Management of Ileosigmoid Knotting: A Literature Review

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Main Points:
• Ileosigmoid knotting is a rare double-segment intestinal obstruction form characterized with rapid progress and poor prognosis.
• In the treatment, early and effective resuscitation followed by urgent surgery is the unique option.
• In surgical treatment, detorsion alone may be used in patients with viable bowel, while cases with gangrenous bowel require primary anastomosis or stoma following resection.
• Recurrence of sigmoid volvulus is rare and the role of recurrence-reducing procedures are controversial.

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ABSTRACT
Ileosigmoid knotting (ISK) is a rare double-segment intestinal obstruction form. Urgent surgery is the unique solution in the management of ISK. In surgical treatment, detorsion alone is generally used in patients with viable bowel, while cases with gangrenous bowel require resection. ISK recurrence is uncommon. However, due to the recurrence risk of sigmoid volvulus, the role of recurrence-reducing procedures is unclear. In this review, urgent treatment of ISK as well as the techniques and patient selection criteria of recurrence-reducing management are discussed.

Keywords: Ileum, sigmoid colon, ileosigmoid knotting, management, follow up

INTRODUCTION
In ileosigmoid knotting (ISK), ileum or sigmoid colon twists around the other stricture (Figure 1.a) [1,2]. Abdominal pain, distention, and obstipation are the prominent clinical features of ISK [3,4]. Abdominal plain X-rays generally suspect intestinal obstruction or sigmoid volvulus (SV) by demonstrating multiple intestinal air-fluid levels in addition to ‘coffee-bean sign’ in sigmoid colon, while abdominal computerized tomography or magnetic resonance imaging are highly sensitive by revealing ‘whirl sign’ in both sigmoid colon and terminal ileum mesenteries in addition to X-ray findings [5]. Urgent surgery following resuscitation is essential in the treatment [6]. However, ISK has a relatively poor prognosis particularly in cases with bowel gangrene, perforation, or peritonitis [7,8].

ISK is a very rare disease over the world with less than 1,000 cases reported to date [9,10]. However, it is relatively common in Turkey, particularly in Eastern Anatolia [11]. Our ISK experience of 58 years (from June 1966 to July 2024) and 81 cases constitutes one of the most comprehensive single-centre ISK series over the world [12]. In this review, we discuss the management and follow-up of ISK based on above-mentioned experience.
First-Line Management

Due to the fluid and electrolyte loss into the obstructive lumens and absorption of the toxic materials from the bowel surfaces, ISK rapidly causes hypovolemic and/or toxic shock [13,14]. In the management, an early and effective resuscitation is essential [15,16]. In the presence or suspicion of complicated colonic volvulus, without considering the bowel viability, urgent surgery is strongly recommended in all patients by actual guidelines [17,18]. Similarly, current reviews and articles support this idea [19,20]. Although endoscopic detorsion is effective in the management of uncomplicated SV, the unravelling of the knot by endoscopy is very difficult or impossible in ISK, a complicated form of SV. Additionally, endoscopy doesn’t demonstrate the viability of the
ileum and endoscopy trying may cause missing the ileum gangrene resulting in toxic shock and related death [21,22]. For this reason, surgical treatment is the unique solution [2,12,23,24].

Management of Viable Bowel
If the bowels are viable, untying the knot may be enough in most cases. Detorsion alone has 1%-5% of mortality and 5%-15% of morbidity [2,6,10,12,14-16,23,24]. In such patients, ISK or SV recurrence is rare and one case has been reported in the actual literature for each [12,25,26]. For this reason, the therapeutic route and patient selection criteria are not clear [2,12,24]. In clinical practice, cecopexy (fixation of the anti-mesenteric edge of the cecum to the parietal peritoneum) (Figure 1.b) may be used in patients with mobile cecum, while no additional procedure including ileectomy (resection of the knotted ileum segment) (Figure 1.c) is necessary for viable ileum [2,11,12,22]. However, dolichosigmoid, an elongated and dilated sigmoid colon, is an anatomic indicator of recurrent SV [27,28]. For this reason, recurrence-reducing procedures such as sigmoidopexy (fixation of the anti-mesenteric edge of the sigmoid colon to the parietal peritoneum) (Figure 1.d), sigmoid mesopexy (fixation of the sigmoid mesentery to the parietal periton by using horseshoe-shaped sutures) (Figure 1.e), sigmoid mesoplasty (efformation of the sigmoid mesentery by cutting it longitudinally and suturing transversely) (Figure 1.f), or sigmoid extraperitonealization (fixation of the apex of the sigmoid colon to the extra-peritoneal area) (Figure 1.g) may be preferred in selected well-conditioned (American Society of Anesthesiologists – ASA score 1-3) and nonelderly (younger than 70-75 years old) cases with 1%-8% of mortality and 10%-20% of morbidity rates [2,12,24,29-31]. However, the role of percutaneous endoscopic sigmoidopexy (fixation of the apex of the sigmoid colon to the anterior abdominal wall by using stoma kits) (Figure 1.h) is unclear and it may be applied in bad-conditioned (ASA score 4) and elderly (older than 70-75 years old) patients [2,12,24,32,33]. On the other hand, sigmoidectomy (resection of the twisted sigmoid segment to prevent a recurrence) (Figure 1.i) is an alternative option with 1%-10% of mortality and 15%-25% of morbidity rates in above-mentioned ASA score 1-3 and nonelderly individuals [2,12,24,29-31].

Management of Single-Segment Gangrenous Bowel
In patients with ileum or sigmoid colon gangrene, following the resection, primary anastomosis is preferred in above-mentioned well-conditioned and nonelderly cases with 5%-20% of mortality and 10%-30% of morbidity rates, while stoma is life saver in most bad-conditioned and elderly patients with 20%-50% of mortality and 30%-60% of morbidity rates [2,12,24,32,33]. If the sigmoid colon is viable, one of the above-mentioned recurrence-reducing procedures may be added [2,12,24,29-33].

Management of Double-Segment Gangrenous Bowel
It is clear that both gangrenous segments require resection. Following this procedure, primary anastomosis is preferred in both segments in above-mentioned well-conditioned and nonelderly cases with 10%-30% of mortality and 20%-40% of morbidity rates. Bad-conditioned and elderly patients are treated with one anastomosis and one stoma (preferably ileum anastomosis and sigmoid colon stoma), the mortality and morbidity rates are 30%-60% and 40%-80%, respectively [2,12,24,29-33].
Ileosigmoid Knotting in Childhood
ISK in childhood is seldom with less than 30 cases reported in the literature [2,12,34,35]. Although the therapeutic principles are similar, if the bowels are viable, short-term procedures including detorsion alone may be preferred in most bad-conditioned children. However, the high recurrence rate in early-onset SV patients may necessitate a recurrence-reducing procedure in well-conditioned group [36]. The inability of a healthy medical anamnesis and clinical examination in addition to the complexity of the clinical features generally retard the diagnosis resulting in a relatively poor prognosis consisting of 15%-60% of mortality and 20%-60% of morbidity rates [2,24,34,35,37].

Ileosigmoid Knotting in Pregnancy
ISK is rare in pregnancy and puerperium with less than 20 cases reported to date [2,37-39]. The treatment requires a multidisciplinary approach. Surgical treatment principles are similar to that of non-pregnant individuals. Short-term surgery such as detorsion alone is the most preferred option in cases with viable bowel, while recurrence-reducing techniques are generally postponed post-delivery period. However, the prognosis is relatively poor with 15%-25% of maternal and 30%-50% of fetal mortality in addition to 40%-60% of morbidity rates [2,12,37-39].

Ileosigmoid Knotting in Elderliness
ISK generally affects middle-aged population and about one eight of the cases are over 80 years old [12,37,40]. Although the basic therapeutic principles are similar, due to the worse prognosis arising from high-rate comorbidities, short-term techniques including detorsion alone are generally preferred. The prognosis is relatively poor with 20%-80% of mortality and 30%-60% of morbidity rates [2,12,37,40].

Clinical Experience
ISK is relatively common in Eastern Anatolia. As a result, the experience of Ataturk University, which includes 81 patients treated over 58 years (from June 1966 to July 2024) constitutes the third large single-centre ISK series over the world [12]. In 20-case (24.7%) viable-bowel group, detorsion was applied in 15 patients, while additionally sigmoid mesoepxy (two patients), sigmoidectomy with primary anastomosis (two cases), and sigmoidectomy with stoma (one patient) were other options with no mortality and 5.0% morbidity. In eight cases (9.9%) with ileum gangrene, the mortality and morbidity rates were similar, 12.5% for each. In this group, following ileectomy (in two patients, additionally right colon resection), primary anastomosis was preferred in seven cases, while one patient treated with stoma. Seven cases (8.6%) had sigmoid colon gangrene with 14.3% of mortality and morbidity rates for each. In this group, following sigmoidectomy, bowel continuity was obtained via stoma in six patients, while one case treated with primary anastomosis. Finally, in 46 patients (56.8%) with double-segment gangrene, both segment resection was followed by ileum primary anastomosis with sigmoid colon stoma in 38 cases (in 11 patients, additionally right colon resection), double-segment stoma in three, ileum stoma with sigmoid colon primary anastomosis in three. In the last group, one patient death during laparotomy, while mortality and morbidity rates were 28.3% for each.

Regarding the special considerations, seven cases were in childhood period. Detorsion alone was used in the management of one patient with viable bowel, while six cases with double-segment gangrene were treated with
ileum primary anastomosis and sigmoid colon stoma following double-segment resection (in one patient, additionally partial jejunum resection) with 14.3% mortality and 42.9% morbidity rates. Three of 22 women (13.6%) were pregnant. Following the resections, two cases with double-segment gangrene were treated with ileum primary anastomosis and sigmoid colon stoma, while sigmoid primary anastomosis was preferred in one patient with sigmoid colon gangrene alone. In this series, maternal and fetal mortality rates were 33.3% for each, while maternal morbidity rate was also 33.3%. Finally, 24 cases (29.6%) were over 60 years old, while the numbers of the patients older than 70, 80 and 90 years were 11, four and one, respectively. As expected, 11 (73.3%) of decedent cases were older than 60 years.

CONCLUSION
In ileosigmoid knotting (ISK), detorsion alone is generally used in patients with viable bowel, while cases with gangrenous ileum and/or sigmoid colon are treated with primary anastomosis or stoma following resection. In patients treated detorsion alone, ISK or sigmoid volvulus recurrence is rare. For this reason, the role of recurrence-reducing procedures is unclear. However, recurrence-reducing procedures such as sigmoidectomy, sigmoidopexy, sigmoid mesopexy, sigmoid mesoplasty, or extraperitonealization may be used in selected well-conditioned and nonelderly cases.
REFERENCES


