



DOLICHOMESOCOLIC PATTERN OF SIGMOID COLON MESENTERY AND DIETARY FIBRES PREDISPOSE TO SIGMOID VOLVULUS: AN OBSERVATION OF PATIENTS FROM THE “VOLVULUS BELT” OF RURAL BENGAL

General Surgery

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ABSTRACT

Background: Sigmoid volvulus is a common cause of intestinal obstruction among the rural people of West Bengal, classifying this area as a volvulus belt. This is a surgical emergency and an attempt to relieve the obstruction must be done promptly. The management may range from a Resection and Anastomosis of the Sigmoid Colon, Hartmann's procedure to Sigmoidopexy and Flatus tube decompression in patient's not fit for surgery.

Methods: Our study is a prospective observation study that aims to establish a relationship between the dietary habits and the dimensions of the sigmoid colon mesentery, which eventually predispose to intestinal obstruction.

Results: An intraoperative measurement of the Sigmoid colon and its mesentery showed, a mean length of the distended sigmoid colon to be 76.5821 ± 2.6150 (cms). The mean vertical length of the mesentery from the base to the antimesenteric border was 34.7641 ± 0.2397 (cms). The mean Horizontal length of the Sigmoid Mesocolon in the middle 14.6294 ± 1.3749 (cms). The mean Horizontal length of the Sigmoid Mesocolon at the Base 6.3357 ± 0.0956 (cms). Dietary habits of soaked puffed rice, unpeeled vegetables add to the stool bulk eventually leading to constipation and Volvulus in males with Dolichomesocolic pattern of Sigmoid colon mesentery.

KEYWORDS

sigmoid, colon, volvulus, mesentery, dolichomesentery

INTRODUCTION

Sigmoid volvulus occurs when the sigmoid colon wraps around its own mesentery, causing a closed loop obstruction. It is dreadful, eventually leading to gangrene and perforative peritonitis and the morbidity ranges from 2 – 50 %. [1-2] This condition has been identified in various countries such as Africa, the Middle East, India and Russia called the as a Volvulus Belt. [1,4] Currently, it is the third most common cause of intestinal obstruction worldwide. Various socio-demographic studies confirm that patients suffering from this disease generally consume large quantities of fibres in their diet. It has also been linked to age, [1,9] wherein a redundancy of the sigmoid colon mesentery may pose to such cases. [5] People with habitual constipation, high altitude dwellers, with an increase in colonic pressure [6] Although 4 % cases are congenital, and are mostly infrequent. [7] Most authors would conclude that the over distended sigmoid colon may twist on an axis on its mesentery, that is long and has a narrow base. Post-operative adhesions may also aid in such an obstruction. [1,8-10] Only a handful of anatomists have deducted ratios from measurements in the length of the sigmoid colon and its mesentery, [11-14] but none have clearly stated the consequences of such a mesentery for volvulus to occur. Our study predominantly aims to validate the observations quoted by the anatomists in a clinical scenario with Sigmoid Volvulus, in our rural teaching hospital in West Bengal India. The treatment of this condition would be preferably surgical.

MATERIAL AND METHODS

Our study is a Prospective Observational Study in a cohort of patients presenting with Sigmoid Volvulus. The study was undertaken in the Department of General Surgery from October 2017 to September 2019, after having obtained an Institutional Ethical Clearance.

Data collection:

Patients presenting at our emergency services with Abdominal Distension, and constipation and vomiting suspected to be intestinal obstruction were screened by a routine Abdominal X ray after resuscitation. An erect screening abdominal film, was considered positive when the sigmoid colon was massively dilated with air-fluid levels and its apex pointing towards the Right upper quadrant.

Questionnaires were distributed amongst the resident surgeons working in our hospital and the socio-demographic, risk factors and management details were documented, in these patients. The operating surgeon was requested to take various measurements of the mesentery.

MEASUREMENT OF THE MESENTERY:

The dimension of the sigmoid colon and mesentery was measured

using silk sutures and were then noted down after measuring the threads with a measuring tape in centimeters. (Figure 1,2) Measurements were taken in accordance to Bhatnagar et al's study from IMS-BHU in 2004. [11]

Figure 1: Intraoperative measurement of the Sigmoid Mesocolon with a Silk suture

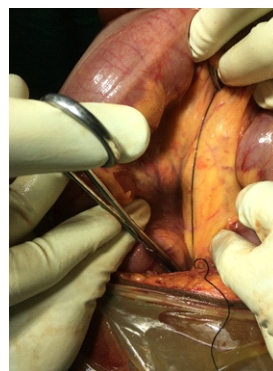
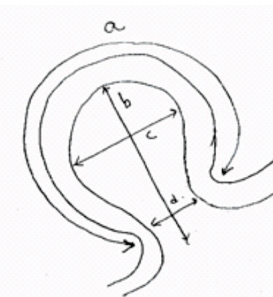


Figure 2: Diagrammatic Representation of the Various Measurements of the Sigmoid Colon and its Mesentery



- Length of Sigmoid Colon at Antimesenteric border (cms)
- Vertical Length from the base to the antimesenteric border (cms)
- Horizontal length of the Sigmoid Mesocolon in the middle (cms)
- Horizontal length of the Sigmoid Mesocolon at the Base (cms)

Tabulation and Analysis:

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS (version 24.0; SPSS Inc.,

Chicago, IL, USA) and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. The difference in mean involved comparison of the observed values in our study to a reference or standard mean lengths of the sigmoid colon mesentery from the data published by Atamanalp S.S et al. [12] Once a *t* value is determined, a *p*-value can be found using a table of values from Student's *t*-distribution. *p*-value ≤ 0.05 was considered for statistically significant.

RESULTS

60 male patients were evaluated in this study, with a mean age of 48.6025 ± 6.6271 . They belonged to a poor socioeconomic status and were mostly manual laborers by profession. The majority presented with abdominal distension followed by constipation or obstipation. Their diet was mostly vegetarian with a lot of fibers. They state to have consumed large quantities of rice in a single instance and vegetables without peeling them, on an average 2 square meals a day. (Table 1). Evaluation for Anaesthetic risk and complications were summarized in Table 2.

Table 1: Socio- Demographic profile of patients with Sigmoid Volvulus

Characteristics	Results (n=60)
Age Mean $\pm$ SD	48.6025 ± 6.6271
Sex Male	60
Occupation Manual Labourer Others	46 14
Socio Economic Status Poor Average High	56 4 0
Dietary Habits Mean Number of Meals Fibres in diet	2.0984 ± 0.0057 YES
Symptoms during Presentation Constipation Obstipation Abdominal Bloating and Distension Severe distension with Respiratory compromise	34 18 60 3

Table 2: Pre-operative risk factors of patients with Sigmoid Volvulus

Characteristics	Results (n=60)
Co-morbidities COPD Smoker CKD CAD None	8 44 2 1 5
High risk features during presentation (Morbidity) Shock Peritonism	12 3
ASA GRADE ASA I ASA II ASA III ASA IV ASA V	7 38 13 2 0

Intraoperative exploratory Laparotomy revealed that 30 % patients had a Sigmoid Volvulus without gangrene and 70 % with Gangrene, 32 patients had intraoperative adhesions. (Figure 3)

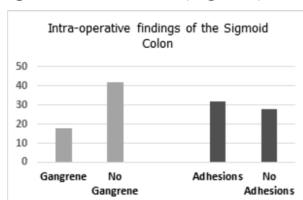


Figure 3: Intraoperative findings of patients with Sigmoid Volvulus

The mean length of the distended sigmoid colon was 76.5821 ± 2.6150 (cms). The mean vertical length of the mesentery from the base to the antimesenteric border was 34.7641 ± 0.2397 (cms). The mean Horizontal length of the Sigmoid Mesocolon in the middle 14.6294 ± 1.3749 (cms). The mean Horizontal length of the Sigmoid Mesocolon at the Base 6.3357 ± 0.0956 (cms). These results were compared to the Standard Reference Means by Atamanalp et al [12] from Turkey using the Unpaired T test. (Table 3)

Thus it was clear that all our evaluated 60 male patients had a massively distended sigmoid colon, with a broad mesentery at the antimesenteric border and a narrow base. This would be termed as a dolichomesocolic pattern according to Bhatnagar et al. [11]

30 % of our patients underwent a Hartmann's procedure and the majority 55 % underwent a Primary Resection and Anastomosis. Patient's too frail to undergo surgery were managed with a flatus tube decompression (3%). (Figure 4)

Figure 4 : Emergency management of admitted cases with Sigmoid Volvulus

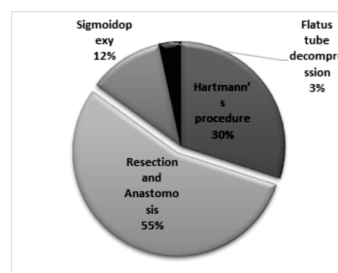


Table 3: Intraoperative measurement of length of Sigmoid Mesentery

Length of Mesentery	Mean $\pm$ SD	T – test value (one tailed) *	95 % C I for Mean	P value	Significant (Y/N)
a.Length of Sigmoid Colon at Antimesenteric border (cms)	76.5821 ± 2.6150	7.649	75.9066 to 77.2576	P < 0.0001	Yes
b.Vertical Length from the base to the antimesenteric border (cms)	34.7641 ± 0.2397	50.544	34.7022 to 34.8260	P < 0.0001	Yes
c.Horizontal length of the Sigmoid Mesocolon in the middle (cms)	14.6294 ± 1.3749	2.088	14.2742 to 14.9846	P = 0.0411	Yes
d.Horizontal length of the Sigmoid Mesocolon at the Base (cms)	6.3357 ± 0.0956	126.747	6.3110 to 6.3604	P < 0.0001	Yes

* In Comparison to a standard mean (a= 70.6 cms, b= 33.2 cms, c=15.6 cms, d=6.9 cms) [12]

DISCUSSION

Sigmoid colon volvulus is very common in our tertiary rural medical Centre. As previously mentioned India being a developing nation, most people predisposed to this disease would be males, with a poor socioeconomic status. Poverty compels them to engage in strenuous work and they hardly get two square meals in a day. Our subset of patients, consume large quantities of water soaked puffed rice or vegetable without skinning them add a lot of fiber to the diet. These fibers are not naturally digested well because of the lack of cellulose disintegrating enzymes thus forming the bulk of stool, leading to constipation. Fibers also add to increased water absorption from the Colon.

Once the lumen is compromised the long standing distended colon may twist on its axis running down vertically through the sigmoid

colon mesentery. [1] Bhatnagar et al described 7 patterns of sigmoid colon mesenteries. Males mostly have a Dolichomesentric pattern, that is longer and has a narrow base. Along with this they also have a narrow pelvis that predispose to Sigmoid volvulus. Our observed set of patient's also had similar findings. A mesenteric index if measured, it would be < 100 (mesentery / mesentery width $\times 100$) Females have a brachymesocolic pattern, where the mesentery is broader than its length. [11] Studies from Turkey and Peru has evaluated that during volvulus, there is an increase in the sigmoid colon length, thus elongating the mesentery, however the mean width of the sigmoid mesocolon does not increase very much. [12-14]

Although these indices are available to anatomists and cadaveric studies, a better understanding of the mesentery may allow a surgeon to predict the course of the disease and predict the risk factors in susceptible individuals with recurrent constipation, based on imaging findings on CT scans. [11-14]

Thus this over distended colon, when twisted around its mesentery, would eventually cut off the blood supply leading to gangrene and perforation. Although our patient's present late, gangrene is comparatively less. These patients are managed with a Hartmann's procedure and later planned for a Takedown with a Colo-anal or Colo Rectal anastomosis in an elective sitting. Those who present early are amenable to Primary Resection and Anastomosis, however the chances of Anastomotic leak may rise if the abdomen is contaminated, or in an elderly patient. Some authors prefer a defunctioning Ileostomy with the Primary Anastomosis. [1, 15-17]

Only a handful of patients underwent Sigmoidopexy [16] and those not amenable to surgery and presented with shock and could not be resuscitated had to be managed with a flatus tube. Sigmoidoscopy is not available in our rural teaching institute.

Newer thoughts on Percutaneous colostomy may be an option for patients with a massively distended Sigmoid colon, have also been evaluated in literature. [15,17]

CONCLUSION

A clear knowledge of the risk factors involved in Sigmoid volvulus may help Emergency surgeons identify and treat the patient. Most of them would be able to identify possible risk factors involved with volvulus and plan the management accordingly. Anatomical and Surgical correlation is of utmost important for understanding the pathology related to Volvulus. Future studies may throw light on these issues.

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