

Classification of Sigmoid Volvulus

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Aim: The aim of this study was to establish a classification that will aid in the surgical treatment and prognosis of sigmoid volvulus (SV).

Materials and Methods: The records of 420 patients with SV who were treated surgically during a 41.5-year period were reviewed retrospectively. The preoperative and operative criteria that were significantly correlated with mortality were determined.

Results: Of 420 patients, 68 (16.2%) died. Age over 60 years ($P < 0.001$), associated disease ($P < 0.001$), presence of shock ($P < 0.001$), and presence of sigmoid colon gangrene ($P < 0.001$) were significantly correlated with mortality. A classification was made using these criteria.

Conclusions: Recommended treatment options and potential mortality rates were determined for each class in the new classification based on the evaluation of the present series, our clinical experience, and literature findings. This classification may be helpful in determination of the surgical treatment and prognosis of SV.

Key Words: Sigmoid volvulus, classification, treatment, prognosis

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Sigmoid Volvulusun Sınıflaması

Amaç: Bu çalışmanın amacı, sigmoid volvulusun (SV) cerrahi tedavisi ve prognozunda yardımcı olacak bir sınıflama oluşturmaktır.

Yöntem ve Gereç: 41.5 yıllık dönemde cerrahi tedavi yapılan 420 SV'li hastanın kayıtları retrospektif olarak incelendi. Mortalite ile anlamlı ilişkisi olan ameliyat öncesi ve ameliyat kriterleri belirlendi.

Bulgular: 420 hastanın 68'i öldü (% 16.2). 60 yaşın üzerinde olma ($P < 0.001$), eş hastalık ($P < 0.001$), şok varlığı ($P < 0.001$) ve sigmoid kolonda gangren varlığı ($P < 0.001$) ile mortalite arasında anlamlı ilişki vardı. Bu kriterler kullanılarak bir sınıflama yapıldı.

Sonuç: Mevcut seri, klinik deneyimimiz ve literatür bulguları değerlendirilerek oluşturulan yeni sınıflamada her bir sınıf için önerilen tedavi seçenekleri ve olası mortalite oranları belirlendi. Bu sınıflama, SV'nin cerrahi tedavisi ve prognozunu belirlemede yararlı olabilir.

Anahtar Sözcükler: Sigmoid volvulus, sınıflama, tedavi, prognoz

Introduction

Sigmoid volvulus (SV), the wrapping of the sigmoid colon around its mesentery, is an unusual but important intestinal obstruction form (1-3). Although the disease was described by von Rokitsky in 1836 (4), there have been controversies as to its treatment, and its prognosis is still grave (1-8). On the other hand, interestingly, to date no classification has been made for SV (2, 3, 5 -12).

The aim of this study was to propose a new classification for use in determination of the surgical treatment and prognosis of SV in light of the 41.5-year experience of our clinic.

Materials and Methods

The clinical records of 420 patients with SV treated in the Department of General Surgery, School of Medicine, Atatürk University between June 1966 and January 2008 were reviewed retrospectively. The diagnosis of SV was based on clinical, radiological,

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endoscopic, and sometimes operative findings. The patients were treated surgically. Age, gender, previous volvulus or surgery history, associated diseases, symptom period, presence of shock, direction of the volvulus, volvulus degree, and presence of bowel gangrene were compared to determine any correlation with mortality. Chi-square test was used in the statistical analysis. The criteria that were significantly correlated with mortality were used in establishing a classification.

Results

In this series, 68 (16.2%) of 420 patients with SV died. Age over 60 years ($P < 0.001$), associated disease (chronic obstructive pulmonary disease, cardiac failure, coronary disease, diabetes mellitus, hemiplegia, renal insufficiency, Parkinsonism) ($P < 0.001$), and the

presence of shock ($P < 0.001$) and sigmoid colon gangrene ($P < 0.001$) were significantly correlated with mortality. However, no correlation was determined between the mortality rate and the other criteria evaluated ($P > 0.05$). The findings and the results of the statistical analysis are presented in Table 1.

Using the risk factors and criteria that were significantly correlated with mortality, a classification of patients was developed as follows (Table 2): Class 1, patients with no risk factor; Class 2, those with no shock or gangrene but other risk factors such as age over 60 years or associated disease; Class 3, those with shock; Class 4, those with sigmoid colon gangrene; and Class 5, those with shock and sigmoid colon gangrene. Depending on the presence of other risk factors, Classes 2, 3 and 4 were further divided into subgroups of a and b.

Table 1. The findings of the patients and the results of statistical analysis.

Criteria	Patient	Death	Statistical analysis
Under 60 years of age	213	17 (8.0%)	$P < 0.001$
60 years of age and older	207	51 (24.6%)	Highly significant
Female	73	11 (15.1%)	$P > 0.05$
Male	347	57 (16.4%)	Non-significant
No history of torsion	302	51 (16.9%)	$P > 0.05$
History of torsion	118	17 (14.4%)	Non-significant
No history of abdominal surgery	350	55 (15.7%)	$P > 0.05$
History of abdominal surgery	70	13 (18.6%)	Non-significant
No associated disease	315	24 (7.6%)	$P < 0.001$
Presence of associated disease	105	44 (41.9%)	Highly significant
Symptom period < 24 hrs	93	10 (10.8%)	$P > 0.05$
Symptom period \geq 24 hrs	327	58 (17.7%)	Non-significant
No shock	318	14 (4.4%)	$P < 0.001$
Presence of shock	102	54 (52.9%)	Highly significant
Volvulus in clockwise direction	154	24 (15.6%)	$P > 0.05$
Volvulus in counterclockwise direction	171	29 (17.0%)	Non-significant
Unknown	95	15 (15.8%)	
Volvulus degree 180°	68	11 (16.2%)	$P > 0.05$
Volvulus degree 270°	29	5 (17.2%)	Non-significant
Volvulus degree \geq 360°	228	38 (16.7%)	
Unknown	95	14 (14.7%)	
No bowel gangrene	155	10 (6.5%)	$P < 0.001$
Presence of bowel gangrene	265	58 (21.9%)	Highly significant

Table 2. New classification for SV.

C (Class)
 A (Age): A0: under 60 years, A1: 60 years and older
 D (Associated disease): D0: absent, D1: present
 S (Shock): S0: absent, S1: present
 G (Bowel gangrene): G0: absent, G1: present

C1	C2		C3		C4		C5
	C2a	C2b	C3a	C3b	C4a	C4b	
A0	One of	Two of	At most 1	Two of	At most 1	Two of	
D0	A,D 1	A,D 1	of A,D 1	A,D 1	of A,D 1	A,D 1	
S0	S0	S0	S1	S1	S0	S0	S1
G0	G0	G0	G0	G0	G1	G1	G1

Discussion

Sigmoid volvulus is the wrapping of the sigmoid colon around its mesentery (1-3). It has an interesting dispersion in the world (1-3, 5-8). Turkey (1-3,7), and particularly Eastern Anatolia (1-3), are endemic regions for SV.

Sigmoid volvulus, described by von Rokitansky in 1836 (4), remains an important intestinal obstruction form today (1-8). Some preoperative data (age, gender, volvulus or surgery history, associated diseases, symptom period, shock), operative findings (volvulus direction, volvulus degree, bowel gangrene, bowel perforation), and postoperative evidence (morbidity, mortality, recurrence) have been evaluated in SV. However, to date, no classification has been made to contribute to the determination of treatment and estimation of the prognosis of this disease (2,3,5-12).

In SV, advanced age affects the mortality rate (2,4,8-11). In a 393-surgically treated case report by our clinic, 72.6% of the patients who died were over 60 years of age (2). In Arnold and Nance’s series (8), two-thirds of the deaths occurred in patients who were over 70 years of age. On the other hand, String and DeCosse (9) have reported that the average age of the deceased was 10 years greater than that of the entire group. Similarly, Bhatnagar et al. (11) reported age over 60 as a risk factor. Age over 60 years and mortality were also correlated in our study.

Serious associated diseases of the cardiovascular, respiratory, renal, and other systems have always been a prevalent feature in all SV series and are one of the main reasons for the high mortality in SV (2, 4, 7, 9). In our previous series, we reported that 64.5% of the deceased had serious associated medical problems (2). Similarly, in the report of Oncu et al. (7), it was observed that additional diseases played an important role in mortality. Similar results were also found in the present study.

In SV, the presence of toxic or septic shock is an important factor that affects mortality (2, 3, 5, 7, 11). In our previous series, 82.3% of the deceased patients were in shock state (2). Similarly, Bhatnagar et al. (11) showed that the presence of shock on admission was a cause of higher mortality. The present study also showed a correlation between the presence of shock and mortality.

As predicted by many authors, one of the major causes of the high mortality rate in SV is the presence of bowel gangrene (2, 3, 5-7, 12-14). In our previous study, we reported that 83.9% of the deceased patients had gangrene in the sigmoid colon (2). In another study on a 299-patient series, the mortality rate was 80% in patients with gangrenous colons compared to 10.6% in patients with viable colons (13). Similarly, in a 106-case series, Kuzu et al. (14) found that the presence of gangrenous bowel increased the mortality rate from 6.6% to 11%. This factor and mortality were also correlated in the present study.

Table 3. Surgical treatment methods suggested in light of the new classification and estimated mortality rates.

Class		Treatment	Mortality
C1		Detorsion, or sigmoidomesopexy, or sigmoidomesoplasty (Resection with primary anastomosis)	0-1%
C2	C2a C2b	Detorsion, or sigmoidomesopexy, or sigmoidomesoplasty Detorsion (Sigmoidomesopexy, or sigmoidomesoplasty)	1-5%
C3	C3a C3b	Detorsion Detorsion	5-20%
C4	C4a C4b	Resection with primary anastomosis* Resection with primary anastomosis* (Resection with stoma)	10-30%
C5		Resection with stoma (Resection with primary anastomosis*)	15-80%

* In the presence of bowel ischemia, edema, perforation, and difference in bowel diameter: resection with stoma

() Second choice

The four criteria mentioned above that were significantly correlated with mortality were considered risk factors, and our classification was based on these criteria. Another important factor, the relationship between the symptom period and mortality, has been discussed in the literature as well (2, 9, 11, 15). Although Bhatnagar et al. (11) showed that delay in presentation does not indicate a higher incidence of shock and a higher mortality, a symptom period longer than 24 hours and mortality were correlated in the reports of many authors (2, 9, 15). In our series, the mortality rate of the patients with symptom period longer than 24 hours was higher than that of the others, but the difference was not statistically significant. We believe a prolonged symptom period may affect mortality by predisposing the patient to shock and sometimes to gangrene, but they are not always directly correlated. As a result, the symptom period was not evaluated as an independent factor in this classification.

There are some controversies regarding the surgical treatment of SV (2-4,6-8,10-18). In gangrenous cases, resection and primary anastomosis are preferred if the patient is stable and a tension-free anastomosis is possible (2, 3, 6, 7, 10, 14-18); this procedure has been used with a 33.3% mortality rate by Bak and Boley (10) and with a 16.6% mortality rate by Dulger et al. (15). On the

other hand, colostomy with resection is life-saving in unstable patients (2, 3, 6-8, 15-18). Similarly, in patients with perforation and fecal peritonitis; with ischemia in proximal and distal intestines; and in those with edema and difference in the diameter, colostomy is preferred despite its high morbidity (2). Different kinds of colostomy have been used with a 25% mortality rate by Pahlman et al. (6) and Oncu et al. (7), with a 66.7% mortality rate by Arnold and Nance (8), and with a 37.5% mortality rate by Dulger et al. (15). In nongangrenous cases, detorsion may be performed as a sole procedure in high-risk patients, and this procedure has been used with 5.4 to 50% mortality rates by different surgeons (2,3,6,8). Because of the high recurrence rates of the nondefinitive procedures, resection with primary anastomosis, or a volvulus-decreasing technique such as mesosigmoidopexy or mesosigmoidoplasty may be applied in stable patients (2, 3, 6, 8, 19-21). All of these procedures can be performed successfully through laparoscopy (20, 21). Table 3 presents the recommended treatment options that were determined based on the evaluation of 420 patients, our clinical experience, and a literature review (2, 3, 6-8, 9-19).

Sigmoid volvulus has a grave prognosis. The mortality rates range between 11% and 80% in gangrenous, and

between 6% and 24% in nongangrenous cases (2, 3, 6-8). The estimated mortality rates are also given in Table 3 for different classes of SV, based on the literature findings (2, 3, 6-8), the findings obtained in the evaluation of our series, and our experience spanning 41.5 years.

In conclusion, we believe that our classification method for SV as proposed in this study may be useful in planning the surgical treatment and in the estimation of prognosis of SV. However, further studies based on this classification method will be helpful in substantiation of the suggestions in this article.

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