ORIGINAL ARTICLE

Factors precipitating volvulus formation in sigmoid volvulus

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ABSTRACT

BACKGROUND: Sigmoid volvulus (SV), the wrapping of the sigmoid colon around itself, is a rare intestinal obstruction form worldwide. For this reason, the physiopathology of SV, particularly the precipitating factors, are not clearly identified. The aim of this study is to evaluate the precipitating factors in SV.

METHODS: The clinical records of consecutive 416 patients with SV were reviewed prospectively from January 1986 to July 2020. As a control, the records of consecutive 100 patients with non-volvulus intestinal obstruction were reviewed prospectively in the past 24 months. The premorbid symptoms including acute diarrhea, sudden and excessive body motions, overeating after a prolonged starvation, coughing spell, and labor was evaluated.

RESULTS: Among the premorbid symptoms, 1–5-day interval of diarrhea (42 patients, 10.1%, $p<0.05$), harvesting activation (35 patients, 8.4%, $p<0.05$), and overeating after Ramadan fasting (31 patients, 7.5%, $p<0.05$) were found to be statistically significant precipitating factors in SV.

CONCLUSION: Although there are few studies about the precipitating factors of SV in the literature, increased bowel motility, excessive body motions, and overeating following a prolonged starvation look like the precipitating factors in the development of SV.

Keywords: Precipitating factor; sigmoid colon; volvulus.

INTRODUCTION

Sigmoid volvulus (SV) is the wrapping of the sigmoid colon around its mesentery, causing an intestinal obstruction. Although SV is endemic in some areas including Africa, Asia, South America, Eastern and Northern Europa, and the Middle East, it is rare worldwide.[1] Most likely, for this reason, the physiopathology of SV, particularly the effects of the physiological and pathological bowel movements in addition to the factors precipitating volvulus formation, are not clearly identified. There are few studies on this subject in the literature.[2] Our practice area, Turkey, is also an endemic region for SV.[3,4] In light of our comprehensive data, including 54 years of history and 1,030 cases of experience, which is the largest single-center SV series in the world,[2,3] we wanted to discuss the possible mechanisms of the twisting and untwisting of the sigmoid colon and the precipitating factors in SV.

MATERIALS AND METHODS

Among total 1,030 patients with SV, the clinical records of consecutive 416 patients were reviewed prospectively from January 1986 to July 2020. As a control, the records of consecutive 100 patients with non-volvulus intestinal obstruction, including adhesive ileus, strangulated hernias (inguinal, incisional, umbilical, internal), Crohn's disease, and Meckel's diverticulitis, were reviewed prospectively in the past 24 months. Prior to the main clinical features of intestinal obstruction including abdominal pain, distention, and obstipation, the premorbid symptoms including acute diarrhea, sudden and excessive body motions, overeating after a prolonged starvation, coughing spell, and labor were noted. This study was approved by the institutional review board (Ethical Committee of Atatürk University Faculty of Medicine, 2017/16).

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Statistical analyses were performed using SPSS v22.0. Student's t-test was used for homogenous distributions, while Chi-square test was used to compare qualitative variables. Statistical significance was set at $p<0.05$.

RESULTS

In our prospectively evaluated 416-case SV series, among the premorbid symptoms, 1–5-day interval of diarrhea (42 patients, 10.1% vs. 3 patients, 3.0%, prospectively, t=5.100, $p<0.05$), harvesting activation (35 patients, 8.4% vs. 2 patients, 2.0%, prospectively, t=4.982, $p<0.05$), and overeating after Ramadan fasting (31 patients, 7.5% vs. 2 patients, 2.0%, prospectively, t=4.003, $p<0.05$) were statistically higher in SV group than that of controls. Among other evaluated factors, coughing demonstrated no statistically significant difference, while there was no patient with premorbid labor (Table 1).

DISCUSSION

The main anatomical predisposing factor in the development of SV is dolichosigmoid, which is known as the elongation of the sigmoid colon in addition to its having a narrow-based mesentery.[5,6] Even if dolichosigmoid happens, SV does not develop in all people-at-risk and all the time by reason of a precipitator effect is required to a volvulus formation. The sigmoid colon twists physiologically from time to time. Torsions less than 180° generally do not show any clinical findings, and they untwist spontaneously.[1,7] Only excessive torsions cause an acute clinical picture, and spontaneous untwisting is expected in only approximately 2% of cases.[8] If torsion exceeds 180°, luminal obstruction occurs, and when it passes over 360°, circulation is blocked.[5]

In our clinical experience and theoretical opinion, two different and opposite movements of the sigmoid colon may affect the development of SV. The first movement is twisting, which requires a physiological or pathological impulse to begin. However, the second movement, untwisting, requires a much more propulsive force in addition to its need for a wider intraabdominal volume. Although the physiological peristalsis of the sigmoid colon also helps with the untwisting, it remains impossible due to the weariness of the bowel. In addition, the twisted loop enlarges due to the gas generation, and the entrapment of the distended sigmoid colon within the abdominal wall and pelvic outlet precludes the untwisting, resulting in SV. This idea may account for the relatively high incidence of SV in males and pregnant women. In both clinical entities, while intraabdominal volume does not prevent the twisting, a smaller pelvic inlet with a strong abdominal wall in males and an enlarged uterus in pregnant women does not allow for spontaneous untwisting.[1,5,7,8]

In our experience, the most common precipitator factor that induces twisting is physiological bowel peristalsis. Despite a careful questioning, the absence of any premorbid symptoms in most of our patients supports this idea. On the other hand, bowel hypermotility, as in acute diarrhea, may be the most important factor among the pathological precipitating factors; Hence, in our series, of prospectively evaluated 416 patients, 42 (10.1%) had a 1–5-day interval of diarrhea. Unfortunately, most likely, due to the retrospective nature of most reports in the literature, there is no adequate information about the relationship between premorbid diarrhea and SV.[2] Although some authors presented the diarrhea as one of the main symptoms of SV in 8–30% of patients in past, its reasonable physiopathologic explanation is not easy.[8–10] According to us, although the diarrhea may be a main symptom in subacute or chronic recurrent SV, it is not a common feature in acute complete form. In SV, the distal line of the rotated sigmoid segment is usually located within 20–30 cm from the anal verge.[11] In our experiment, following the development of acute complete obstruction, a little residual fecal matter in the distal part of the volvulus may mimic the diarrhea by manifesting itself as defecation once or a few times. For this reason, we take the high rate of the diarrhea as a main symptom of SV reported in retrospective studies with a grain of salt. Regarding the premorbid diarrhea, apart from a case with secretory diarrhea reported by Almog et al.[12] and two cases with acute or secretory diarrhea presented by Koc et al.,[13] most of the authors gave no information about the premorbid diarrhea in large-series reports in recent years.[14–19] It is clear that superficial questionings may miss out the premorbid diarrhea in retrospective analyses. For this reason, in-depth investigations

Table 1. The premorbid symptoms and the statistical analyses

Parameter	Sigmoid volvulus group	Control group	Statistical analysis and comment
Age (mean year)	61.2	48.1	Student's t test, t: 6.182, $p<0.001$
Gender (male/female)	339/77 (4.4)	72/28 (2.6%)	Chi Square test, x^2: 4.480, $p<0.05$
Acute diarrhea	42/416 (10.1%)	3/100 (3.0%)	Chi Square test, x^2: 5.100, $p<0.05$
Harvesting	35/416 (8.4%)	2/100 (2.0%)	Chi Square test, x^2: 4.982, $p<0.05$
Overeating following fasting	31/416 (7.5%)	2/100 (2.0%)	Chi Square test, x^2: 4.003, $p<0.05$
Coughing spell	9/416 (2.2%)	2/100 (2.0%)	Chi Square test, x^2: 0.010, $p>0.05$
Labor	0/77 (0.0%)	0/28 (0.0%)	–

are needed in new prospective studies to evaluate the actual role of the premorbid diarrhea in SV.

Sudden and excessive body motions, as in reaping, may be another important factor precipitating SV. In our series, 35 patients, (8.4%) had a harvesting activation. Although the relationship between the body motions and SV is not clearly identified in the literature,[2] some excessive body movements, including harvesting,[20] first coitus,[21] and delivery[22] are reported to be effective in the development of ileosigmoid knotting, which is a complex form of SV.[23] In our opinion, harvesting and similar cases may initiate SV by forcing the sigmoid colon to rotate around itself.

Another important precipitating factor, overeating after a prolonged starvation, as in Ramadan fasting, was determined in our 31 patients (7.5%). Raveenthiran et al.,[5] Saidi,[24] and De[25] supported the relationship between the Ramadan fasting and SV. A habit of ingestion of a high-bulk food and fluid after a prolonged interval of fasting may cause a rapid transit of the bowel content into small intestines, which may force the sigmoid colon to rotate and initiates SV.

Conclusion

In conclusion, despite the presence of statistically significant differences between the age and gender ratios of SV and control groups arising from the epidemiological characteristics of SV and other non-volvulus intestinal obstructions, increased bowel motility, excessive body motions, and overeating following a prolonged starvation look like the precipitating factors of SV. It is clear that new prospective clinical studies looking at the premorbid symptoms of SV may help to clarify the precipitating factors in SV.

Ethics Committee Approval: This study was approved by the Atatürk University Faculty of Medicine Ethics Committee (Date: 23.02.2017, Decision No: B.30.2.ATA.0.01.00/16).

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Conflict of Interest: None declared.

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ORİJİNAL ÇALIŞMA - *ÖZ*

Sigmoid volvulusta volvulus formasyonunu tetikleyen faktörler

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AMAÇ: Sigmoid volvulus (SV), sigmoid kolonun kendi etrafında dönmesi, dünya genelinde nadir bir bağırsak tıkanıklığı şeklidir. Bu nedenle SV'nin fizyopatolojisi, özellikle tetikleyici faktörler yeterince tanımlanmamıştır. Bu çalışmanın amacı, SV'de tetikleyici faktörleri araştırmaktır.
GEREÇ VE YÖNTEM: Ocak 1986 ile Temmuz 2020 arasında, SV'li ardışık 416 hastanın kayıtları, ileriye yönelik olarak irdelendi. Kontrol olarak, son 24 ayda volvulus dışı bağırsak tıkanıklığı olan ardışık 100 hastanın kayıtları ileriye yönelik olarak irdelendi. Premorbid semptomlar olarak akut ishal, ani ve aşırı beden hareketleri, uzun açlık süresini takiben aşırı yemek yeme, öksürük nöbeti ve doğum değerlendirildi.
BULGULAR: Premorbid semptomlardan bir ile beş gün süren ishal, (42 hasta, %10,1, $p<0.05$), ekin biçme (35 hasta, %8.4, $p<0.05$) ve oruç sonrası aşırı yemek yeme (31 hasta, %7.5, $p<0.05$), SV'de istatistksel olarak belirgin tetikleyici faktörler olarak değerlendirildi.
TARTIŞMA: Her ne kadar SV'de tetikleyici faktörler hakkında literatürde oldukça az çalışma varsa da, artmış bağırsak hareketliliği, aşırı beden hareketleri ve uzamış açlık süresini takiben aşırı yemek yeme, SV'nin ortaya çıkmasında tetikleyici faktörler olarak görünmektedir.
Anahtar sözcükler: Sigmoid kolon; tetikleyici faktör; volvulus.

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