INTESTINAL OBSTRUCTION: AN OVERVIEW OF AETIOLOGY, EVALUATION AND MANAGEMENT

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Abstract:
Intestinal obstruction occurs when there is an interruption in the forward flow of intestinal contents. This interruption can occur at any point along the length of the gastrointestinal tract, and clinical symptoms often depend on the level of obstruction. Intestinal obstruction is most commonly caused by intra-abdominal adhesions, malignancy, or intestinal herniation. The clinical presentation generally includes colicky abdominal pain, vomiting, abdominal distension and constipation. Radiologic imaging can confirm the diagnosis. Although radiography is often the initial study, non-contrast computed tomography is recommended if the index of suspicion is high or if suspicion persists despite negative radiography. Management of uncomplicated obstructions includes fluid resuscitation with correction of metabolic derangements, intestinal decompression, and bowel rest. Evidence of vascular compromise or perforation, or failure to resolve with adequate bowel decompression is an indication for surgical intervention.

Key Words: Intestinal Obstruction, Bands and adhesions, abdominal malignancy

Introduction
Intestinal obstruction refers to any form of impedance to the normal passage of bowel content through the small or large intestine. Obstruction can be functional (due to abnormal intestinal physiology) or due to a mechanical obstruction, which can be acute or chronic.¹ Mechanical obstruction of the intestine can be partial or complete. According to the presence or absence of adequate blood supply mechanical obstruction of the intestine can be simple or strangulated obstruction. Intestinal obstruction accounts for approximately 15 percent of all emergency department visits for acute abdominal pain.² Intestinal obstruction is a common surgical emergency that carries a favourable prognosis if recognized and treated promptly. Complications of intestinal obstruction include bowel ischemia and perforation. When cases of intestinal obstruction present late, go undiagnosed or are resuscitated inadequately before surgery, high morbidity and mortality rates may result. Mechanical obstruction often require corrective surgery, whereas functional obstruction, with certain exceptions, relies of conservative management. Aetiology, manifestations, diagnosis, and management of intestinal obstruction will be reviewed here.
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Pathophysiology

a) Simple mechanical obstruction: Intestinal obstruction causes proximal bowel to dilate as fluid and gas accumulate. Distal to the site of obstruction, bowel continues to function until it collapses. Stretch receptors in the proximal bowel are stimulated and the obstructed bowel responds to this distention initially by increased peristaltic activity, which results in colicky abdominal pain. Increased peristaltic activity continues until the obstruction is overcome; otherwise, the activity of the proximal bowel is ultimately overridden by an inhibition of motor activity. It is a protective mechanism.

Fluid loss from vomiting, bowel edema, and loss of absorptive capacity leads to dehydration. Vomiting leads to loss of gastric potassium, hydrogen, and chloride ions, and significant dehydration stimulates renal proximal tubule reabsorption of bicarbonate and loss of chloride, perpetuating the metabolic alkalosis. In addition to derangements in fluid and electrolyte balance, intestinal stasis leads to overgrowth of intestinal flora and leads to bacterial translocation across the bowel wall.

b) Intestinal obstruction with strangulation: Ongoing dilation of the intestine increases luminal pressures. When luminal pressures exceed venous pressures, loss of venous drainage causes increasing edema and hyperemia of the bowel. This may eventually lead to compromised arterial flow to the bowel, causing ischemia, necrosis, and perforation. Alternatively, mesenteric blood flow may be interrupted by direct vascular occlusion (intestinal entrapment in a hernial sac, volvulus and intussusception). The profound sepsis that accompanies the development of intestinal necrosis is a consequence of the release of predominantly anaerobic bacteria form the compromised intestine. A closed-loop obstruction, occurs when the intestine is obstructed at two locations, creating a segment with no proximal or distal outlet. Closed-loop obstruction can rapidly progress to bowel strangulation.

c) Functional intestinal obstruction: May affect both the small and large intestine and occurs when normal intestinal motility ceases in the absence of a mechanical cause.

Pathophysiology of intestinal obstruction:

Obstructed bowel accumulates pre-existing fluid and gas

Increased intraluminal pressure → Ongoing secretion of fluid into GI tract

Stretch receptors activated

Increased peristalsis → Depletion of ECF volume

Further rise in intraluminal pressure

Increased wall tension → Cessation of peristaltic activity

Impaired venous return

Capillary engorgement → Sequestration of blood in affected gut

Progressive bowel wall edema → Further hypovolaemia

Arterial supply occluded

Intestinal ischemia

Intestinal necrosis → Migration of aerobic and anaerobic bacteria across intestinal wall

Generalized sepsis

Circulatory collapse

Aetiology

Classification of type of obstruction:

| Extrinsic | Intrinsic | Luminal |
|-----------|-----------|---------|
| Adhesions | Tuberculosis | Parasites |
| Hernia | Carcinoma | Polypoid tumors |
| Volvulus | Crohn's disease | Foreign bodies |
| Intussusception | Congenital atresia | Gall stones |
| Inflammatory masses | Bezoars |

Small bowel mechanical obstruction accounts for about 80% of all cases of mechanical obstruction. Adhesions resulting from prior abdominal surgery are the predominant cause of small bowel obstruction, accounting for approximately 60 percent of cases.
**Fig 1:** Sigmoid colon volvulus

**Fig 2:** Sigmoid colon volvulus with gangrene

**Fig 3:** Compound volvulus

**Fig 4:** Mesenteric vascular occlusion with gangrene of small gut
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Ascaris lumbricoids is cause of intestinal obstruction

Small intestinal GIST was the cause of intestinal obstruction

Fig. 5: Ascaris lumbricoids is cause of intestinal obstruction

Fig. 6: Foreign body is cause of intestinal obstruction

Fig. 7: Small intestinal GIST was the cause of intestinal obstruction

Causes of functional intestinal obstruction
- Reflex inhibition of motor activity
- Postoperative paralytic ileus
- Spinal injury
- Retroperitoneal haemorrhage
- Head injury
- Chest infection

Drug induced
- Tricyclic antidepressants
- General anaesthetics

Mesenteric vascular diseases
- Mesenteric arterial embolus
- Mesenteric venous thrombosis

Metabolic
- Hypokalaemia
- Hyponatraemia
- Hypothermia
- Diabetic ketoacidosis
- Uraemia

Peritoneal sepsis
- Peritonitis
- Pelvic and interloop abscesses

Diagnosis

Symptoms
The hallmarks of intestinal obstruction include abdominal pain, vomiting, abdominal distension, and constipation. Symptoms vary according to the level of obstruction.

- Pain- mechanical obstruction causes colicky pain, whereas functional bowel obstruction usually causes vague abdominal discomfort. Mechanical obstruction of small intestine and proximal colon results in central abdominal colic and obstruction of the distal colon (embryological hind-gut) results in poorly localized hypogastric discomfort. A change from colicky to constant abdominal pain is associated with the development of ischemia.

- Distention- Distal obstructions allow for a greater intestinal reservoir and distension more marked.

- Vomiting occurs early with proximal intestinal obstruction.

- Constipation- failure to pass faeces or flatus is the hallmark of complete intestinal obstruction. Passage of flatus alone is indicative of subacute obstruction.
Signs

- **Tachycardia** may be due to hypotension or may reflect bowel ischemia.

- **Hypotension** may represent hypovolaemia or development of septic shock in patients with strangulated intestinal obstruction.

- **Temperature** - a rise in temperature, coupled with a tachycardia and peritoneal irritation suggests intestinal ischemia.

- **Abdominal tenderness** - simple intestinal obstruction results in poorly localized abdominal tenderness. Bowel ischemia causes focal peritoneal signs.

- **Abdominal percussion** may reveal a tympanitic abdomen.

- **Auscultation** in patients with early obstruction reveals high-pitched bowel sounds, whereas those with late obstruction may present with minimal bowel sounds as the intestinal tract becomes hypotonic.

- **Hernial orifices** - examination of the hernial orifices is mandatory in all patients.

- **Rectal examination** - the rectum is often empty but may reveal rectal tumor, deposits in the Pouch of Douglas.

Investigations

a) **Serology**

Laboratory evaluation of patients with suspected obstruction should include a complete blood count, blood urea, serum creatinine and metabolic panel. Hypokalemic, hypochloremic metabolic alkalosis may be noted in patients with severe vomiting. Elevated blood urea nitrogen levels are consistent with dehydration, and hemoglobin and hematocrit levels may be increased. The white blood cell count may be elevated if intestinal bacteria translocate into the bloodstream. The development of metabolic acidosis, especially in a patient with an increasing serum lactate level, may signal bowel ischemia.

b) **Abdominal radiography**

Supine abdominal radiograph is the initial method of confirming the presence of intestinal obstruction and it is confirmatory in 60% of patient with intestinal obstruction.  

| Characteristic findings of intestinal obstruction |       |
|--------------------------------------------------|-------|
| Small intestinal obstruction                      | Large intestinal obstruction |
| Bowel loops with valvulae conviventes which traverse the diameter of the gut. | Haustral fold which incompletely traverse the gut. |
| Central bowel loops                               | Dilated bowel in the periphery of the film. |
| Pathological dilatation is present if bowel diameter exceeds 5cm | Pathological dilatation is present if bowel diameter exceeds 8 cm. |

c) **Ultrascanography**

Ultrasound has a limited role in the diagnosis of intestinal obstruction because the presence of dilated bowel hinders image acquisition. Ultrasonography remains a valuable investigation for unstable patients with an ambiguous diagnosis and in patients for whom radiation exposure is contraindicated, such as pregnant women.

d) **Contrast fluoroscopy**

Incomplete intestinal obstruction is readily diagnosed using barium studies, though barium is contraindicated if complete obstruction is suspected. A single contrast study using water soluble contrast material is recommended method of differentiation mechanical and functional bowel obstruction. There are several variations of contrast fluoroscopy. In the small-bowel follow-through study, the patient drinks contrast material, then serial abdominal radiographs are taken to visualize the passage of contrast through the intestinal tract. Enteroclysis involves naso- or oroduodenal intubation, followed by the instillation of contrast material directly into the small bowel. Rectal fluoroscopy can be helpful in determining the site of a suspected large bowel obstruction.

e) **CT Scan:**

CT is appropriate for further evaluation of patients with suspected intestinal obstruction in whom clinical examination and radiography do not yield a definitive diagnosis. CT scan identifies obstruction in up to 95% of cases. CT Scan may show level of obstruction, cause of obstruction, viability of involved bowel.

CT findings in patients with intestinal obstruction include dilated loops of bowel proximal to the site of obstruction, with distally decompressed bowel. Thickened intestinal walls and poor flow of contrast material into a section of bowel suggests ischemia,
whereas pneumatosis intestinalis, free intra-peritoneal air, and mesenteric fat stranding suggest necrosis and perforation. Therefore, in most patients, CT should be ordered when the diagnosis is in doubt.

**f) Magnetic resonance imaging**

Magnetic resonance imaging (MRI) may be more sensitive than CT in the evaluation of intestinal obstruction. MRI enteroclysis, which involves intubation of the duodenum and infusion of contrast material directly into the small bowel, can more reliably determine the location and cause of obstruction.

**Treatment of intestinal obstruction**

Management of intestinal obstruction is directed at correcting physiologic derangements caused by the obstruction, bowel rest, and removing the source of obstruction.

a) Non-operative treatment and resuscitation

Initial non-operative treatment comprises:
- Intravenous fluid resuscitation
- Nil by mouth (intestinal rest)
- Nasogastric decompression

Absence of tachycardia, fever, tenderness and leucocytosis indicates that non-operative treatment is safe. Operative intervention is indicated if one or more of these parameters changes. Resuscitation of the patient with intestinal obstruction is of crucial importance, whether or not early surgical intervention is anticipated. Premature surgery in patients who have not undergone correction of hypovolaemia or electrolyte disturbances may cause cardiac or renal complications. Before initiating resuscitation it is important to establish: the likely cause of intestinal obstruction, estimated fluid deficit, likely electrolyte imbalance.

**Parameters used to guide resuscitation**

| Physiological       | Biochemical          |
|---------------------|----------------------|
| Mandatory Pulse     | Mandatory Haematocrit|
| Blood pressure      | Serum electrolytes   |
| Hourly urine output |                     |

**Second line**

- Central venous pressure
- Arterial blood gases

The use of a bladder catheter to closely monitor urine output is the minimum requirement for gauging the adequacy of resuscitation. Antibiotics are used to treat intestinal overgrowth of bacteria and translocation across the bowel wall. The presence of fever and leukocytosis should prompt inclusion of antibiotics in the initial treatment regimen. Antibiotics should have coverage against gram-negative organisms and anaerobes.

Conservative management is successful in 40 to 70 percent of clinically stable patients, with a higher success rate in those with partial obstruction.

Although conservative management is associated with shorter initial hospitalization (4.9 versus 12 days), there is also a higher rate of eventual recurrence (40.5 versus 26.8 percent). With conservative management, resolution generally occurs within 24 to 48 hours. Beyond this time frame, the risk of complications, including vascular compromise, increases. If intestinal obstruction is not resolved with conservative management, surgical evaluation is required.

b) Operative treatment

The decision to perform surgery for intestinal obstruction can be difficult. Peritonitis, clinical instability, or unexplained leukocytosis or acidosis are concerning for abdominal sepsis, intestinal ischemia, or perforation; these findings mandate immediate surgical exploration.

General aims of operating on patients with intestinal obstruction are:

i. decompress the obstructed bowel
ii. correct the cause
iii. maintain intestinal continuity

In reality, these aims often require modification according to the pathology encountered. Patients with an obstruction that resolves after reduction of a hernia should be scheduled for elective hernia repair, whereas immediate surgery is required in patients with an irreducible or strangulated hernia. Stable patients with a history of abdominal malignancy or high suspicion for malignancy should be thoroughly evaluated for optimal surgical planning. Abdominal malignancy can be treated with primary resection and reconstruction or palliative diversion.

Treatment of stable patients with intestinal obstruction and a history of abdominal surgery presents a challenge. Conservative management should be attempted initially, using nasogastric decompression, aggressive intravenous rehydration, and antibiotics.
A common problem is the determination of viability, the most useful criteria for which are intestinal color, motility and presence of mesenteric arterial pulsation. Bowel of dubious viability should be warmed and oxygen delivery increased to restore effective tissue oxygenation. Bowel resection is carried out in intestine fails to return to normal. Anastomosis should be performed only if both ends are viable.

Conclusion
Morbidity and mortality associated with intestinal obstruction have declined since the advent of more sophisticated diagnostic tests, but the condition remains a challenging surgical diagnosis. Physicians who are treating patients with intestinal obstruction must weigh the risks of surgery with the consequences of inappropriate conservative management.

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