

The Role of CT scan in the Diagnosis of Ileosigmoid Knot: A Case Report and Literature Review

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Abstract

Case Report

The ileosigmoid knot, although rare, represents a complex surgical emergency requiring rapid and precise management. Imaging, particularly computed tomography (CT), plays a crucial role in diagnosis by highlighting specific features such as the "spiral sign" and signs of necrosis. Early detection through these imaging modalities allows for prompt surgical intervention, minimizing the risks of severe complications associated with intestinal torsion. The speed of surgical intervention is crucial to prevent progression to ischemic necrosis, reduce the risks of intestinal perforation, peritonitis, and other serious complications. Various surgical modalities, such as colonic diversion, detorsion, segmental resection, or extended resection in case of necrosis, must be tailored to the clinical presentation and intraoperative findings. Ultimately, the combination of advanced radiological imaging and swift surgical intervention is the key to successful management of the ileosigmoid knot. Emphasizing awareness among healthcare professionals of this rare condition and educating patients to recognize symptoms promptly will contribute to the early and effective management of this infrequent surgical emergency.

Keywords: The ileosigmoid knot, CT scan, spiral sign, ischemic necrosis.

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INTRODUCTION

The pathological entity of the ileosigmoid knot, characterized by a double volvulus affecting both the sigmoid and the small intestine, poses a significant clinical challenge due to its rapid progression to intestinal necrosis. When the small intestine wraps around the base of the sigmoid colon, it forms a knot, leading to obstruction of the sigmoid. The preoperative diagnosis of this condition remains complex, underscoring the crucial importance of a deep understanding of its pathophysiology.

Understanding the underlying mechanism of the ileosigmoid knot is of paramount importance, as it allows for the exploration of characteristic radiological signs essential for achieving an early diagnosis, thereby providing the opportunity for prompt surgical intervention. This study, focusing on two cases, aims to deepen our understanding of the pathophysiology of the ileosigmoid knot and underscore the pivotal role of imaging in the diagnostic process.

OBSERVATION

This concerns a 71-year-old patient admitted to the emergency department due to a cessation of bowel movements and gas for the past 6 days, accompanied by initially episodic and later persistent colicky pain. The clinical examination revealed a distended abdomen, abdominal meteorism, diffuse cutaneous-mucosal pallor, and an empty rectal ampulla. A computed tomography (CT) scan of the abdomen and pelvis was performed, showing, on the one hand, a radial arrangement of small bowel loops in a peri-umbilical location with several transition zones, associated with a whirl sign at the level of L2 (Figure 1), indicative of ileal volvulus. On the other hand, it demonstrated the distension of a sigmoid loop upstream of a transitional beak (Figure 2) without dilation of the colon upstream, associated with the convergence of inferior mesenteric vessels towards the described whirls (Figure 3), suggesting sigmoid volvulus, with no dilation of the colon upstream. The spontaneously hyperdense appearance with pneumatosis and a lack of parietal enhancement in a portion of the twisted segment (Figure 4), coupled with a moderate amount of peritoneal fluid (Figure 1, Figure 2), is consistent with digestive ischemic injury. This

radiological appearance suggests a dual obstruction caused by both ileal and sigmoid volvulus. The patient underwent emergency surgery, confirming sigmoid volvulus over a knot created by the twisted ileum,

forming the ileosigmoid knot (Figure 5) with extensive ileosigmoid necrosis. The patient underwent ileosigmoid resection (Figure 6) and a stoma.

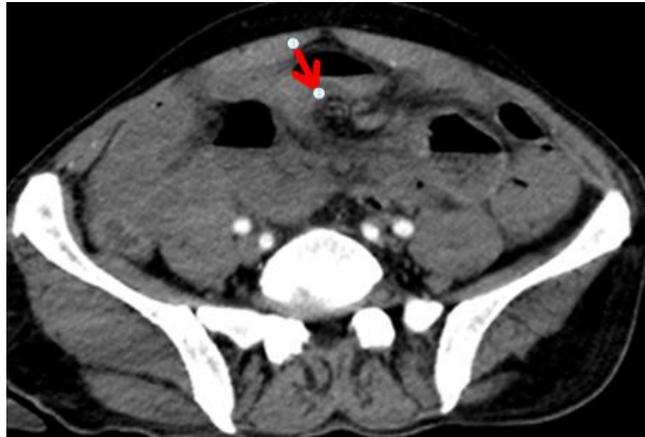


Figure 1: Abdominopelvic CT scan in axial sections with iodinated contrast injection, demonstrating a peri-umbilical radial arrangement of distended small bowel loops with a whirl sign in the corresponding area, associated with the distension of a sigmoid loop without dilation of the colon upstream



Figure 2: Abdominopelvic CT scan in coronal reconstructions, with iodinated contrast injection, in parenchymal window showing the distension of a sigmoid loop upstream of a transitional beak

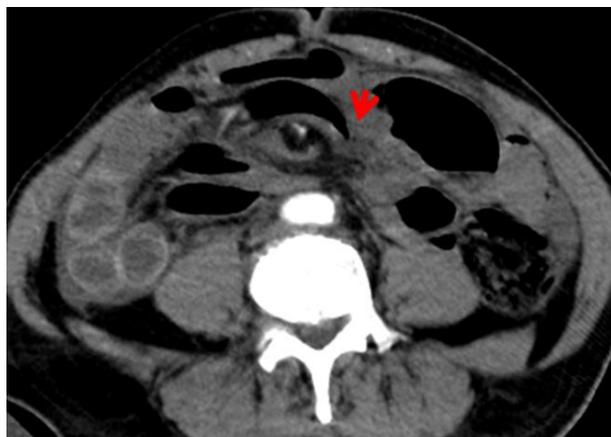


Figure 3: Abdominopelvic CT scan in axial reconstructions, with iodinated contrast injection, in parenchymal window showing the convergence of mesenteric vessels towards the described whirls

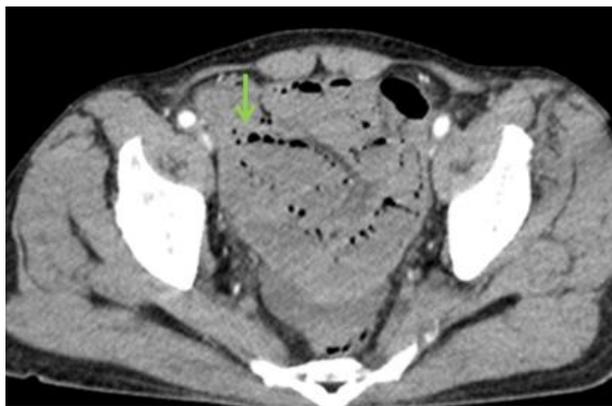


Figure 4: Abdominopelvic CT scan in axial sections, with iodinated contrast injection, showing a lack of enhancement with pneumatosis of the walls of the ileum

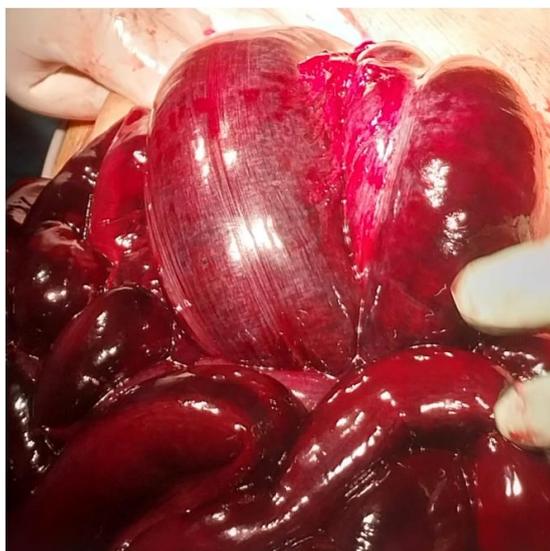


Figure 5: Intraoperative views of the ileal knot around the base of the sigmoid Visceral Surgery Department, Ibn Tofail Hospital, Mohamed VI University Hospital, Marrakech



Figure 6: Surgical specimen of the en bloc resection of the necrotic ileum and sigmoid Visceral Surgery Department, Ibn Tofail Hospital, Mohamed VI University Hospital, Marrakech

DISCUSSION

The ileosigmoid knot, also known as double ileosigmoid volvulus, represents a rare surgical emergency, predominantly affecting males in their fourth decade of life [3, 4]. This condition is characterized by the formation of a volvulus involving both the sigmoid colon and the small intestine, particularly the ileum. The first description of this entity dates back to Parker in 1845 [1]. The development of this pathology is multifactorial, and several elements have been proposed to explain its occurrence. Atamanalp *et al.*, [3] suggested anatomical predispositions, such as excessively mobile small intestine due to a long mesentery and a short root, which may lead to its winding around the ileum and involving the sigmoid loop. Another factor involves dietary habits [4, 5], suggesting that rapid consumption of a meal in individuals who eat only once a day could promote the torsion of the ileum around the empty ileum,

thereby involving the sigmoid colon. This complex combination of anatomical and dietary factors contributes to the uniqueness of this pathology, emphasizing the need for a thorough understanding of its mechanisms for effective clinical management.

The ileosigmoid knot primarily occurs when the ileal loop descends into the left paracolic gutter and wraps around the base of the sigmoid colon, forming a knot, either clockwise or counterclockwise. However, in a limited number of cases, the sigmoid colon can actively contribute by amplifying peristalsis, thereby inducing torsion in both parts of the intestine and causing double strangulation. Alver *et al.*, [5] proposed a classification into four different types to describe the underlying mechanisms of the ileosigmoid knot. This diversity of mechanisms underscores the complexity of this pathological entity, requiring a thorough clinical and diagnostic approach for effective management.

Type of mechanism for the formation of the NIS, according to the active digestive segment responsible for the torsion.	
Type I	The ileum is the active segment winding around the passive sigmoid. Type Ia when the torsion occurs clockwise. Type Ib counterclockwise
Type II	Active sigmoidal torsion attracting the passive small intestine
Type III is exceptional.	It is the ileocecal junction that wraps around the sigmoid loop
Type IV is undetermined.	as it is not possible to differentiate between the two segments.

The ileosigmoid knot results in a complex intestinal obstruction due to the double strangulation of the mesenteric vessels supplying the small bowel and the sigmoid colon. The tightening force of the knot and its impact on the mesentery are crucial, as this compression can rapidly lead to ischemic necrosis of the ileum and colon, observed in a high prevalence ranging from 74 to 80% of cases [6-9].

The consequences of this tightening are particularly serious, accentuating the surgical urgency of the situation. Ischemic necrosis, if not quickly identified and treated, can lead to severe complications, including intestinal perforation, peritonitis, and potentially septic shock. The speed at which this pathology can progress emphasizes the crucial importance of early diagnosis and prompt surgical intervention to minimize adverse effects on intestinal perfusion.

However, preoperative diagnosis remains a major challenge due to the rarity of this pathological entity and its atypical clinical-radiological presentation. In less than 20% of cases, an accurate preoperative diagnosis can be established [7-9]. This emphasizes the need for increased awareness among healthcare professionals, as well as judicious use of imaging techniques to improve early detection and management of this surgical emergency.

Computed tomography (CT) imaging plays a crucial role in the detection and characterization of the

ileosigmoid knot, highlighting distinctive aspects of this pathology. Unlike sigmoid volvulus, ileal torsion in the ileosigmoid knot occurs higher in the abdomen, making radiological detection more complex. CT reveals characteristic findings, with the "spiral sign," created by the torsion of the intestine and mesocolon, being a major diagnostic element [5, 6]. Furthermore, CT can detect signs of intestinal ischemia resulting from strangulation, such as pneumatosis. In the case of the ileosigmoid knot, specific features can be identified, such as the medial deviation of the distal descending colon with a sharply defined medial border

Two explanations are put forward for these distinct characteristics. Firstly, a traction effect causes the peritoneum to shift from the left paracolic groove towards the center of the knot. Secondly, a mass effect from the distended ileal loops intervenes between the descending and proximal sigmoid colon and the left body wall. Although the cecum may also be medially deviated in many patients, the sharp appearance of its medial border, coupled with the medial deviation of the distal descending colon, constitutes useful features for diagnosing the ileosigmoid knot.

The surgical management of the ileosigmoid knot depends on the presence or absence of signs of intestinal necrosis. In the absence of necrosis, options such as colonic diversion, detorsion, or segmental resection can be considered to address intestinal torsion. Conversely, in the presence of signs of necrosis,

extensive resection of the ischemic segment is essential, possibly accompanied by a diversion colostomy to facilitate healing. Peritoneal lavage may be performed to remove debris. Close postoperative monitoring, including assessment of intestinal perfusion and management of complications, is crucial to ensure optimal recovery of the patient. The precise decision on the surgical strategy depends on intraoperative evaluation and the severity of ischemic involvement, emphasizing the importance of prompt and tailored surgical intervention to improve the prognosis of the ileosigmoid knot.

Postoperative monitoring of the ileosigmoid knot is crucial to assess the response to surgical intervention and anticipate potential complications. Criteria such as intestinal perfusion, intestinal function, and the presence of infectious signs must be closely monitored. The use of imaging techniques, such as computed tomography, can be valuable for assessing anastomotic healing and detecting any intra-abdominal complications.

The prognosis of the ileosigmoid knot is closely linked to the speed of diagnosis and surgical intervention. With early detection and appropriate management, the prognosis can be favorable, with functional intestinal recovery. However, in the presence of extensive intestinal necrosis, the prognosis may be more reserved, with an increased risk of complications such as fistula, peritonitis, or even septic shock.

The recurrence of the ileosigmoid knot is rare, but long-term surveillance is recommended to identify any late complications or the possibility of recurrence. Patients should be educated about potential clinical deterioration signs and encouraged to seek prompt medical attention in case of unusual symptoms. Close follow-up and continuous awareness are crucial for the optimal long-term management of the ileosigmoid knot.

CONCLUSION

The ileosigmoid knot, although rare, represents a complex surgical emergency. The use of imaging,

particularly computed tomography, is crucial for a rapid diagnosis by highlighting specific characteristics. The speed of surgical intervention, tailored to the clinical presentation, remains essential to minimize complications and optimize the patient's prognosis.

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