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THE CURRENT MANAGEMENT OF ILEO-SIGMOID KNOTTING: NARRATIVE REVIEW ARTICLE

Kumar H. R. (MBBS, MS)*

Associate Professor of Surgery, Taylor University School of Medicine and Health Science, 47500 Subang Jaya, Malaysia.

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***Corresponding author:**

Dr. Kumar H. R. (MBBS, MS)

Associate Professor of Surgery, Taylor University School of Medicine and Health Science, 47500 Subang Jaya, Malaysia.

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ABSTRACT

Ileo-sigmoid knotting is a rare variant of colonic volvulus that presents with acute intestinal obstruction and has a very high risk of gangrene and perforation. The clinical presentation is that of acute intestinal obstruction, and imaging modalities like abdominal radiographs and computerized tomography may aid in its diagnosis. The diagnosis is often made intra-operatively. The treatment of ileo-sigmoid knotting involves surgical management, with the release of the volvulus segment and resection of the segment of ileum that is not viable, followed by an anastomosis. A sigmoid colectomy is also performed, and depending on the viability of the colon, either anastomosis or stoma formation is done. In this review, we will investigate the diagnosis and classification of ileo-sigmoid knotting and also its management.

KEYWORDS: "Ileo-sigmoid volvulus", "Sigmoid volvulus"," Compound volvulus", "Double volvulus"," Sigmoid resection"," Laparotomy", and "stoma formation".

INTRODUCTION

Ileo-sigmoid knotting is a form of mid-gut volvulus, which is characterized by a loop of small intestine that moves to the left side of the abdomen to encircle the sigmoid colon in a clockwise or anticlockwise manner to cause acute intestinal obstruction. This condition is known as compound volvulus or double volvulus and is a common cause of acute intestinal obstruction in Africa, parts of central Asia, and the Middle East (Mallick & Winslet, 2004.; Rakinic, 2011). For ileo-sigmoid knotting to develop requires a long, small bowel mesentery with a mobile small bowel, the presence of a long sigmoid colon on a narrow mesentery, and the ingestion of a large meal with an empty bowel. Ileo-sigmoid knotting is classified into type 1, where the ileum wraps itself around the sigmoid colon in a clockwise or anticlockwise manner, type 2, where the sigmoid colon wraps itself around the small intestine in a clockwise or anticlockwise manner, and type 3, where the ileocecal segment wraps itself around the sigmoid colon (Akgun et al, 1997; Mandal et al., 2012).

The clinical presentation of ileo-sigmoid knotting is that of abdominal pain, vomiting, abdominal distension, and constipation. The diagnosis of ileo-sigmoid knotting is made by imaging modalities like abdominal x-ray, which will reveal a grossly dilated sigmoid colon and corresponding dilated loops of small bowel, but computerized tomography is better at diagnosing this condition, which will reveal a twisted or dilated sigmoid colon with a corresponding segment of small bowel. As ileo-sigmoid knotting is associated with a higher risk of bowel ischemia and gangrene, prompt fluid resuscitation, intravenous antibiotics, analgesics, and emergency laparotomy are performed. The surgical treatment will involve releasing the segment of intestine that is causing the volvulus, and

depending on the viability of the intestine, either a resection and anastomosis or stoma formation is performed. The goal of the surgical management of ileo-sigmoid knotting is also to prevent its recurrence(Atamanalp,2009.; Ephraim Kazuma et al., 2021; Kapadia, 2017; Puthu et al., 1991).

Ileo-sigmoid knotting is a rare but dangerous form of volvulus, which is associated with high morbidity and mortality. In this review, we will look at the diagnosis and treatment of ileo-sigmoid knotting. We will review the surgical management and classification of the ileo-sigmoid knotting. A comprehensive literature review was conducted using PUBMED, the Cochrane Database of Clinical Reviews, and Google Scholar, focusing on clinical trials, observational studies, cohort studies, systematic reviews, case reports, and meta-analyses from 1980 to 2026. The search employed keywords such as "Sigmoid volvulus," "ileo-sigmoid knotting," "Compound volvulus," "double volvulus," "sigmoid resection," "laparotomy," and "stoma formation." Only articles published in English were considered. Additional relevant articles were identified through manual cross-referencing of the literature. The study included adult male and female patients, while pregnant and pediatric patients were excluded.

DISCUSSION

Epidemiology and Risk Factors for Ileo-Sigmoid Knotting

The incidence of ileo-sigmoid knotting is unknown, but it is known to be at 18% to 27% of all sigmoid volvulus cases in high-incidence areas and 5% to 8% of those in low-incidence areas. The high-incidence regions include the Middle East, Africa, and Central Asia. Ileo-sigmoid knotting is commonly seen in patients in the 3rd to 5th decade of life and is predominantly seen in male patients(Gupta et al., 2020).

Several anatomical and dietary factors predispose individuals to Ileo-sigmoid knotting. These include a long, mobile small-bowel mesentery; a redundant sigmoid colon with a narrow mesenteric base; and inadequate fixation of the cecum. Dietary habits, such as consuming a single bulky, high-fiber meal after prolonged fasting, commonly observed during religious fasting periods, may precipitate sudden bowel hypermotility and twisting. Chronic constipation, pregnancy, adhesions, and prior abdominal surgery have also been implicated as contributing factors(Atamanalp, Peksöz, et al., 2022; Korkut & Atamanalp, 2022).

Classification of Ileo-sigmoid knotting

Several classification systems have been developed to classify ileo-sigmoid knotting according to its severity. The most recognized classification is the anatomical classification of ileo-sigmoid knotting by Alver et al. This classification divides ileo-sigmoid knotting into Type 1, where the ileum, the active component, wraps itself around the sigmoid colon, the passive component, and this is the most common form. Type 2, where the sigmoid colon is the active component, and it warps around the ileum, which is the passive component. Type 3, where the ileo-sigmoid segment, which is the active component, wraps around the sigmoid colon, which is the passive component. Type 4 is where it is impossible to determine which is the active component(Alver et al., 1993.).

Table I: Anatomical Classification of Ileo-Sigmoid Knotting.

Type	Active Segment	Anatomical Description	Subtypes / Direction
Type I	Ileum	The ileum wraps around the base of the sigmoid colon, resulting in knot formation.	Ia: Clockwise Ib: Counter-clockwise
Type II	Sigmoid colon	The sigmoid colon twists around the ileum, causing entrapment and obstruction.	IIa: Clockwise IIb: Counter-clockwise
Type III	Ileo-cecal segment	The ileo-cecal segment twists around the sigmoid colon.	No consistent subtypes
Type IV	Indeterminate	Unable to identify the initiating or active segment intra-operatively.	Not applicable

This is the anatomical classification of ileo-sigmoid knotting by Alver et al.

Atamanalap et al had proposed a classification for ileo-sigmoid knotting where the patients were classified into C1, patients with no risk factors, and C2, patients with medical problems, and age above 60.C3 are patients with shock, C4 are patients with single segment bowel gangrene, C5 are patients with shock and single segment bowel gangrene and C6 are patients with gangrene of both segments(Atamanalp et al., 2009).This classification for ileo-sigmoid knotting was further updated to include the American Society of Anesthesia score(ASA), the surgical

treatment options, and the morbidity and mortality for the respective grade.

Table II: Classification of ileo-sigmoid knotting by Atamanalp.

Group	Definition	Surgical Treatment	Mortality (%)	Morbidity (%)
1A	G0, A0, ASA1-3	Decompression Or Colopexy, mesoplexy, mesoplasty Or sigmoid resection and anastomosis	1-5% 1-8% 1-10%	5-15% 10-20% 15-25%
1B	G0, A1, ASA 4-5	Decompression	10-30%	20-40%
2A	G1, A0, ASA1-3, B0	Ileal or sigmoid resection and anastomosis	5-20%	10-30%
2B	G1, A1, ASA 4-5, B1	Ileal or sigmoid resection and stoma	20-50%	30-60%
3A	G2, A0, ASA 1-3, B0	Ileal and sigmoid resection and anastomosis	10-30%	20-40%
3B	G2, A1, ASA 4-5, B1	Ileal and sigmoid resection, one anastomosis and one stoma	30-60%	40-80%

A0-age less than 75, A1-age more than 75, ASA1-no disease, ASA2-mild systemic disease, ASA3-severe systemic disease, ASA4-life threatening disease, ASA5-moribund patient. B0-normal anastomotic risk, B1-increased anastomotic risk, G0-viable bowel, G1-gangrenous ileum or sigmoid colon, G2-gangrenous ileum and sigmoid colon.

Diagnosis of Ileo-sigmoid knotting

Imaging modalities are often used to aid in the diagnosis of Ileo- sigmoid knotting. Abdominal radiographs will often reveal dilated small bowel loops with a dilated sigmoid colon. Abdominal radiographs typically show mixed features of small- and large-bowel obstruction, such as multiple air-fluid levels and a markedly dilated sigmoid loop, often displaced to the right abdomen, but it will not be able to diagnose ileo- sigmoid knotting on its own. Computerized tomography is the current imaging modality of choice to diagnose ileo-sigmoid knotting. The appearance of ileo-sigmoid knotting includes the whirl sign, indicating twisted mesentery and vessels. Simultaneous volvulus of the ileal and sigmoid loops, beak-shaped afferent and efferent limbs, medial deviation of the cecum and descending colon(Atamanalp, 2013; Baheti et al., 2011; Hegde et al., 2019; Lee et al, 2000.)

The Management of Ileo-Sigmoid Knotting

The management of ileo-sigmoid knotting initially involves the use of intravenous fluid to correct any fluid or electrolyte abnormality, followed by intravenous antibiotics. The definitive management of ileo-sigmoid knotting is by performing a laparotomy and identifying the site of volvulus and releasing it. Depending on the viability of the bowel, a decision is then made to determine if bowel resection needs to be performed or not. The indication for performing a bowel resection and anastomosis or stoma formation will depend on the patient's factors and the level of contamination of the intestine and surrounding structures. The most common operation is usually a small bowel resection and anastomosis for the ileal segment, and either a sigmoid resection and anastomosis or a Hartmann's procedure(Atamanalp, Disci, et al., 2022; Atamanalp et al., 2024). Atamanalp had conducted a retrospective study on 74 patients who were diagnosed with ileo-sigmoid knotting, and the treatment included surgical resection and anastomosis for those patients with a viable bowel. The mortality rate was 0 in those patients with no gangrene, while the mortality rates for those with gangrenous ileum, sigmoid colon, and both ileum and sigmoid colon were 12.5%,14.3%, and 28.9%, respectively(Selçuk Atamanalp, 2014).

Atamanalp et al also looked at the management of ileo-sigmoid knotting over the past 50 years by retrospectively assessing 78 patients with ileo-sigmoid knotting. There are no changes in the diagnosis and treatment of ileo-sigmoid knotting, but the trend of management has moved towards a higher rate of resection and anastomosis rather than stoma formation. There were no changes concerning the morbidity and mortality of patients with ileo-sigmoid knotting(Atamanalp et al., 2018). An analysis of the outcomes of patients with ileo-sigmoid knotting was conducted by Abebe et al. A total of 28 patients were included in this study, and the most common surgical procedure was small bowel resection and anastomosis, and Hartmann's procedure. The mortality rate was 21.4%, and the morbidity rate was 39.3%(Abebe et al., 2020). Ooko et al also conducted a retrospective study on the management of patients with ileo-sigmoid knotting. A total of 61 patients were included in this study, and resection and anastomosis were performed in 85% of the cases, while stoma formation was done in the remaining 15% of the cases. The morbidity and mortality rates were 24.6% and 11.5%, respectively(Ooko et al., 2016). A similar retrospective

study by Molla et al on 25 patients with ileo-sigmoid knotting who had undergone treatment also concluded that prompt diagnosis and treatment are essential to reduce mortality(Molla et al., 2023).

Evaluation of the clinical profile and outcomes of patients with ileo-sigmoid knotting was assessed by Bayleyegn et al. A total of 40 patients with ileo-sigmoid knotting who underwent surgery were followed up to one year, and the mortality was 3.2% and the presence of shock, co-morbidities, and tachycardia were predictors of mortality (Bayleyegn et al., 2024). Chalya et al. also examined the management of ileosigmoid knotting over five years. A total of 26 patients with ileo-sigmoid knotting were included in this study, and surgical resection and anastomosis were performed in 63% of the cases, while colostomy was done in 30.1%. The mortality rate was at 17.1%, and this study highlighted the importance of early diagnosis and treatment of ileo-sigmoid knotting(Chalya & Mabula, 2015). Mbanje et al retrospectively assessed 21 patients with ileo-sigmoid knotting, and all of the patients had undergone ileal resection and anastomosis with a Hartmann's procedure, and the mortality rate was at 4.8%(Mbanje et al., 2020). Another retrospective study by Cakir et al on the ileo-sigmoid knotting, which looked at the diagnosis and management of this condition, also concluded the same(Cakir et al., 2015).Several case series on the diagnosis and management of ileo-sigmoid knotting have also highlighted the importance of early diagnosis and treatment of this condition(Ahbala et al., 2024; Sseruwagi & Lewis, 2022).

CONCLUSION

Ileo-sigmoid knotting is a rare presentation of colonic volvulus, and early diagnosis and treatment of this condition are important due to the high risk of bowel ischemia and perforation. Imaging modalities like computerized tomography are important for perioperative diagnosis, but most cases are usually diagnosed intraoperatively. Bowel resection and anastomosis should be done if the bowel segments are viable, and stoma formation should be considered for patients with hemodynamic instability or gross contamination of the peritoneal cavity. The postoperative management of ileo-sigmoid knotting is important to reduce the morbidity and mortality of this condition.

Conflict of Interest: There is no conflict of interest.

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