolic BP, temperature and respiratory rate of the patients in experimental group were 98.32 ± 11.90 bpm, 95.20 ± 18.74 mm hg, 60.20 ± 9.63 mm hg, $100.40 \pm$

1.19°F and 16 ± 2 respectively. In control group patients' mean pulse, systolic BP, diastolic BP, temperature and respiratory rate were 97.84 ± 9.50 bpm, 96.00 ± 14.43 mm hg, 58.80 ± 12.01 mm hg, $100.12 \pm 1.05^\circ\text{F}$ and 18 ± 2 respectively.

Table IV: Pre-operative vital signs of the patients

Vital sign	One stage	Two stage	t, p
Pulse	98.32 ± 11.90	97.84 ± 9.50	0.87, 0.48
Systolic BP	95.20 ± 18.74	96.00 ± 14.43	0.17, 0.88
Diastolic BP	60.20 ± 9.63	58.80 ± 12.01	0.46, 0.65
Temperature	100.40 ± 1.19	100.12 ± 1.05	0.88, 0.38
Respiration	16 ± 2	18 ± 2	0.65, 0.68

Per operative findings of intestine are shown in **Table V**. Narrow attachment with long pelvic mesocolon was found in 36% cases whether looking total or

separately. In one stage operation and two stage operation long pelvic mesocolon and redundant colon were found in 24%, 20% and 20%, 24% cases respectively.

Table V: Aetiological findings of volvulus per-operatively

Per operative finding	Type of operation		Total (%)	χ^2 , p
	One stage (%)	Two stage (%)		
Band in antimesenteric border	1 (4.0)	1 (4.0)	2 (4.0)	0.18,

Long pelvic mesocolon	6 (24.0)	5 (20.0)	11 (22.0)	0.99
Narrow attachment with long pelvic mesocolon	9 (36.0)	9 (36.0)	18 (36.0)	
Overloaded sigmoid colon	4 (16.0)	4 (16.0)	8 (16.0)	
Redundant colon	5 (20.0)	6 (24.0)	11 (22.0)	
Total	25	25	50	

$t = 4.6, p < 0.001$

Figure 2 shows the late complication of one stage and two stage operation. No complication occurred in one stage operation while in 76% cases of two stage operation had no complication but stomal

complications (bleeding, prolapsed, retraction, parastomal hernia etc.) were found in 24% cases and this difference is found significant ($p = 0.009$).

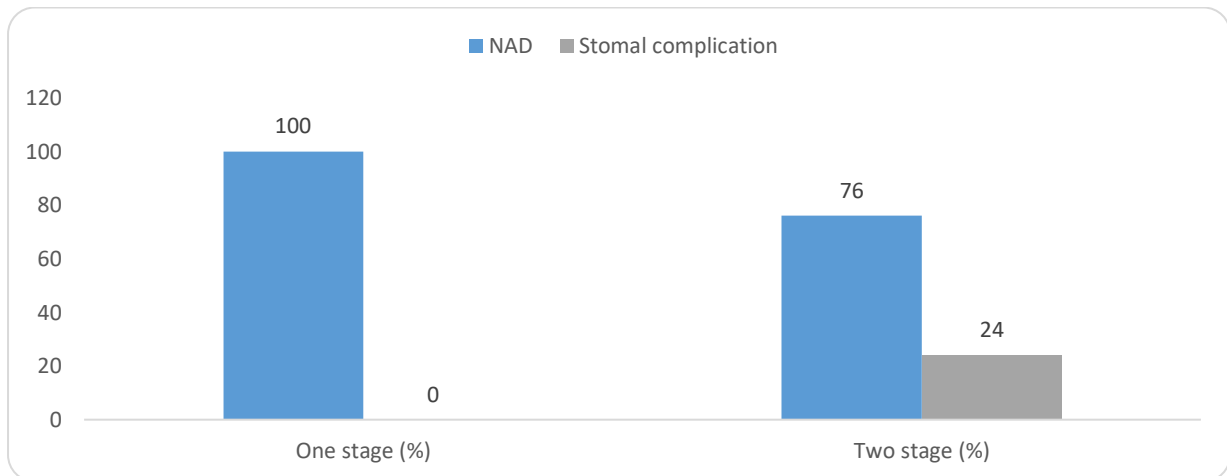


Figure 2: Late complication of the patients

Table VI shows that the percentage of improvement in one stage type of operation is 64%, 24% cases were deteriorated and 12% cases were static. In case of two stage type of operation 52%

cases were improved, 32% cases were static and 16% cases were deteriorated. The association between the type of operation and the outcome was not found statistically significant.

Table VI: Outcome of operation

Outcome of operation: Patient's condition	Type of operation		Total (%)	χ^2, p
	One stage (%)	Two stage (%)		
Improved	16 (64.0)	13 (52.0)	29 (58.0)	2.98, 0.23
Static	3 (12.0)	8 (32.0)	11 (22.0)	
Deteriorated	6 (24.0)	4 (16.0)	10 (20.0)	
Total	25	25	50	

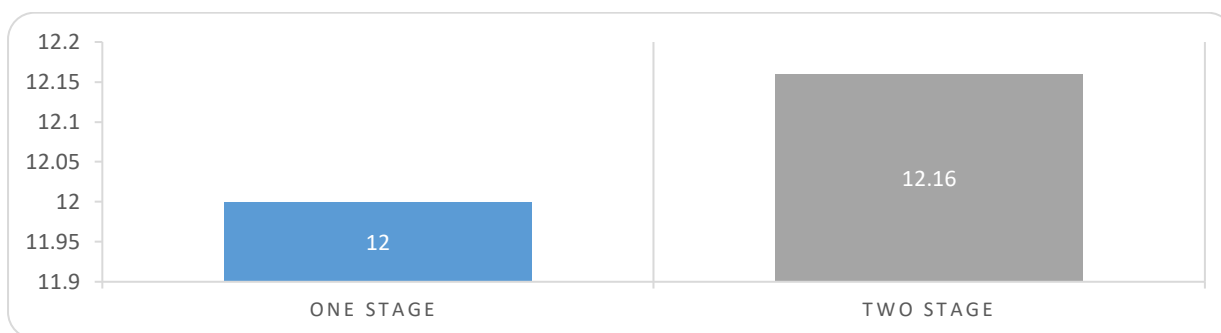


Figure 3: Post-operative hospital stay.

Figure 3 shows the post operative hospital stay. There was no significant difference found between one stage and two stage operation in case of hospital stay. ($t= 4.61$, $p<0.001$)

DISCUSSION

This randomized control trial study was conducted in Sher-E-Bangla Medical College Hospital, Barisal to compare between one stage and two stage operation for sigmoid volvulus and to find out the best one. Data was collected regarding age, sex, pre-operative, per-operative and post-operative procedure related information.

Our study found that the middle aged people came with problem of volvulus for which they had to undergo operative procedure. Study from Daniel G *et al.* also found the age to be within 40 to 60; the lowest and highest age for volvulus was found in Assan's study ^[12, 21]. The finding is similar to this study finding.

Most of the patients in our study were males. Jonathan C Samuel *et al.* also found more males suffered by sigmoid volvulus than females in their study ^[3]. The finding is similar to our study. Study by Kevin C.N. *et al.* found women were more

affected than men ^[4]. This was due to a longer period of study done by them.

In this study, 26% had no medical abnormality, 24% had diabetes mellitus, 24% had hypertension and 26% had other diseases. There was no significant association seen with any disease and sigmoid volvulus. So we cannot say any specific disease is responsible for sigmoid volvulus. BS Oshiro *et al.* said it is frequently associated with neuropsychiatric diseases, diabetes mellitus and Chagas disease ^[17]. The opinion of him differs from ours may be due to our small sample size, limited investigations or lack of health consciousness of the people of our country.

As for the surgical history we found that 84% patient had no previous surgical history and this was the first surgery for them. While the rest had surgery before but that was not associated with similar type of surgery. Kevin C.N. *et al.* said there is a high early recurrence rate of sigmoid volvulus about 43% for those treated by endoscopic decompression alone during a mean period of 32 days ^[4]. Similar results have been reported by Isbister with a recurrence rate of 29% in that study²². Daniel *et al.* in his study

suggested that recurrence is common and occurs in up to 90% of patients after endoscopic distortion [1,23]. In our study we did not do further study to check any recurrence. So in this topic further research should be done.

During operation findings of the intestine were recorded. We find narrow attachment with long pelvic mesocolon the most about 36%. Long pelvic mesocolon (22%) and redundant colon (22%) were also found. Adesola Akinkuotu *et al.* found in their study that supports the assertion that sigmoid volvulus is due to a long and wide mesosigmoid that rotates on a constant mesosigmoid root width [7]. Their findings are quite similar with our findings.

We also looked over the late complication of one stage and two stage surgery. In one stage operation no complication occurred while in two stage operation (24% cases) stomal complication developed.

Outcome of operation as a whole was recorded and we found 58% cases was improved, 22% cases remain static and 20% cases were deteriorated. While comparison between the two procedures we found improvement was more in one stage operation (64%) than two stage (52%) as well as deteriorated cases were also more in one stage operation (24%) than the two stage procedure (16%). While in two stage operation static patients (32%) were more than one stage operation (12%).

CONCLUSION

One stage operation is proven to yield better outcome than two stage operation in context of post-operative infection and systemic complications. At two stage operation patient has an inevitable readmission to the surgical indoor for reversal of the stoma which may add post-

operative complications, total hospital stays duration and other operative hazards. Our randomized controlled trial provides valuable insights into the management of acute non-complicated sigmoid volvulus. While primary resection and anastomosis appear to reduce the risk of recurrence, further research is needed to validate these findings and explore long-term outcomes and cost-effectiveness.

LIMITATION OF THE STUDY

The present study had the following limitations.

1. It was not necessarily a pure randomized trial because all the criteria of randomized control trial were not fulfilled.
2. In this study complicated sigmoid volvulus like volvulus with nonviable, ischemic, gangrenous, perforated gut were excluded, so the overall management protocol of sigmoid volvulus could not be assessed.
3. The sample size was small hence ideal randomization could not be done in this study.
4. The study was done only in one clinical setting and multicenter comparison was not done to assess the similarity and differences across centers.

RECOMMENDATION

Two stage surgery is relatively a safer option for trainee surgeons. But this type of study may be conducted in a more specialized center with larger sample size and longer study period so that a better management protocol can be made.

FUNDING

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee

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