

Elective Treatment of Detorsioned Sigmoid Volvulus

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Aim: Recurrence after a successful nonoperative detorsion or a nondefinitive operation is an important problem in the treatment of sigmoid volvulus (SV). This study was designed to review the outcomes of elective treatment of successfully detorsioned SV and to discuss the treatment algorithm.

Materials and Methods: The records of 873 patients were reviewed retrospectively.

Results: Nonoperative treatment was applied in 614 patients. The success, mortality, complication and recurrence rates were 77.5%, 0.8%, 2.8%, and 4%, respectively. Emergency surgical treatment was performed in 416 patients with 15.6% mortality, 36.5% complication, 0.7% early recurrence and 6.5% late recurrence rates. Elective surgical treatment was suggested for 436 patients, 94 of whom (21.6%) received the treatment. Open sigmoid resection and anastomosis was applied in 86 patients, while laparoscopy-assisted sigmoid resection and anastomosis was applied in 8 patients. The mortality, complication and recurrence rates were 0%, 12.8% and 0%, respectively.

Conclusions: The principal strategy in the treatment of SV must be early nonoperative detorsion followed by an elective surgery in selected and well-prepared patients.

Key Words: Sigmoid volvulus, detorsion, elective treatment

Detorsiyone Edilmiş Sigmoid Volvulusun Elektif Tedavisi

Amaç: Başarılı bir ameliyatsız detorsiyon veya kalıcı olmayan bir ameliyat sonrası nüks, sigmoid volvulus (SV) tedavisinde büyük sorun oluşturur. Bu çalışma, başarıyla detorsiyone edilmiş SV'un elektif tedavisinin sonuçlarını gözden geçirmek ve tedavi algoritmasını tartışmak amacıyla yapıldı.

Yöntem ve Gereç: SV'lu 873 hastanın kayıtları retrospektif olarak incelendi.

Bulgular: Ameliyat dışı tedavi 614 hastaya uygulandı. Başarı, ölüm, komplikasyon ve erken nüks oranları sırasıyla % 77.5, 0.8, 2.8 ve 4 olarak bulundu. Acil cerrahi tedavi uygulanan 416 hastada, % 15.6 ölüm, % 36.5 komplikasyon, % 0.7 erken nüks ve % 6.5 oranında geç nüks oranları saptandı. Elektif cerrahi tedavi 436 hastaya önerildi, olguların 94'ü (% 21.6) tedaviyi kabul etti. Hastaların 86'sına açık sigmoid rezeksiyon ve anastomoz uygulanırken, 8 hastaya laparoskopik yardımcı sigmoid rezeksiyon ve anastomoz uygulandı. Ölüm oranı % 0, komplikasyon oranı % 12.8 ve nüks oranı % 0 olarak bulundu.

Sonuç: SV tedavisinde temel strateji, erken dönemde ameliyat dışı detorsiyonu takiben seçilmiş ve iyi hazırlanmış hastada elektif cerrahi tedavi olmalıdır.

Anahtar Sözcükler: Sigmoid volvulus, detorsiyon, elektif tedavi

Introduction

Sigmoid volvulus (SV), which was described by von Rokitansky in 1836 (1), has apparently increased in frequency during the past several decades (2), and today it remains an important intestinal obstruction modality (3,4). In emergency care of SV, nonoperative procedures that aim to detorsion the sigmoid colon are advocated as the primary treatment. These measures include barium or saline enemas, sigmoidoscopy or colonoscopy, and rectal tube insertion. Nevertheless, for patients in whom bowel gangrene or peritonitis is present, or for whom nonoperative treatment is unsuccessful, an emergency surgery is needed, which includes nondefinitive procedures such as detorsion, mesosigmoidopexy or mesosigmoidoplasty, or definitive procedures such as resection with primary anastomosis or stoma creation (1-5). Although the emergency treatment of SV is well-discussed and defined, there are some controversies in the elective treatment of successfully detorsioned SV cases.

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The purpose of this study was to review the clinical experience covering 41 years and 873 urgently treated SV cases, which included 94 electively operated cases after a successful detorsion. This series is one of the largest in Turkey and in the world and we aim to discuss the algorithm for the elective treatment of SV.

Materials and Methods

The records of 873 patients who underwent emergency nonoperative or operative treatment for SV, 94 of whom underwent elective operative treatment for detorsioned SV, in the Department of General Surgery, School of Medicine, Atatürk University, over a 41-year period between June 1966 and July 2007 were reviewed retrospectively. The age, gender, previous or associated problems, nonoperative or operative procedures, mortality, morbidity, hospital stay, and recurrence rates were studied.

The diagnosis was based on clinical, radiological (abdominal X-rays, computerized tomography-CT, or magnetic resonance imaging-MRI), endoscopic, and sometimes operative findings.

In the emergency treatment of SV, nonoperative procedures, which include barium enema and rigid or flexible sigmoidoscopy, were performed as the initial treatment, subsequent to resuscitation. The patients who consented to elective surgery were operated on in the same hospitalization period, while the others were discharged and were called in for elective surgery 3 weeks later. Emergency surgery was needed for the patients with unsuccessful nonoperative detorsion, with early recurrence, with bowel gangrene revealed in sigmoidoscopy, with muscular defense or rebound tenderness found in physical examination, with rectal melanotic stool in rectal digital examination, or with preoperative diagnostic dilemma. As a surgical procedure, detorsion, mesosigmoidopexy, or resection with primary anastomosis was generally performed on the patients with viable bowel, while resection was performed and primary anastomosis with or without on-table lavage via tube cecostomy or colostomy was added in gangrenous patients.

For the elective treatment of successfully detorsioned SV, open sigmoid resection and anastomosis or laparoscopy-assisted sigmoid resection and anastomosis was applied.

Results

Emergency treatment was performed in 873 SV patients during the 41-year period. The characteristics of the patients are summarized in Table 1. The mean age of the patients was 58.6 years (range: 10 weeks to 98 years), and 724 of the patients (82.9%) were male. Of the 873 patients, 507 (58.1%) resided in rural areas. The records of 772 patients provided information on anamnesis, and among 199 (25.8%) patients with a history of volvulus episode, 154 had undergone nonoperative detorsion(s) (128 patients, once; 14 patients, twice; 9 patients, three times; 1 patient, four times, 1 patient, five times; and 1 patient, six times), and 45 patients had undergone operative detorsion(s) (44 patients, once; and 1 patient, twice). Thus, the probability of a recurrent SV episode in any SV patient was 31.6% (244 episodes/ 772 patients). Of the 772 patients, 198 (25.6%) had comorbid conditions (chronic obstructive pulmonary disease, hypertension, cardiac or coronary artery disease, diabetes mellitus, hemiplegia, renal insufficiency and Parkinsonism). The mean symptom duration before hospital admission was 39.2 hours (range: 12 hours to 7 days) and 102 (13.2%) of the 772 evaluated patients were in shock state.

Therapeutic procedures are listed in Figure 1. Nonoperative treatment was performed in 614 patients (barium enema in 13 patients, rigid sigmoidoscopy in 351, and flexible sigmoidoscopy in 250). The overall success rate was 77.5%. In this group, 5 patients (0.8% in entire group, 1.1% in successfully detorsioned group) died. The cause of death was toxic shock in 3 patients and peritonitis in 2 patients. In 17 patients (2.8%), complications occurred (renal insufficiency in 13, myocardial infarction in 2, and peritonitis in 2). The mean hospital stay was 36.4 hours (range: 24 to 96 hours) in this group of patients. Early recurrence (during the hospitalization period) was seen in 19 of the 476 successfully detorsioned patients (4%).

Emergency surgical treatment was needed for 416 patients (detorsion in 47 patients, mesosigmoidopexy in 56, exteriorization in 4 patients for later sigmoidectomy, sigmoidectomy and Hartmann's procedure in 157, sigmoidectomy and Mikulicz's procedure in 14, sigmoidectomy and primary anastomosis in 61, tube cecostomy, sigmoidectomy and primary anastomosis with on-table lavage in 76, and laparotomy in 1 patient). In this group, 65 patients (15.6%) died, 1 of them during

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

Criterion	EMNT	EMOT	ELOT	Statistical analysis
Number	614	416	94	-
Age (Year)	58.3	57.7	56.7	ANOVA test EMNT-EMOT: P > 0.05, non-significant EMOT-ELOT: P > 0.05, non-significant EMNT-ELOT: P > 0.05, non-significant
Gender (Male/Female)	5.3	4.8	5.7	Chi-square test EMNT-EMOT: P > 0.05, non-significant EMOT-ELOT: P > 0.05, non-significant EMNT-ELOT: P > 0.05, non-significant
Rural/City (Ratio)	1.4	1.5	0.6	Chi-square test EMNT-EMOT: P > 0.05, non-significant EMOT-ELOT: P < 0.01, significant EMNT-ELOT: P < 0.01, significant
History of detorsion (%)	24.9	27.1	100.0	Chi-square test EMNT-EMOT: P > 0.05, non-significant
Associated disease (%)	26.0	24.6	17.0	Chi-square test EMNT-EMOT: P > 0.05, non-significant EMOT-ELOT: P < 0.05, significant EMNT-ELOT: P < 0.05, significant
Mortality (%)	0.8	15.6	0.0	Chi-square test EMNT-EMOT: P < 0.01, significant EMOT-ELOT: P < 0.01, significant EMNT-ELOT: P > 0.05, non-significant
Complication (%)	2.8	36.5	12.8	Chi-square test EMNT-EMOT: P < 0.01, significant EMOT-ELOT: P < 0.01, significant EMNT-ELOT: P < 0.01, significant
Hospital stay (Day)	1.5	13.0	9.6	Student's t test EMNT-EMOT: P < 0.01, significant EMOT-ELOT: P < 0.01, significant EMNT-ELOT: P < 0.01, significant
Early recurrence (%)	4.0	0.7	0.0	Chi-square test EMNT-EMOT: P < 0.01, significant EMOT-ELOT: P > 0.05, non-significant EMNT-ELOT: P < 0.01, significant
Late recurrence (%)	?	6.5	0.0	Chi-square test EMOT-ELOT: P < 0.05, significant

EMNT: Emergent nonoperative treatment. EMOT: Emergent operative treatment. ELOT: Elective operative treatment.

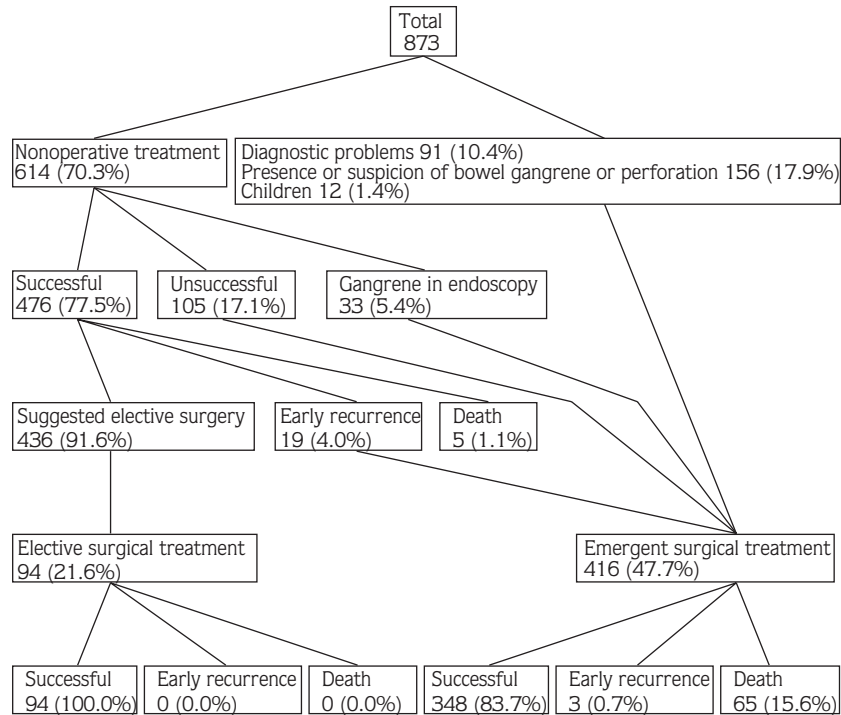


Figure 1. Schematic diagram of the therapeutic procedures used in our patients with sigmoid volvulus.

laparotomy. The cause of death was toxic shock in 36 patients, pulmonary embolism in 7, anastomotic leakage and peritonitis in 6 patients, pulmonary insufficiency in 5, myocardial infarction in 4, cardiac insufficiency in 4, colostomy perforation and peritonitis in 2, and disseminated intravascular coagulation in 1 patient. In this group of emergency surgical treatment, 152 patients (36.5%) had complications (wound infection in 85, atelectasis in 30, paralytic ileus in 14, myocardial infarction in 13, pulmonary embolism in 11, evisceration in 10, anastomotic leakage in 8, adhesive ileus in 7, renal insufficiency in 3, colostomy perforation in 3, internal hernia in 1, and disseminated intravascular coagulation in 1 patient). The mean hospital stay was 13 days (range: 5-65 days) in surviving patients. Early recurrence was seen in 3 patients (0.7%) (all in detorsion group), while late recurrence occurred in 14 of the 215 followed-up patients (6.5%), and all of them were in the nondefinitive procedures groups (37.5% in detorsion group, 17.2% in mesosigmoidopexy group, total 26.4% in nondefinitive surgery group) in a mean 18.1-year follow-up period. When emergency nonoperative and operative treatment methods were evaluated concurrently, the mortality rate

was found as 8%, while the complication rate was 19.4%.

Elective surgical treatment was suggested in 436 patients and performed in 94 (21.6%) of those who accepted the treatment. Of these 94 patients, 64 were operated within the same hospitalization period (4-7 days after the first intervention, mean interval: 5.5 days), while the other 30 patients were discharged and were operated when they were received for elective operation (3-10 weeks later, mean interval: 28 days). Open sigmoid resection and anastomosis was applied in 86 patients (91.5%), and laparoscopy-assisted sigmoid resection and anastomosis was applied in 8 patients (8.5%). In this group, no mortality was seen. In 12 of the patients (12.8%), complications were seen (wound infection in 8, evisceration in 2, paralytic ileus in 2, anastomotic leakage in 1, pulmonary embolism in 1, adhesive ileus in 1 patient). The mean hospital stay was 9.6 days (range: 5-26 days). No early or late recurrence was seen in the 59 followed-up patients in a mean 24.5-year follow-up period. The characteristics of these patients and the results of the treatment are provided in Table 2.

Table 2. The characteristics of the patients with elective surgical treatment and the related results.

Criterion	SRA	LASRA	Total
Period	1966-2007	2003-2007	1966-2007
Number	86	8	94
Age (Mean)	56.8	58.5	56.7
Gender (Male/Female)	73/13	7/1	80/14
Associated disease (%)	16.3	25.0	17.0
Mortality (%)	0.0	0.0	0.0
Complication (%)	14.0	0.0	12.8
Hospital stay (Day)	9.9	6.4	9.6
Early recurrence (%)	0.0	0.0	0.0
Follow-up (Year)	27.9	2.5	24.5
Late recurrence (%)	0.0	0.0	0.0

SRA: Sigmoid resection and anastomosis. LASRA: Laparoscopy-assisted sigmoid resection and anastomosis.

Discussion

Recurrence after nonoperative detorsion methods or nondefinitive operative procedures is an important problem in the treatment of SV (1-5). The previous studies report that 3%-44% of SV cases have a history of recurrent volvulus episodes with nonoperative or operative detorsion (2,3,5,6), as was determined in 25.8% of our patients. These high percentages show that SV recurrence tends to occur in patients without definitive surgery.

In SV, spontaneous reduction can be expected in about 2% of the cases (6); thus, the patients need an effective resuscitation and emergency treatment (1-5). In emergency treatment, nonoperative procedures, such as barium or saline enemas, sigmoidoscopy or colonoscopy, and rectal tube insertion are recommended as a primary treatment. Failure of the nonoperative treatment, as well as the presence of bowel gangrene or peritonitis, must be followed by an emergency surgery (1-5). Nonoperative procedures have been found unsuccessful in 16.5% of the cases by Arnold and Nance (5), in 9% of the cases by Bak and Boley (7), in 56% of the cases by Öncü et al. (8), and

in 37%-48% of the cases by Brothers et al. (9), while it was 17.1% in the present series. In 17.9% of the cases, peritonitis findings were detected during clinical examination, and in 5.4% to 23% of the cases, bowel gangrene was reported after endoscopic examination (3,5,7,8). Emergency surgery was necessary for 89% of the patients in the study of Brothers et al. (9) and 46.7% in the study of Pahlman et al. (10), while it was needed in 47.7% of our patients. The mortality rates of the nonoperative treatment procedures have been reported to be 9% by Arnold and Nance (5), 2.6% by Bak and Boley (7), and 8% by Brothers et al. (9), compared to 0.8%-1.1% in the present study. The complication rate has been reported to be 3% and the early recurrence rate during the same hospitalization period as 3.3%-16.8% (3,8). These results show that the prognosis of nonoperative treatment of SV is unpredictable and morbidity-mortality rates may not be negligible.

In the emergency surgical treatment of SV, nondefinitive procedures such as detorsion, mesosigmoidopexy or mesosigmoidoplasty, or definitive procedures such as resection and primary anastomosis or

stoma may be used (1-5). However, the mortality rate of the emergency surgical procedures is high, reported as 44% by Arnold and Nance (5), 36% by Bak and Boley (7), 20% by Öncü et al. (8), 21% by Pahlman et al. (10), 13%-37.5% by Dulger et al. (11), 6.6% by Kuzu et al. (12), 42% by Bhatnagar et al. (13), and 15.6% in the present series. Late hospital admission or diagnosis, advanced age, the presence of associated diseases, toxic shock and bowel gangrene are the factors that increase the mortality rate (1-5,7-13). The complication rate is between 6% and 55%, and wound infection, intraabdominal abscess, evisceration, anastomotic leakage, and stomal complications are the main problems (3,7,13). The mean hospital stay of these patients has been reported to be 13.1 days (3). The high recurrence rate associated with nondefinitive surgery has also been well documented in SV. The early recurrence rate has been reported to be 0.8%, while the late recurrence rate is between 6.7% and 18.2% (3,6). In the present study, the late recurrence rates were 37.5% in the detorsion group, 17.2% in the mesosigmoidopexy group, and 0% in the resection with early or late anastomosis groups in a mean 18.1-year follow-up period. Based on these results, we can conclude that the prognosis of emergency surgical treatment of SV is grave and the recurrence rates of the nondefinitive procedures are high.

Each SV episode carries a certain degree of mortality risk before, during, or after the treatment no matter which of the above-mentioned methods is used. The overall mortality rate for each SV episode has been found as 28% by Arnold and Nance (5), 12% by Bak and Boley (7), 16.8% by Öncü et al. (8), and 15% by Pahlman et al. (10), while this rate was 8.0% in the present study. Therefore, deciding on the elective surgical treatment for successfully detorsioned SV cases is the critical point that determines the prognosis of this disease.

Although there are some reports that compare the results of the elective resection after successful nonoperative detorsion with the results of management by observation, the information provided by prospective and controlled studies is limited. In 1973, Arnold and Nance (5) described the patients who were treated successfully by nonoperative or nondefinitive treatments as the 'at-risk group' for a recurrent SV episode. In their

series, during a follow-up period averaging 2 years, 55% of these at-risk patients had at least one recurrent episode, and 9% died as a result of recurrence, with an elective operative mortality of 15%. As a result of their study, elective resection after the first episode was recommended only for good-risk / young patients, while elective resection after recurrent episode was recommended for all but poor-risk patients. Although this report is important, we believe that the mortality rate was too high and the follow-up period too short to evaluate the prognosis of SV. Bak and Boley (7) noted two possible causes of the high mortality rate of Arnold and Nance's series (5) as the indigent nature of their patient population and the possibility that residents rather than attending physicians may have been the senior surgeons. In their own series, Bak and Boley (7) in 1986 reported a mortality rate of 5.6% for elective resection and of 21% for the observed patients. Therefore, they reported that maximal survival is achieved by early elective resection after a successful nonoperative reduction, and that age alone is not an adequate reason for adopting a nonoperative approach. In 1989, Pahlman et al. (10) proposed the semi-elective sigmoid resection after decompression and bowel cleansing as the appropriate treatment method because of the high risk of emergency resections. Similarly, to reduce the recurrence and mortality rates, elective definitive surgical treatment was suggested by Dulger et al. (11) in 2000 and Lau et al. (14) in 2006. In our opinion, the evaluation of the anesthesia risk of SV patients is the critical point in decision-making for elective surgical treatment. According to the classification of the American Society of Anesthesiologists (ASA), the perioperative mortality rate has been found below 4.3% in Class 1 to 3 patients, while this rate has been reported to be over 7.8% in Class 4 and 5 patients (15). Although the absence of information on the patients who did not consent to elective surgery and on those who were managed by observation is a limitation of our study, considering the results and literature information, we can suggest that elective sigmoid resection and anastomosis is recommended in all patients except those with ASA Class 4 and 5, whose operative mortality rates have been higher than the rates of those who have undergone elective surgery of SV.

Whether elective surgical treatment of SV should be resectional or nonresectional is still a controversial issue. However, the most advisable choice is to perform sigmoid resection and anastomosis because of the high recurrence rates of nondefinitive surgical techniques such as mesosigmoidopexy, sigmoidopexy, mesosigmoidoplasty, or extraperitonealization (5,7,8,10,12). Sigmoid resection and anastomosis may be performed by open (5,7,11,16), laparoscopy-assisted (17), or preferably laparoscopic techniques (18-20). In the elective treatment, the mortality rate has been reported to be 5.6% by Bak and Boley (7) and 7.6% by Dulger et al. (11), while it was 0% in the present study. On the other hand, postoperative complication rate has been reported as 26% by Bak and Boley (7), while it was found as 12.8% in the present series. Furthermore, in the present study, the mean hospitalization period was shorter in elective treatment. The mean recurrence rate after sigmoid resection has been reported as 0% - 20%, and the major causes of the recurrence have been reported as the presence of concomitant megacolon and inadequate or limited resection (21,22).

In the elective treatment of SV, the timing of the operation after a successful nonoperative detorsion has been a subject of debate, and the literature does not present sufficient information to determine the optimal period. While some authors, like Öncü et al. (8), suggest a delay of 3-4 weeks before elective sigmoid resection, some others, like Pahlman et al. (10), Lau et al. (14), and

Tsai et al. (20) advocate that a 2-3 day interval is adequate for bowel preparation and optimization of the patient's condition. In our experience, 4-5 days is an appropriate waiting and preparation period for elective surgery.

In the treatment of SV, the reluctance of the patients to accept the elective operation is another important problem. The acceptance rate of the elective surgery has been reported as 50% by Bak and Boley (7) and 8% by Öncü et al. (8), while this rate was 21.6% in our series. Interestingly, we determined that urban residents were more willing to consent to elective operation than those residing in rural areas. Patients with no accompanying disease were also more willing to accept than those with accompanying diseases. Briefly, whatever their reason, most of the patients seem unwilling to consent to elective surgery after an acute illness. As expressed by many authors (14,20), we also believe that because many patients may fail to return for elective operation and may present later with more severe disease, which may be fatal, surgery may be performed within the same hospitalization period.

In conclusion, when we compare the mortality rate of the patients managed by elective resection after successful nonoperative detorsion with that of the patients managed by observation, we may suggest that the principal strategy must be early nonoperative detorsion followed by elective surgery in selected and well-prepared patients.

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