



Intestinal Obstruction Etiology, Diagnosis and Management

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Bowel obstruction is a leading cause of illness and mortality in the United States. Mechanical intrinsic luminal blockage or extrinsic compression are the causes of bowel obstruction. A full blood count and a metabolic panel must be performed on patients with suspected blockage in the laboratory. Patients with simple emesis may develop hypokalemic, hypochloremic metabolic alkalosis. Dryness is associated with higher blood urea nitrogen levels, as well as increased haemoglobin and hematocrit levels. It's possible that your white blood cell count will rise. When the forward movement of intestinal contents is interrupted, acute intestinal blockage occurs. This disruption can occur anywhere throughout the gastrointestinal tract's length. The treatment of intestinal blockage focuses on reversing the physiologic changes caused by the obstruction, bowel rest, and eliminating the obstruction's source. The goal of this study is to learn more about the causes, diagnosis, and treatment of intestinal blockage.

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1. INTRODUCTION

Over the last 100 years, the anatomical location of Bowel Obstruction (BO) has endured unchanged; however, the etiological factors in small and large BO have altered significantly. With the advance of time more and more elderly patients are presenting with BO [1]. But still, BO continues to be one of the most common surgical emergencies [2] encountered in overall surgery units and it continues to be a major cause of morbidity and financial expenditure [3]. Peritoneal adhesions and hernia were the most common causes of BO and contributed 42.3% [4]. All patients of BO are potential candidates for major abdominal surgery with long-term morbidity and possible mortality. Henceforth, the decision of surgery and its timing is vital. Numerous factors are considered for deciding on operative or non-operative management. The factors considered are the age of the patients, period of obstruction, the volume of nasogastric aspirate, findings on the radiological imaging, earlier abdominal surgeries and malignancy.

A mechanical or functional obstruction of the small or large intestines is known as a bowel obstruction. When the gut lumen becomes partially or fully obstructed, the obstruction develops. Abdominal pain, nausea, vomiting, constipation-to-obstipation, and distention are all common symptoms of obstruction. This, by coincidence, obstructs the usual flow of digested materials. Small bowel obstructions (SBOs) are more common than large bowel obstructions (LBOs), and surgery on the small intestines is the most common recommendation. Partially, completely, or completely closed loops are the three types of bowel blockages. A closed-loop obstruction is a type of minor or big intestinal obstruction in which the intestine is completely blocked both distally and proximally in the given segment [5,6,7].

SBO incidence is about 350,000/annum in the USA. Etiologies include adhesions (65%), hernias (10%), neoplasms (5%), Crohn's disease (5%), and others (15%). Bowel dilatation happens proximal to obstruction primarily from swallowed air and secondarily from intraluminal fluid accretion. Dilatation increases mural tension, decreases mucosal perfusion, origins bacterial proliferation, and decreases mural tensile strength that increases bowel puncture risks. Classical clinical tetrad is abdominal pain, nausea and emesis, abdominal distention, and constipation-to-obstipation. Physical examination

may reveal restlessness, acute illness, and signs of dehydration and sepsis, with tachycardia, pyrexia, dry mucous membranes, hypotension/orthostasis, abdominal distention, and hypoactive bowel sounds. Severe direct tenderness, involuntary guarding, abdominal rigidity, and rebound tenderness suggest advanced SBO, as do marked leukocytosis, neutrophilia, bandemia, and lactic acidosis [8].

Intestinal obstruction accounts for approximately 15 percent of all emergency section visits for acute abdominal pain [9]. Complications of intestinal obstruction include bowel ischemia and puncture. Morbidity and mortality associated with intestinal obstruction have declined since the arrival of more sophisticated diagnostic tests, but the disorder remains a challenging surgical diagnosis. Physicians who are treating patients with intestinal obstruction must weigh the risks of surgery with the penalties of inappropriate conservative management. A suggested method to the patient with suspected small bowel obstruction.

Bowel blockage is a major cause of morbidity and mortality, accounting for almost 30,000 deaths and more than \$3 billion in direct medical costs each year in the United States; it accounts for around 15% of hospital charges for acute abdominal pain and 20% of patients requiring emergency surgical care [10,11]. The aetiology of bowel obstruction is based on mechanical intrinsic luminal blockage or extrinsic compression. A lack of enteric propulsion causes a dynamic ileus and colonic pseudo-obstruction [12]. Drugs, trauma, the surgical phase, metabolic disturbances, and other factors might produce colonic pseudo-obstruction and adynamic ileus [12,13]. Small bowel obstruction is caused by adhesions, hernias, and neoplasms in 90% of cases [14]. Adhesive small intestinal obstruction accounts for 55–75% of all occurrences of small intestine obstruction [15]. For the rest, hernias and small bowel tumours are interpreted [11]. Cancer is responsible for roughly 60% of large bowel obstructions [16]; volvulus and diverticular disease are responsible for the remaining 30%. [10]. The remaining 10–15 percent of intestinal obstructions are due to diverse causes (carcinomatosis, endometriosis, inflammatory bowel disease stenosis, etc.). To be better included in the gastric outlet obstruction unit, this review focuses the management of bowel obstruction omitting duodenal mechanical obstruction [17].

2. ETIOLOGY

Small and big bowel blockages can have a variety of causes, which are classed as extrinsic, intrinsic, or intraluminal. Extrinsic causes are the most common cause of SBOs in industrialised countries, with post-surgical bands being the most common. Significant adhesions can cause bowel kinking, which can lead to obstruction. Adhesions are thought to affect at least two-thirds of people who have had previous abdominal surgery. Cancer, which causes the small bowel to become dense and obstructive, is another major extrinsic reason. Inguinal and umbilical hernias are less common but still common extrinsic reasons. As the small bowel protrudes through the gap in the abdominal wall and becomes imprisoned in the hernia sack, untreated or symptomatic hernias may eventually become kinked. Unidentified or unreducible hernias can cause bowel obstruction and be treated as a surgical emergency, with the strangulated or imprisoned intestine becoming ischemic over time. Intrinsic illness, which causes a gradual thickening of the intestinal wall, is another cause of SBO. The intestinal wall weakens over time, resulting in a stricture. In the adult population, Crohn's disease is the most common cause of benign stricture [18,19]. SBOs have less common intraluminal causes. When an ingested foreign body produces impaction inside the gut lumen or navigates to the ileocecal valve and is difficult to pass, producing a barricade to the large intestine, this operation is performed. Most foreign bodies that pass through the pyloric sphincter, on the other hand, will be able to pass through the rest of the gastrointestinal tract. LBOs are less mutual in nature, accounting for approximately 10% to 15% of all intestinal blockages. Adenocarcinoma is the most common cause of LBOs, followed by diverticulitis and volvulus. The sigmoid colon is the most common site of colon blockage

3. EPIDEMIOLOGY

Both males and females are equally affected by small and major intestinal blockages. Previous abdominal surgery, colon or metastatic cancer, chronic intestine inflammatory disease, current abdominal wall, and/or an inguinal hernia, earlier irradiation, and foreign body ingestion are all factors that influence the incidence and distribution of the disease [20,21].

4. PATHOPHYSIOLOGY

The absorption of food and the absorption of nutrients are both part of the small intestine's normal physiology. The large gut is still involved in digesting and is in charge of vitamin synthesis, water absorption, and bilirubin failure. These physiologic components will be hampered by any obstructive cause. The bowel enlarges proximal to the changeover point and contracts distally as a result of obstruction. Emesis is a symptom caused by partial or full blockage of digested items during obstruction. Recurrent emesis can cause dehydration and electrolyte imbalances. As the condition progresses and worsens, gut wall edoema develops, and third-spacing develops [22].

The effects of intestinal obstruction on whole-body fluid/electrolyte balances and the mechanical effect of increased heaviness on intestinal perfusion are the main concerns. The digestive tract widens near the point of obstruction as it fills with intestinal fluids and ingested air [23]. When intestinal fillings fail to travel through the intestinal track, flatus and bowel routines stop working. Small bowel blockage and big bowel obstruction are the two types of intestinal obstruction. Dehydration is indicated by fluid loss by emesis, intestinal edoema, and a reduction of absorptive ability.

Emesis causes a loss of stomach potassium, hydrogen, and chloride ions, while severe dehydration causes bicarbonate reabsorption and chloride loss in the renal proximal tubule, preserving metabolic alkalosis [24]. In addition to disrupting fluid and electrolyte balance, intestinal stasis causes an overgrowth of intestinal flora, which can lead to feculent emesis spreading. Furthermore, bacterial translocation across the bowel wall is indicated by an increase of intestinal flora in the small bowel [25].

5. CAUSES AND RISK FACTORS

Adhesions, neoplasms, and herniation are the most common causes of intestinal blockage. Small intestinal blockage is most commonly caused by adhesions from previous abdominal surgery, which are secretarial in about 60% of instances [26]. Appendectomies, colorectal surgery, gynecologic procedures, and hernia care are all associated with a higher incidence of adhesion small intestinal obstruction. Intestinal intussusception, volvulus, intra-abdominal

abscesses, gallstones, and foreign substances are less common causes of blockage.

6. HISTORY AND PHYSICAL EXAMINATION

Because these disorders increase the likelihood of blockage, patients should be asked about their history of abdominal neoplasia, hernia or hernia repair, and inflammatory bowel disease. Colicky stomach pain, nausea and vomiting, abdominal distension, and a cessation of flatus and bowel motions are all signs of intestinal obstruction. It's critical to distinguish between genuine mechanical obstruction and alternative causes of similar symptoms. Patients with proximal blockages may have minor abdominal distension but severe emesis, whereas patients with distal obstructions have a superior intestinal reservoir and have more discomfort and distension than emesis. Hypotension and tachycardia are both symptoms of severe dehydration. An enlarged, tympanitic abdomen may be palpable in patients with early or proximal blockage, however this finding may not be present. Early obstruction is characterised by high-pitched bowel noises, but late obstruction is characterised by modest bowel sounds when the intestinal system becomes hypotonic [27].

When a patient has a suspected bowel obstruction, the doctor should take a thorough medical history and inquire about any substantial risks associated with intestinal blockage. Many of the symptoms of small and big bowel blockages are similar. Quality, timing, and presentation, however, differ. Abdominal discomfort in SBO is often described as random and colicky, although it improves with vomiting, whereas pain in LBO is constant. SBO vomiting is more frequent, greater in volume, and bilious, as opposed to LBO vomiting, which is often recurring and feculent when present. Tenderness to palpation is evident in both situations, but it is more focal in SBO and more diffuse in LBO. With addition, in LBO, there is a lot of distention, and obstipation is more common. It's vital to remember that if the ileocecal valve isn't working properly, an LBO can look like an SBO. The insufflation of air from the large bowel into the small bowel might cause symptoms of an SBO if the ileocecal valve is ineffective [22].

- **Abdominal hernias • Abdominal pain in the elderly Differential diagnosis**
 - Appendicitis
 - Megacolon (chronic)

- Polyps in the colon
- Diverticulitis
- Empiric therapy for diverticulitis
- Surgery for pseudomembranous colitis
- Obstruction of the small intestine
- Megacolon toxic [22]

7. DIAGNOSTIC EVALUATION

7.1 Abdominal Plain X-ray

The first level radiologic study is an abdominal plain X-ray. Plain abdominal radiography data are diagnostic in 50–60% of patients with small intestinal obstruction, inconclusive in 20%–30% of patients, and deceptive in 10–20% of patients [28,29]. In one investigation, the sensitivity of intestinal blockage was much higher following radiography than after simply clinical assessment: 74 percent versus 57 percent, respectively (P 0.01). However, there was no significant difference in the positive predictive value between clinical valuation alone and plain radiography [30]. The abdominal X-ray had 84 percent sensitivity and 72 percent specificity in a study of 140 cases of suspected major intestinal blockage [31].

7.2 Water-soluble Contrast Administration X-ray

A water-soluble contrast enema can diagnose great bowel obstruction with 96 percent sensitivity and 98 percent specificity [31] but cannot distinguish between different causes of great bowel obstruction. Patients with severe small intestinal obstruction are frequently treated non-operatively using a small bowel follow-through with water-soluble contrast. Water-soluble contrast agents have been shown to be useful in the diagnosis of adhesive small intestinal obstruction in numerous systematic reviews and meta-analyses [32,33]. If the dissimilarity on an abdominal X-ray 24 hours after treatment has not reached the colon, this is extremely indicative of non-operative management failure [34]. The use of water-soluble contrast compounds has been established in numerous trials to accurately anticipate the need for surgery with a strong therapeutic role [32,35,36,37]. Although the use of water-soluble contrast chemicals in adhesive small intestinal obstruction has been shown to be safe in terms of morbidity and mortality, adverse effects have been documented. Aspiration pneumonia and pulmonary edema are two

potentially fatal consequences. The contrast medium should be controlled after the stomach has been properly decompressed by a nasogastric tube to avoid these issues. Another possible side effect is that, due to their higher osmolarity, water-soluble contrast agents may further desiccate a patient with a small bowel obstruction, allowing instable fluids into the bowel lumen; in some children and elderly adults, the loss of plasma fluid may be sufficient to cause a shock-like state [38].

7.3 Ultrasound

If there are > 2.5-cm dilated loops of the bowel proximal to distorted loops and there is diminished or absent peristalsis activity, small intestinal obstruction can be detected using ultrasonography [39]. Ultrasound has a sensitivity of 90% and a specificity of 96% for detecting minor intestinal obstructions [40]. Ultrasound is just as good as computed tomography for detecting major intestinal obstruction. In terms of etiologic definition for small bowel blockage and large bowel obstruction, computed tomography is more comprehensive than ultrasound [41,42]. In cases of large intestinal obstruction, ultrasound is more effective than planar abdominal X-ray (43).

7.4 Computed Tomography Scan

Computed tomography with intravenous contrast has a higher diagnostic accuracy than conservative abdominal radiography and ultrasound. A notable benefit of computed tomography, in addition to its better sensitivity and specificity, is its ability to provide information regarding the underlying cause of obstruction or an alternate diagnosis if no indications of intestinal obstruction are present. The use of computed tomography allows for more precise treatment and preoperative planning [44]. Because the intraluminal fluid and gas already present within the obstructed bowel are good dissimilarity agents, a positive oral contrast physical is not required in the diagnosis of small intestinal obstruction using computed tomography. If a patient with small bowel blockage has received positive oral contrast material, a late abdominal radiograph taken during non-operative therapy can determine if the contrast material has moved to the colon. When there are concerns regarding the diagnosis of a major bowel blockage, a water-soluble rectal contrast agent can be used to better see the obstruction.

7.5 Magnetic Resonance Imaging

Magnetic resonance imaging [45] is a good alternative inspection to computed tomography scan for intestinal blockage to minimise the burden of ionising radiation in children and pregnant women: prospective study exhibited compassion of 95% and specificity of 100%. [46].

7.6 Colonoscopy

The value of colonoscopy in diagnosing major intestinal obstruction is limited. The goal is to rule out any other potential stumbling blocks. When no spare surgery has been assigned and endoscopic stent placement is likely in cases of suspected malignancy, a biopsy should be performed [47].

7.8 Imaging and Diagnostic Testing (Laboratory Tests)

A full blood count and a metabolic panel should be performed in patients with suspected blockage. Patients with simple emesis may develop hypokalemic, hypochloremic metabolic alkalosis. Dehydration is associated with elevated blood urea nitrogen levels, as well as an increase in haemoglobin and hematocrit. If intestinal bacteria translocate into the circulation, a condition known as sepsis, the white blood cell count may rise. The progression of metabolic acidosis, particularly in patients with rising serum lactate levels, may indicate intestinal ischemia [27].

8. TREATMENT

An assessment of the patient's airway, breathing, and circulation should always be part of the first care. If resuscitation is required, isotonic saline and electrolyte replenishment should be used. If the patient is unstable or septic, a Foley catheter should be used to monitor the patient's urine production. The placement of a nasogastric tube will allow for intestinal decompression and the removal of distention proximal to the obstruction. The installation of a nasogastric tube will also help to control emesis, allow for accurate intake and output measurements, and reduce the risk of aspiration [22].

Modifying physiologic derangements produced by the obstruction, bowel rest, and eliminating the source of obstruction are all part of the treatment for intestinal obstruction. Intravenous fluid revival with isotonic fluid is used to treat the former. The lowest prerequisite for determining resuscitation competence is the use of a bladder

catheter to closely monitor urine output; other invasive procedures, such as arterial canalization or central venous pressure monitoring, can be performed as the clinical circumstances enables. Antibiotics are used to treat bacterial overgrowth and translocation through the gut wall of the intestine [48]. The presence of fever and leukocytosis necessitates the immediate addition of antibiotics to the first therapy regimen. Antibiotics should protect against gram-negative bacteria and anaerobes, with the specific antibiotic chosen based on local susceptibility and convenience. After confirming good renal function, aggressive electrolyte replacement is recommended.

9. THERAPY NON SURGICAL (CONSERVATIVE) TREATMENT

Unless there are evidence of intestinal ischemia/perforation, conservative treatment is the cornerstone of nonoperative organisation in all patients with adhesion small intestine obstruction. Although there is no consensus on the recommended duration of non-operative care, most experts believe that a 72-hour cutoff is safe and suitable [49]. Nil per os and decompression with naso-gastric suction or a long intestinal tube are the mainstays of non-operative administration. Long intestinal tubes are more active than naso-gastric tubes in the treatment of severe small bowel obstruction, according to the literature: long trilumen naso-intestinal tubes are more active than naso-gastric tubes, but they require endoscopic insertion [50]. Water-soluble contrast management is a valid and safe treatment that has been linked to a large reduction in the need for surgery in patients with adhesion small intestinal obstruction, as well as a considerable decrease in the time to diagnosis and duration of stay. Water-soluble difference is a safe treatment that hasn't resulted in any substantial alterations in complications or mortality [51, 52].

10. SURGERY

For most abdominal wall complex hernias, prosthetic repair is the treatment of choice (inguinal, femoral, incisional, umbilical, epigastric, parastomal, spigelian, etc.). Suture repair is preferred in the case of perforation/bowel resection with contaminated surgical fields due to the risk of mesh infection. After complex hernias have been reduced, diagnostic laparoscopy may be a useful tool for assessing intestinal viability. When no bowel

resection anastomosis is required, a laparoscopic approach can be used to repair a complex hernia. Otherwise, a mini-open method (small laparotomy) is required. Internal hernias are treated by early reduction, suture repair, and, in cases of intestinal necrosis, bowel resection anastomosis [53].

11. CONCLUSION

There are numerous potential etiologies of small and large bowel obstructions that are classified as either extrinsic, intrinsic, or intraluminal. The most mutual cause of SBOs in industrialized nations is from extrinsic sources, with post-surgical bonds being the most common. The fundamental concerns about intestinal obstruction are its result on whole-body fluid/electrolyte balances and the mechanical effect that increased heaviness has on intestinal perfusion. Suspected bowel obstruction necessitates the practitioner to obtain a detailed medical history inquiring about significant risk issues related to bowel obstruction. Small and large bowel obstructions have many overlapping symptoms. The morbidity and mortality associated with intestinal obstruction has decreased since the advent of more complex diagnostic tests, but the condition remains a surgical challenge for diagnosis. Physicians treating patients with intestinal obstruction must weigh the risks of surgery against the consequences of inappropriate conservative management.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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