

Sigmoid Volvulus

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Abstract

In sigmoid volvulus (SV), the sigmoid colon wraps around itself and its mesentery. SV accounts for 2% to 50% of all colonic obstructions and has an interesting geographic dispersion. SV generally affects adults, and it is more common in males. The etiology of SV is multifactorial and controversial; the main symptoms are abdominal pain, distention, and constipation, while the main signs are abdominal distention and tenderness. Routine laboratory findings are not pathognomonic: Plain abdominal X-ray radiographs show a dilated sigmoid colon and multiple small or large intestinal air-fluid levels, and abdominal CT and MRI demonstrate a whirled sigmoid mesentery. Flexible endoscopy shows a spiral sphincter-like twist of the mucosa. The diagnosis of SV is established by clinical, radiological, endoscopic, and sometimes operative findings. Although flexible endoscopic detorsion is advocated as the primary treatment choice, emergency surgery is required for patients who present with peritonitis, bowel gangrene, or perforation or for patients whose non-operative treatment is unsuccessful. Although emergency surgery includes various non-definitive or definitive procedures, resection with primary anastomosis is the most commonly recommended procedure. After a successful non-operative detorsion, elective sigmoid resection and anastomosis is recommended. The overall mortality is 10% to 50%, while the overall morbidity is 6% to 24%.

Key Words: Intestinal obstruction, Sigmoid colon, Volvulus

Özet

Sigmoid volvulus (SV), sigmoid kolonun kendisi ve mezenteri etrafında dönmesidir. SV, tüm kolonik tıkanıklıkların %2-50'sini oluşturur ve ilginç bir coğrafi dağılımı vardır. SV genellikle erişkinleri tutar ve erkeklerde daha sık görülür. SV'nin etiyolojisi çok faktörlü ve tartışmalıdır. Başlıca belirtiler karın ağrısı, şişkinlik ve gaz-gaita çıkaramama iken başlıca bulgular karında şişkinlik ve hassasiyettir. Rutin laboratuvar bulguları hastalığa özgü değildir. Düz karın radyografileri genişlemiş bir sigmoid kolon ve çok sayıda ince ya da kalın barsak hava-sıvı seviyelerini gösterir. Karın CT veya MRI'de dönmüş bir mezenteri ortaya koyar. Fleksibl endoskopi sfinkter benzeri spiral mukoza dönmesini gösterir. SV tanısı klinik, radyolojik, endoskopik ve bazen de operatif bulgulara dayanır. Her ne kadar fleksibl endoskopik detorsiyon başlangıç tedavi seçeneği olarak önerilirse de peritoniti, barsak gangreni veya perforasyonu olan veya nonoperatif tedavinin başarısız olduğu hastalarda acil cerrahi gerekir. Acil cerrahi değişik nondefinitif veya definitif işlemi kapsamakla birlikte, rezeksiyon ve primer anastomoz en çok önerilen işlemdir. Başarılı bir nonoperatif detorsiyon sonrası elektif sigmoid rezeksiyon ve anastomoz, iyi riskli hastalarda önerilir. Toplam mortalite %10-50 iken toplam morbidite %6-24'tür.

Anahtar Kelimeler: Barsak tıkanıklığı, Sigmoid kolon, Volvulus

Introduction

Sigmoid volvulus (SV), first described by von Rokitsansky in 1836 [1, 2], is a condition in which the sigmoid colon wraps around itself and its own mesentery, causing a closed-loop obstruction (Figure 1). It remains a rare but important intestinal obstruction [1, 3].

Epidemiology

SV accounts for 2% to 5% of colonic obstructions in Western countries and 20% to 50% of obstructions in Eastern countries [1, 4, 5]. African, Asian, Middle Eastern, South American, Eastern and Northern European countries, as well

as Turkey, are endemic regions for SV [1, 3, 5, 6]. The community-based incidence of SV in the USA is 1.67 per 100,000 persons per year [6].

SV generally affects adults, with the highest incidence seen in the 4th-8th decades of life [1, 4, 6]. It is more common in males and occurs in ratios ranging from 2/1 to 10/1 [1, 2, 7, 8].

Etiology

The etiology of SV is multifactorial and controversial [1, 4, 9, 10]. The anatomical constitution of the sigmoid colon is a prerequisite for SV. The redundancy of the sigmoid colon [1, 4, 6, 9-11], dolichomesentery, which is described as 'mesentery that is wider than long' [9, 10, 12, 13], and the narrowing of

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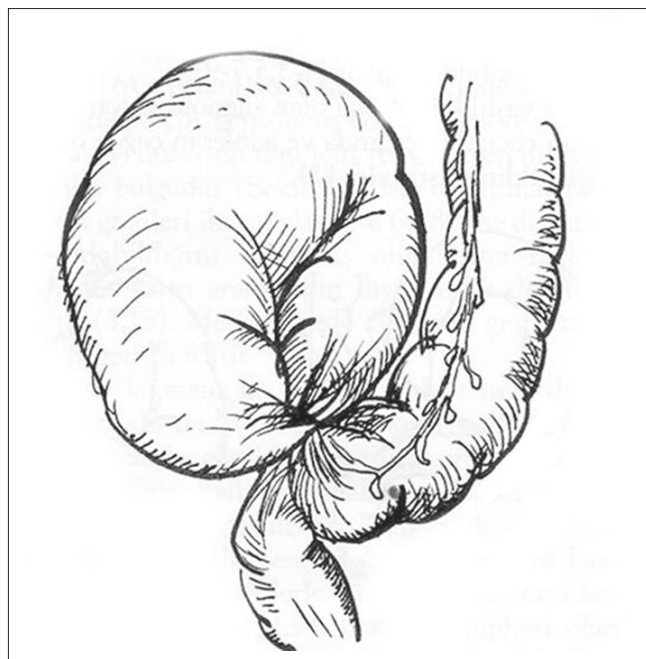


Figure 1. Schematic diagram of SV.

the base of the sigmoid mesentery [1, 4, 9] are considered effective factors for the development of SV. These anatomical characteristics may be acquired, and, in rare cases, they are congenital [3, 14, 15].

Some authors have shown positive correlations between advanced age and sigmoid colon redundancy as well as dolichomesentery [10, 16], which may explain the relationship between advanced age and SV. Similarly, dolichomesentery [9] and smaller pelvic inlet [7] are more common in males, and these cause torsion and do not allow for spontaneous detorsion. This may explain the relationship between the male gender and SV. On the other hand, pregnancy makes torsion more likely in females, and it is thought that the enlarged uterus pushes the redundant sigmoid colon out of the pelvis and causes volvulus [1, 6, 17].

High-altitude may lead to high colonic pressure, which causes a redundant sigmoid colon, and it may be a possible reason for the geographic dispersion of SV [1, 18]. Similarly, a high-fiber vegetable diet habit may cause redundant sigmoid colon and may explain the relationship of SV with both geographic dispersion and socioeconomic status [1, 3, 4, 8, 14]. On the other hand, habitual constipation may cause elongation of the sigmoid colon, and this may be why the elderly and people with neurologic, psychiatric or metabolic diseases are at higher risk for SV [1, 3, 8, 14].

Some diseases, including postoperative adhesions, internal herniations, omphalo-mesenteric abnormalities, malrotations, intussusceptions, congenital megacolon, appendicitis, and carcinomas, may be rare predisposing factors for SV [1, 3, 8].

Pathophysiology

Two important problems arise in SV: luminal obstruction and vascular occlusion [1, 19]. Both mechanical obstruction and bacterial fermentation cause the distention of the twisted-loop and the proximal colon [1, 20]. Increased intracolonic pressure decreases capillary perfusion. Both mechanical occlusion and thrombosis of the vessels contribute to ischemia [1, 21]. Mucosal ischemic injury causes bacterial translocation and toxemia, resulting in colonic gangrene. Increased intra-abdominal pressure causes abdominal compartment syndrome [1, 14].

Hypertrophied colonic wall, thickened mesentery, prominent vessels, splayed out teniae, and abolished haustrations are the morphological changes seen in SV [1, 22].

Classification

SV is classified as either primary or secondary according to the etiological factor. SV that is the result of diseases such as postoperative adhesions or internal herniations is regarded as secondary. Whether SV is regarded as acute or chronic (recurrent), classification is based on the duration and the extent of the symptoms [1]. In 2008, using preoperative and operative criteria that are correlated with mortality, a classification was developed for surgically-treated SV [23]. In this classification, patients with SV are classified as follows: Class 1, patients with no risk factor (advanced age, associated disease); Class 2, those with no shock or bowel gangrene but with other risk factors mentioned above; Class 3, those with shock; Class 4, those with bowel gangrene; Class 5, those with both shock and bowel gangrene.

Clinical Presentation

Although acute SV has a sudden onset, patients usually present with a mean delay of 1 to 4 days. Abdominal pain, distention, and constipation are the classical triad of symptoms in acute SV. Additional complaints include vomiting, nausea, diarrhea, anorexia, rectal bleeding, and hematemesis [1-3, 8, 24].

The main physical findings are asymmetrical abdominal distention and tenderness (Figure 2). Other findings include abnormal bowel sounds, tympany, empty rectum, visible peristalsis, abdominal mass, and fecal odor of the breath. Presence of rectal melanotic stool or rebound tenderness and muscular defense generally show gangrene or perforation and peritonitis [1-3, 8, 24].

Diagnosis

Routine laboratory findings for SV are not pathognomonic, and the findings are related to intestinal obstruction and/or bowel ischemia or gangrene [25].

Plain abdominal X-ray radiographs usually show a dilated sigmoid colon and multiple small or large intestinal air-fluid levels [1, 3] (Figure 3). The described diagnostic X-ray signs are an omega or horseshoe sign [7, 26, 27], bird beak sign [7, 28],

inverted V sign [29], Y sign [7], northern exposure sign [30], coffee bean sign [31], bent inner tube or ace of spades sign [6,28], left pelvic overlap or left flank overlap sign, liver overlap sign, and empty left iliac fossa sign [26]. Plain abdominal radiography has been found diagnostic in 57%-90% of patients [1, 2, 24, 32, 33].



Figure 2. Clinical appearance of SV (asymmetrical distention in abdomen).



Figure 3. Plain erect abdominal x-ray film in SV (dilated sigmoid colon and air-fluid levels).

A barium or water-soluble contrast enema generally shows the obstructive lumen as a beak-like termination with or without some of the signs described above [1, 2, 26, 27]. Nevertheless, the possibility of bowel perforation and the risk of overlooking bowel gangrene are potential hazards. Thus, enemas are used if the patients do not have peritonitis, bowel gangrene, or perforation [2, 32, 34]. Barium enemas have been found to be diagnostic in 20%-30% of patients [6,34].

Abdominal computed tomography (CT) and magnetic resonance imaging (MRI) usually show a whirled sigmoid mesentery in addition to dilated sigmoid loops and small or large intestinal air-fluid levels [1, 3, 26, 33, 35, 36] (Figures 4 and, 5). Both CT and MRI have high diagnostic values for SV [1, 2, 26, 33].

Flexible endoscopy generally shows a spiral sphincter-like twist of the mucosa in the obstructive sigmoid colon, usually 20 cm to 30 cm from the anal verge [1, 4, 37, 38] (Figure 6). Flexible endoscopy has a high diagnostic value for SV [1, 3, 4].

The diagnosis of SV may be difficult, particularly when CT, MRI, or flexible endoscopy are not used, and diagnosis is made at laparotomy or autopsy in 10%-15% of patients [1-3, 24]. Differential diagnosis of SV includes colorectal malignancy, pseudo-obstruction, paralytic ileus, toxic megacolon, Hirschsprung's disease, cecal volvulus, ileosigmoid knot, and giant colonic diverticulum [34].

Treatment

Because patients with SV have a tendency to be hypovolemic and in toxic shock, they require effective resuscitation including fluid-electrolyte imbalance, nasogastric aspiration, and parenteral feeding [1,3]. Flexible endoscopic detorsion is advocated as the primary treatment choice for SV, with a success rate of 33% to 91%. Nevertheless, emergency surgery is required for patients in whom peritonitis, bowel gangrene

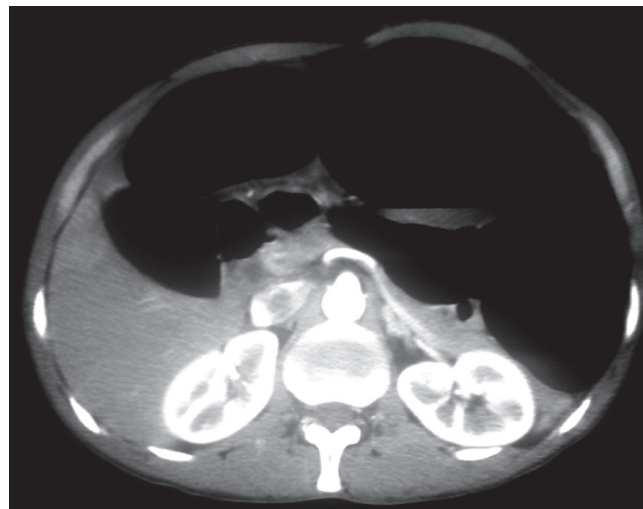


Figure 4. Axial CT image in SV (whirl pattern in sigmoid mesentery and dilated sigmoid colon segments).



Figure 5. Coronal T2-weighted MRI image in SV (whirl pattern in sigmoid mesentery and dilated sigmoid colon segments).

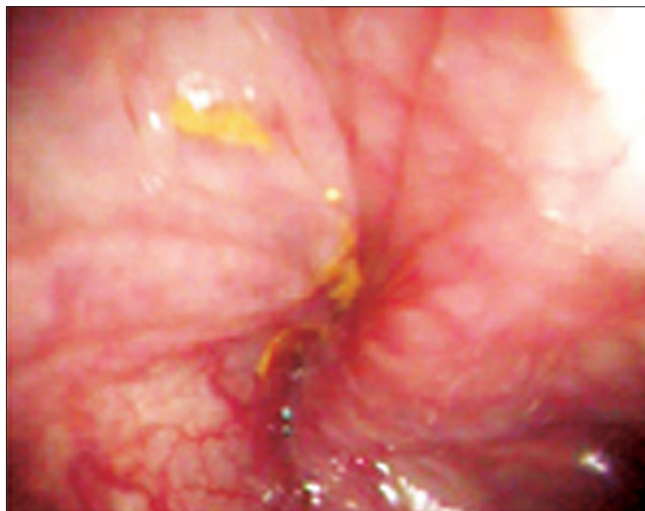


Figure 6. Endoscopic appearance in SV (spiral sphincter-like twist of the sigmoid mucosa).

or perforation is present or in those for whom non-operative treatment is unsuccessful [1, 3, 39, 40].

Although emergency surgery includes various non-definitive or definitive procedures such as detorsion, sigmoidopexy, mesosigmoidoplasty, or sigmoid resection with primary

anastomosis or stoma, resection with primary anastomosis, which has an 8% to 33% mortality rate, is the most commonly recommended procedure because of the high recurrence rate of non-definitive procedures [1, 3, 39-43]. After the resection of gangrenous segment, Hartmann's or Mikulicz procedures may be lifesaving, particularly to unstable patients, and the mortality rate of the stoma procedures has been reported to be 25% to 67% [1, 3, 39, 40]. Other alternatives are tube sigmoidostomy, extraperitonealization of the sigmoid colon, and percutaneous endoscopic colostomy [1, 39, 40, 44-47]. Although laparoscopic techniques of sigmoid resection, sigmoidopexy, and extraperitonealization have been described, their role is generally limited to elective surgery [1, 39, 48].

Although there has been considerable controversy about the ideal definitive procedure, elective sigmoid resection and anastomosis are generally recommended for good-risk patients after a successful non-operative detorsion. These procedures also have a low mortality rate of 0% to 15% [1, 39, 49].

Prognosis

SV has a grave prognosis [1,39]. The overall mortality, which was originally greater than 50%, has now dropped well below 10% [1, 6, 11, 41-43]. The presence of shock, bowel gangrene, colonic perforation, major co-morbidity, advanced age, and emergency surgery increases the mortality rate [1, 5, 39]. The overall morbidity is 6% to 24%, and wound infection, incisional dehiscence, intra-abdominal abscess, anastomotic leakage, and stomal complications are the main problems [39].

Special Circumstances

Sigmoid Volvulus in Children

SV accounts for 4% of all intestinal volvulus in children and is usually accompanied by congenital anomalies. Vomiting and diarrhea are more common. Plain abdominal X-ray graphs are diagnostic in only 30% of cases. A barium enema is generally preferred instead of endoscopic detorsion. Diagnosis is usually delayed, resulting in bowel gangrene. Mortality has risen from 8% to 21% in recent studies [1, 3, 50-52].

Sigmoid Volvulus in the Elderly

Nearly 1/3 of elderly patients have a history of SV attack, and 50%-85% have serious co-existing diseases. SV may be preceded by inactivity and pseudomegacolon. Diagnosis is often difficult due to psychiatric problems and chronic illness. Initial management with non-operative reduction is less disputed. Mortality increases after 70 years of age [1, 24, 53].

Sigmoid Volvulus in Pregnancy

SV is the most common cause of intestinal obstruction during pregnancy. Abdominal pain, nausea, and leukocytosis due to normal pregnancy cloud the clinical picture. The

discretion to obtain radiological evaluation contributes to diagnostic delay. If possible, surgery is best postponed until delivery by endoscopic detorsion. Maternal mortality varies between 6% and 21%, while fetal mortality is between 26% to 50% [1, 17, 54, 55].

Conflict of interest statement: The authors declare that they have no conflict of interest to the publication of this article.

References

1. Raveenthiran R, Madiba TE, Atamanalp SS, De U. Volvulus of the sigmoid colon. *Colorectal Dis* 2010; 12: 1-17
2. Arnold GJ, Nance FC. Volvulus of the sigmoid colon. *Ann Surg* 1973; 177: 527-37.
3. Atamanalp SS, Yildirgan MI, Basoglu M, Kantarci M, Yilmaz I. Sigmoid colon volvulus in children: review of 19 cases. *Pediatr Surg Int* 2004; 20: 492-5.
4. Lal SK, Morgenstern R, Vinjirayer EP, Matin A. Sigmoid volvulus an update. *Gastrointest Endoscopy Clin N Am* 2006; 16: 175-87.
5. Madiba TE, Thomson SR, Corr P. Volvulus of the sigmoid colon. *Gastroenterol Forum* 1997; 8: 28-33.
6. Ballantyne GH, Brandner MD, Beart RW, Ilstrup DM. Volvulus of the colon. Incidence and mortality. *Ann Surg* 1985; 202: 83-92.
7. Avots-Avotins KV, Waugh DE. Colon volvulus and geriatric patient. *Surg Clin North Am* 1982; 62: 249-60.
8. Pahlman L, Enblad P, Rudberg C, Krog M. Volvulus of the colon. *Acta Chir Scand* 1989; 155: 53-6.
9. Bhatnagar BN, Sharma CL, Gupta SN, Mathur MM, Reddy DCS. Study on the anatomical dimensions of the human sigmoid colon. *Clin Anat* 2004; 17: 236-43.
10. Madiba TE, Haffajee MR, Sikhosana MH. Radiological anatomy of the sigmoid colon. *Surg Radiol Anat* 2008; 30: 409-15.
11. String ST, DeCosse JJ. Sigmoid volvulus: An examination of the mortality. *Am J Surg* 1971; 121: 293-7.
12. Tubes MN. Volvulus of the sigmoid colon in relation to the anatomy of the pelvic colon. *South Afr Med J* 1963; 37: 1151-5.
13. Katsarski M, Singh U. Anatomical characteristics of the sigmoid intestine and their relationship to sigmoid volvulus among the population of Uganda and the city of Plovdiv, Bulgaria. *Khirurgiia Sofia* 1977; 30: 159-63.
14. Shepherd JJ. The epidemiology and clinical presentation of sigmoid volvulus. *Br J Surg* 1969; 56: 353-9.
15. Northeast AD, Dennison AR, Lee EG. Sigmoid volvulus: new thoughts on the epidemiology. *Dis Colon Rectum* 1984; 27: 260-1.
16. Sadahiro S, Ohmura T, Yamada Y, Saito T, Taki Y. Analysis of the length and surface area of each segment of the large intestine according to age, sex and physique. *Surg Radiol Anat* 1992; 14: 251-7.
17. Lord SA, Boswell WC, Hungerpillar JC. Sigmoid volvulus in pregnancy. *Am Surg* 1996; 62: 380-2.
18. Anand AC, Sashindran VK, Mohan L. Gastrointestinal problems at high altitude. *Trop Gastroenterol* 2006; 27: 147-53.
19. Arigbabu AO, Badejo OA, Akinola DO. Colonoscopy in the emergency treatment of colonic volvulus in Nigeria. *Dis Colon Rectum* 1985; 28: 795-8.
20. Sinha RS. A clinical appraisal of volvulus of the pelvic colon with special reference to aetiology and treatment. *Br J Surg* 1969; 56: 838-40.
21. Gibney EJ. Volvulus of the sigmoid colon. *Surg Gynecol Obstet* 1991; 173: 243-55.
22. Madiba TE, Ramdial PK, Dada MA, Mokoena TR. Histological evidence of hypertrophy and ischemia in sigmoid volvulus among Africans. *East Afr Med J* 1999; 76: 381-4.
23. Atamanalp SS, Aydinli B, Öztürk G, et al. Classification of sigmoid volvulus. *Turk J Med Sci* 2008; 38: 425-9.
24. Bak MP, Boley SJ. Sigmoid volvulus in elderly patients. *Am J Surg* 1986; 151: 71-5.
25. Atamanalp SS, Keleş MS, Öztürk G, Özoğlu B, Kısaoğlu A, Akbaş A. Serum sodium levels in sigmoid volvulus. *EAJM* 2009; 41: 1-3.
26. Wai CT, Lau G, Khor CJL. Clinics in diagnostic imaging. Singapore Med J 2005; 46: 483-7.
27. Tsang TK, Siu KW, Lai A, Kwok PC, Chan S. Images of interest: Sigmoid volvulus. *J Gastroenterol Hepatol* 2005; 20: 790.
28. Slidell M, Samir SA, Feller ER. Sigmoid volvulus in three college-age teenagers. *J Clin Gastroenterol* 2004; 38: 910-1.
29. Chen SY, Liu CT, Tsai YC, Yu JC, Lin CH. Sigmoid volvulus associated Chilaiditi's syndrome. *Rev Esp Enferm Dig* 2007; 99: 476-83.
30. Javors BR, Baker SR, Miller JA. The northern exposure sign: a newly described finding in the sigmoid volvulus. *AJR* 1999; 173: 571-4.
31. Feldman D. The coffee bean sign. *Radiology* 2000; 216: 178-9.
32. Mellor MF, Drake DG. Colonic volvulus in children: value of barium enema for diagnosis and treatment in 14 children. *Am J Roentgenol* 1994; 162: 1157-9.
33. Heis HA, Bani-Hani KE, Rabadi DK, et al. Sigmoid volvulus in the Middle East. *World J Surg* 2008; 32: 459-64.
34. Raveenthiran V. Emptiness of the left iliac fossa: a new clinical sign of sigmoid volvulus. *Postgrad Med J* 2000; 76: 638-41.
35. Catalano O. Computed tomographic appearance of sigmoid volvulus. *Abdom Imaging* 1996; 21: 314-7.
36. Meyer F, Rapp LAC, Lippert H. Unusual twister-like appearance of a sigmoid volvulus on computed tomography. *Endoscopy* 2007; 39: 295.
37. Martinez Ares D, Yanez Lopez J, Souto Ruzo J, et al. Indication and results of endoscopic management of sigmoid volvulus. *Rev Esp Enferm Dig* 2003; 95: 544-8.
38. Brothers TE, Strodel WE, Eckhauser FE. Endoscopy in colonic volvulus. *Ann Surg* 1987; 206: 1-4.
39. Oren D, Atamanalp SS, Aydinli B, et al. An algorithm for the management of sigmoid colon volvulus and the safety of primary resection: experience with 827 cases. *Dis Colon Rectum* 2007; 50: 489-97.
40. Madiba TE, Thomson SR. The management of sigmoid volvulus. *J R Coll Surg Edinb* 2000; 45: 74-80.
41. De U, Ghosh S. Single stage primary anastomosis without colonic lavage for left-sided colonic obstruction due to acute sigmoid volvulus: a prospective study of one hundred and ninety-seven cases. *ANZ J Surg* 2003; 73: 390-2.
42. Irabor DO. Acute sigmoid volvulus: experience with primary resection and anastomosis in a tropical African population. *J Chinese Clin Med* 2008; 3: 343-6.
43. Nasir M, Khan IA. Resection and primary anastomosis in the management of acute sigmoid volvulus. *Pakistan J Surg* 2008; 24: 95-7.
44. Jagetia A, Verma S, Mittal D, Das Agarwal P, Jain S, Prasad P. Sigmoidopexy (tube sigmoidostomy) as definitive surgical procedure for sigmoid volvulus. *Indian J Gastroenterol* 1998; 17: 129-30.
45. Bhatnagar BN, Sharma CL. Nonresective alternative for the cure of nongangrenous sigmoid volvulus. *Dis Colon Rectum* 1998; 41: 381-8.

46. Bach O, Rudloff U, Post S. Modification of mesosigmoidoplasty for nongangrenous sigmoid volvulus. *World J Surg* 2003; 27: 1329-32.
47. Subrahmanyam M. Mesosigmoidoplasty as a definitive operation for sigmoid volvulus. *Br J Surg* 1992; 79: 683-4.
48. Fleshman JL. Laparoscopic management of colonic volvulus. *Semin Colon Rectal Surg* 1999; 10: 154-7.
49. Atamanalp SS, Oren D, Aydinli B, et al. Elective treatment of detorsioned sigmoid volvulus. *Turk J Med Sci* 2008; 38: 227-34.
50. Salas S, Angel CA, Salas N, Murillo C, Swischuk L. Sigmoid volvulus in children and adolescents. *J Am Coll Surg* 2000; 190: 717-23.
51. Smith SD, Golladay ES, Wagner C, Seibert JJ. Sigmoid volvulus in childhood. *South Med J* 1990; 83: 778-81.
52. Khanna PR, Gangopadhyay AN, Shahoo SP, Khanna AK. Sigmoid volvulus in childhood: report of six cases. *Pediatr Surg Int* 2000; 16: 132-3.
53. Gallagher P, Clark K. The ethics of surgery in the elderly demented patient with bowel obstruction. *J Med Ethics* 2002; 28: 105-8.
54. Narjis Y, El Mansouri MN, Jgounni R, et al. Sigmoid volvulus, a rare complication of pregnancy *Gynecol Obstet Fert* 2008; 36: 776-8.
55. De U, De KK. Sigmoid volvulus complicating pregnancy. *Indian J Med Sci* 2005; 59: 317-9.