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Factors associated with surgical management of acute high intestinal obstruction: A case series

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Abstract

Objective: To describe the factors associated with surgical management of acute high intestinal obstruction.

Materials and methods: This descriptive retrospective study was conducted over a seven-year period, from 2017 to 2023, and focused on patients with obstruction. Variables examined in relation to the use of surgical treatment include epidemiological factors, medical and surgical history, blood biology values, CT scan severity signs, and the etiology of the obstruction. Sensitivity and specificity analyses were performed to establish the correlation between these variables and the use of surgery, with a significant p-value less than 0.05. Data analysis was carried out using SPSS software.

Study findings: A total of 150 patients were included, of whom 68% underwent surgery. The results showed that female gender was significantly associated with surgery (p=0.05), while arterial hypertension acted as a protective factor (p=0.045). Hyperleukocytosis was observed in 58.7% of patients, with statistical significance (p=0.048). Additionally, an elevated CRP greater than 50 was identified as a predictive factor in 23.3% of patients (p=0.048). The presence of CT scan severity signs was also in favor of surgical intervention.

Conclusion: Although several factors are associated with an increased risk of medical treatment failure, a consensus on the optimal timing for surgical intervention remains to be established.

Keywords: Acute high intestinal obstruction; Risk factors; Medical treatment failure; Surgery.

Introduction

Acute High Intestinal Obstruction (AHIO) is a medical and surgical emergency characterized by the interruption of intestinal contents passage in the upper part of the small intestine. Common etiologies include adhesions, hernias, and tumors. This condition can result in severe complications such as intestinal perforation and peritonitis, necessitating early diagnosis and prompt treatment to improve clinical outcomes. The decision to pursue surgical intervention in cases of AHIO is multifactorial, influenced by the patient's overall condition, the cause of obstruction, surgical risks, and patient preferences. Understanding these factors is critical to optimize surgical outcomes and minimize postoperative complications. Literature highlights that post-surgical adhesions, hernias, and neoplasms are the most frequent causes of intestinal obstruction. This study aims to assess the factors associated with surgical management in AHIO and provide data-driven recommendations.

Material and methods

This retrospective descriptive study was conducted over seven years (2017-2023) and included patients admitted with AHIO. Patients with low or functional obstructions were excluded. Variables analyzed in relation to surgical management included epidemiological factors, medical and surgical histories, blood test values, imaging findings, and the etiology of obstruction. Sensitivity and specificity analyses were performed, with a p-value <0.05 considered statistically significant. Data analysis was carried out using SPSS software.

Study findings: Out of 150 patients, 57 (38%) underwent surgical intervention.

Key findings include

Gender: Female patients were slightly more likely to undergo surgery, though not statistically significant (p=0.951).

Imaging: Abdominal CT was diagnostic in 81.3% of cases, identifying adhesions (74.6%) as the primary etiology, followed by Crohn's disease (10.6%) and hernias (6.7%). Surgical approaches included midline laparotomy (98.2%) and laparoscopy (1.8%). The only patient who underwent emergency laparoscopic surgery was a young woman with no surgical history, who was hospitalized for the management of a strangulated internal hernia through the broad ligament. Among 57 patients operated on by median laparotomy, 14 patients (24.5%) underwent a resection procedure. The postoperative morbidity was 15.7%, related to non-specific complications. Four patients died due to three cases of septic shock and one pulmonary embolism.

Table 1: Statistical comparison between the two sexes.

Patients	Operated		Non operated		Total
	N	%	N	%	N
Male	32	37,2	54	62,8	86
Female	25	39.1	39	60,9	64
Total	57	38	93	62	150

Hypertension: Identified as a protective factor against surgery (p=0.045). **Age:** Mean age was 55.6 years (range: 16-92 years), only one case of fatality among elderly. **Surgical history:** 68% had prior abdominal surgery, with midline incisions being the most common.

Table 2: Type of incision in patients with a history of abdominal surgery.

Type of incision	Frequency	Percentage %
Mac Burney	23	22.5
Midline	64	62.8
Pfannestiel	9	8.9
Subcostal	5	4.9
Jalaguier	1	0.9
Total	**102**	**100**

Biological parameters: Elevated C-reactive protein (CRP>50 mg/L) and leukocytosis (>10,000 cells/mm³) were predictive of surgery (p=0.048 and p=0.043, respectively). Acute renal failure (creatinine > 100 µmol/L) was a predictor of medical treatment failure (p=0.034).

Discussion

Bowel obstruction may be functional, due to bowel wall or splanchnic nerve dysfunction, or mechanical, due to a mechanical barrier [1]. Obstruction may occur in the Small Bowel (SBO) or Large Bowel (LBO) [1]. AHIO may be partial or complete, simple or complicated. Partial obstruction allows some liquid contents and gas to pass through the point of obstruction, whereas complete obstruction impedes passage of all bowel contents [1]. Unlike simple obstruction, complicated obstruction indicates compromise of the circulation to a segment of bowel with resultant ischemia, infarction, and perforation [1]. This study aims to assess the factors associated with surgical management in AHIO and provide data-driven recommendations

Sex: Our study revealed that female sex is associated with a slightly increased risk of resorting to surgery, which is in agreement with the results of the study by Schraufnagel et al. (2013), which showed that female sex is a significant predictive factor for failure of medical treatment, with 66.7% of female patients requiring surgical intervention and a higher incidence of complications as well as prolonged postoperative stays [2].

Age: Age has long been recognized as a factor associated with an increased risk of intestinal necrosis and failure of medical treatment, as demonstrated by the study published by Fevang et al. (2000) in Annals of Surgery, which highlights complications and mortality after surgical treatment in elderly patients [3]. However, in our study, this variable was not considered a risk factor for surgical treatment and post-operative complications.

Medical history: No medical history was proven significant in our study, contrary to the literature where diabetes can complicate the management of Acute Intestinal Obstruction (AIO) since diabetics are more likely to suffer from vascular complications, which can compromise blood perfusion of the intestine during an obstruction. This increases the risk of intestinal ischemia and necrosis, making the situation more critical [4].

Surgical history: Surgical history was not identified as a factor associated with resorting to surgery (p=0.2), which contradicts the literature. Indeed, among patients who have had several previous surgical interventions, only partial intestinal obstructions can benefit from non-surgical management [5]. It is unknown whether the increase in laparoscopic intra-abdominal surgery has translated into fewer postoperative complications due to adhesions; a recent review of 11 experimental studies involving seven animal models and four human studies reported mixed results. Some reported decreased rates of adhesion formation after laparoscopy. However, there was significant heterogeneity among the human studies [6]. Indeed, among patients who have had several previous surgical interventions, only partial intestinal obstructions can benefit from non-surgical management [5].

Clinical signs: Heart rate was not considered a significant factor in the surgical decision in our study, contrary to the retrospective study by Jian Feng Mu et al. (2018), which identified a heart rate above 100 bpm as an important indicator; moreover, fever was not associated with any particular management in our research, although it may signal complications such as acute peritonitis, thus justifying surgical intervention according

to some publications [7].

Biological parameters: Our study revealed that the presence of an inflammatory syndrome, defined by a CRP above 50 mg/l and hyperleukocytosis exceeding 10,000 El/mm [3], is associated with a surgical decision, with respective p-values of 0.048 and 0.043. Although these factors do not directly predict the success of non-surgical treatment of AHIO, they are important elements in the overall assessment of the patient's condition. Contrary to what the literature suggests, which considers the creatinine level as an element associated with an increased risk of laparotomy due to dehydration and resulting intestinal ischemia [8]. Acute renal failure was not identified as a predictive factor for failure of medical treatment in our series.

Abdominal CT scan: Abdominal CT scan plays an essential role in the positive, etiological, and severity diagnosis of AIO, with sensitivity and specificity ranging from 78% to 100%. It cannot predict who will benefit from conservative treatment in cases of partial SBO [1]. However, the signs of severity observed on CT scan, particularly the presence of abundant effusion (p=0) and mesenteric edema are indicators of surgical necessity. The Bologna guidelines [5] emphasize that signs of ischemia, such as a lack of enhancement of the intestinal wall, are specific criteria for intestinal necrosis justifying surgery. In the intestinal necrosis prediction score developed by Bouassida et al. (2022) on 124 patients treated for AIO, the lack of intestinal enhancement and mesenteric edema were considered crucial parameters for deciding on surgical intervention [9].

Management of proximal intestinal obstructions: Resuscitation is paramount in the successful management of bowel obstruction.

Etiologies: The etiology of AHIO varies significantly, with postoperative adhesions dominating the causes in this study, accounting for 74.6% of cases (N=112). Other notable etiologies include Crohn's disease of the ileocecal region (N=16) and strangulated hernias (N=10). The choice of treatment depends critically on the specific etiology, with strangulated hernias requiring surgical intervention in 100% of cases, while postoperative adhesions might be managed conservatively under certain conditions. This variability underscores the importance of precise etiological assessment to guide the most appropriate therapeutic strategy, recognizing that each underlying cause presents unique clinical challenges and management considerations.

Non-operative treatment: Non-operative treatment is effective in most patients with acute SBO [5]. The treatment of AHIO includes correction of electrolyte disorders, volume compensation with appropriate replacement solutions, and especially digestive decompression using a nasogastric tube [5]. Medical treatment plays a crucial role in the management of partial AHIO, with about 60% to 70% of patients benefiting from a non-surgical approach [1]. However, a delay in surgical intervention of more than 24 hours increases the risk of requiring digestive resection, which increases morbidity and mortality [10]. Although medically treated patients have a shorter hospital stay, they have a higher recurrence rate and a shorter readmission time [11].

Surgical treatment: Surgical intervention is indicated when strangulation mechanism is suspected to develop during non-operative treatment, or when conservative treatment fails [1]. Results and morbidity rates can be affected by factors such as patient age, comorbidities, and severity of obstruction. A study conducted by Behman et al., published in the Journal of Trauma Acute Care Surgery in 2019, recommends opting for early surgical treatment during the first episode of AIO due to adhesions, as early intervention has proven to be very effective, with a lower recurrence rate. A delay in surgical intervention exposes patients to an increased risk of intestinal resection [12]. In a retrospective analysis of 1,613 patients conducted by Leung et al., [10] it was observed that for those operated on within 24 hours, only 12% underwent intestinal resection, while this figure rose to 29% for those operated on after 24 hours. Furthermore, this study revealed that the complication rate, as well as prolonged hospital stays and deaths, were higher in patients admitted for high AIO and operated on after a period of 4 days or more. The 2013 World Society of Emergency Surgery (WSES) guidelines for management of adhesive small bowel obstruction provide valuable recommendations for clinical practice [13]. These guidelines suggest that medical treatment can be extended up to 72 hours in the absence of signs of strangulation or peritonitis, with surgery recommended if symptoms persist beyond this period. However, the lack of objective criteria to identify patients likely to respond to conservative treatment remains a challenge. In our series, 86% of patients underwent surgery within 48 hours of admission, with the average time between admission and surgery ranging from 2 to 6 days according to various studies. This approach aligns with the WSES guidelines, which emphasize the importance of close monitoring and timely intervention in cases of small bowel obstruction.

The classic approach

Laparotomy: In our series, the majority of patients (98.2%) were operated on by the classic approach, which is not surprising given the significant abdominal adhesions in some patients with a scarred abdomen. Laparotomy is considered the gold standard for surgical treatment of AIO [5-13], despite potential complications such as wall abscesses and postoperative adhesions. It is often used in cases of strangulation mechanism or after failure of conservative treatment.

The laparoscopic approach: When operative treatment is required, a laparoscopic approach may be beneficial for selected cases of simple AHIO [5]. Laparoscopic adhesiolysis has a number of potential advantages including less postoperative pain, faster return of intestinal function, shorter hospital stays, reduced recovery time, allowing an earlier return to full activity, fewer wound complications, and decreased postoperative adhesion formation [6]. It has become the preferred surgical approach under certain conditions: intervention within 24 hours of symptom onset, absence of signs of peritonitis on physical examination, low rate of previous open surgery and adequate surgeon experience due to associated risks [14]. According to the Bologna guidelines, laparoscopy is recommended in patients with minimally distended small bowel or single non-complex adhesions [5]. Although laparoscopic adhesiolysis is encouraged due to technological advances and increasing surgeon experience, it is not yet standardized. In our series, only 1 patient (1.8%) was operated on laparoscopically, reflecting the current practice in our institution. However, it's worth noting that younger surgeons are increasingly gravitating towards laparoscopic approaches for AHIO management [15].

Complications

Intraoperative complications: Intraoperative complications in AHIO surgery are influenced by various factors, including an-

esthesia type, surgeon expertise, surgical technique, and equipment sterility [5]. While our study did not focus on general complications, we observed specific complications related to adhesiolysis. Complicated adhesiolysis, which involves inadvertent injury during the procedure, is a notable concern. Bowel injuries are the most frequent complications during adhesiolysis and can be categorized as seromuscular injuries, enterotomies, or delayed diagnosed perforations [5]. In our series, 3 patients (5.2%) experienced seromuscular injuries of the small intestine, which were promptly repaired without postoperative sequelae. Laparoscopic surgery for AHIO generally carries a lower risk of intestinal perforation, particularly when performed by experienced surgeons on patients without previous abdominal surgeries and with minimal small bowel distension [5]. This approach offers potential benefits in terms of reduced complications, although its application depends on specific patient and clinical factors.

Postoperative complication: Postoperative complications following adhesive SBO surgery remain a significant concern, affecting 15.7% of patients in our study. The most common complications included wall abscesses and respiratory infections (5.3% each), followed by paralytic ileus (3.5%) and short bowel syndrome (1.8%). Recent studies, however, suggest that laparoscopic management of AHIO may lead to improved postoperative outcomes. Nordin et al.'s retrospective matched-pair analysis demonstrated significant benefits of laparoscopy, including a 60% reduction in postoperative length of stay (P<0.001), fewer major complications, and a 50% decrease in surgery duration (P<0.001) [16]. These findings indicate that laparoscopy could be a safer alternative to laparotomy for AHIO treatment, potentially reducing morbidity.

Mortality: Patient age and therapeutic approach significantly influence patient prognosis.

Geriatric patients (>75 years) exhibit a 4-5-fold increase in mortality risk compared to younger cohorts. A Russian multicenter retrospective analysis emphasized the critical role of surgical timing on patient outcomes [17]. Early operative intervention (4-12 hours post-admission) in elderly patients without confirmed intestinal ischemia was associated with unexpectedly elevated mortality rates. Current literature advocates for extended non-operative management in geriatric patients without signs of bowel strangulation, as surgical intervention in this demographic is linked to substantially higher morbidity and mortality rates. Conversely, delayed surgical intervention (24-48 hours post-admission) in hemodynamically stable patients did not demonstrate worsened outcomes. Notably, all patients undergoing surgery after 24 hours in the referenced study survived, suggesting that prolonged conservative management in stable patients without apparent strangulation mechanism may be advantageous, even in cases of unrecognized ischemia. Our series revealed a 2.7% overall mortality rate, with 25% of fatalities occurring in patients over 75 years old. Septic shock was the primary cause of death in 75% of these cases. All four deceased patients underwent surgical intervention within 24 hours of admission. Contrary to existing literature, our study attributed mortality predominantly to patients with significant comorbidities and complex medical histories. When evaluating mortality risks associated with surgical intervention versus unrecognized strangulation mechanism, clinical decision-making should prioritize a rigorously reasoned approach based on etiology provided by CT imaging and the patient comorbidities. Injudicious escalation of surgical intervention may lead to increased adverse outcomes.

Conclusion

Surgical management in small bowel occlusion is influenced by a complex interplay of clinical, biological, and imaging factors. Key predictive factors identified in our study include one clinical finding (female sex), two inflammatory markers (CRP and leukocytosis) and two imaging findings (abundant effusion and mesenteric edema) suggestive of severity and predictive of the conservative approach failure. Timely surgical intervention, particularly in cases of intestinal ischemia or hernias, is essential to reduce morbidity and mortality. Further studies should explore optimal timing for surgical intervention to enhance decision-making in AHIO management.

Declarations

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Competing interests: None.

Authors' contributions: Nbg Contributed to Work Conception and Collected Data, Gr and Yc Revised the Manuscript, Am Wrote the Manuscript, Bsm Supervised the Study.

Consent: Written informed consent for publication of their clinical details and/or clinical images was obtained from the patients.

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