



Perspectives on Mechanical Small Bowel Obstruction in Adults



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Abstract

Small bowel obstruction is a serious and costly medical condition indicating often emergency surgery. Delay in operative intervention may lead to an unnecessary bowel resection, an increased risk of perforation and an overall worsening of patient morbidity and mortality. A thorough history and examination would distinguish simple from strangulation obstruction and facilitate appropriate management. The article reviewed small bowel obstruction and emphasized the importance of history taking and examination in the early diagnosis of its cause, thus, facilitating appropriate management.

Keywords: Small bowel; Obstruction; Mechanical; Clinical features; Treatment

Introduction

Small bowel obstruction accounts for about 85% of cases of intestinal colic and the other 15% are due to large bowel obstruction [1]. It is a serious and costly medical condition constituting 1.9% of all hospital and 3.5% of all emergency treatment that has led to laparotomy in the United States [2-4]. The main clinical issue is to determine whether the obstruction affects the small bowel or the colon, since the causes and treatments are different. Delay in operative intervention may lead to an unnecessary bowel resection, an increased risk of perforation and an overall worsening of patient morbidity and mortality. The overall mortality is approximately 10% and is greatest in patients with ischaemic bowel which may or may not have perforated prior to surgery [2,5,6]. The most common causes of death are intra-abdominal sepsis, myocardial infarction and pulmonary embolism [1-6]. Intestinal obstruction may be mechanical which presents with colicky pain or paralytic which is painless being aperistaltic. The latter is commonly seen in postoperative ileus which resolves after 24-48 hrs or from electrolyte (potassium) imbalance with diuretic use [6,7]. Mechanical obstruction may be due to obstruction in the wall, in the lumen or outside the wall of the bowel (Table 1) [2]. There is a degree of overlap as mechanical obstruction can progress to paralytic obstruction (ileus) as it becomes more severe. Small bowel obstruction may be simple obstruction that can wait for 24hrs or strangulating obstruction (closed-loop) where there

is interruption of the blood supply of the bowel requiring an immediate operation [2,6-10].

Table 1: Causes of mechanical small bowel obstruction. The most common cause is the start of the list.

Extrinsic	In the wall	In the lumen
Adhesions (Europe 60%, Africa 10%): usually from previous surgery, intra-abdominal sepsis	Crohn's disease	Meconium ileus (neonate)
Strangulated hernias (Europe 20%, Africa 50%)	Intussusception	Gallstones (Gallstone ileus)
Volvulus (Europe 5%, Africa 30%)	Other inflammatory strictures	FB (Esp after pyloroplasty or gastrectomy)
Neoplastic mass (not primary to small bowel) adjacent to bowel (local invasion) (Europe 10% Africa 5%)	Radiation stricture	Faecolith

Inflammatory mass (e.g. appendix, tubo-ovarian abscess) (Europe 5%, Africa 5%)	Tuberculosis (TB)	Phytobezoar (a ball of plant fibre)
Inflammatory mass (e.g. appendix, tubo-ovarian abscess) (Europe 5%, Africa 5%)	Atresia (neonate/ infant)	Trichobezoar (a hair ball)
	Primary tumour of the bowel (lymphoma, carcinoid or adenocarcinoma)	

Discussion

The visceral pain of intestinal colic is from increased peristalsis against the obstructive lesion is usually referred towards the midline rather than being localised as the gut has a midline origin of development. The visceral sensory fibres are carried by the sympathetic nerves on their way to the spinal cord. The consequences of bowel obstruction are progressive dehydration, electrolyte imbalance and systemic toxicity due to migration of toxins and bacteria translocation either through the intact but ischaemic bowel or through a perforation [2,5].

Aetiology of Small bowel obstruction

There are several possible causes and the epidemiology varies considerably from region to region. Adhesions is the cause in 80% of instances. They are usually from previous abdominal surgery and the use of abdominal mopping gauze swabs or towels [11-15], but may also arise from previous intra-abdominal sepsis [11,12,14]. They produce kinking of the bowel or obstruction from pressure of a band or volvulus. Intestinal adhesions are the commonest cause of mechanical small bowel obstruction in the western world due to the greater number of operations performed [2,11]. Intestinal adhesions to other vascular structures occur as injured peritoneal cavity need to gain some extra blood supply during the healing process [12-14]. Thus by minimizing disruption of the peritoneal cavity minimally-invasive surgery can help reduce the probability of adhesion formation [15]. Inguinal hernias are the commonest cause of mechanical small bowel obstruction in the developing world where the uptake of modern medicine is low with the consequent delay in surgical interventions [16]. Usually pressure of the neck of the sac causes obstruction especially with the narrow femoral and indirect inguinal hernia defects and occasionally internal hernia, and, it may be associated with strangulation. Primary small bowel volvulus is a life-threatening surgical emergency requiring immediate laparotomy following resuscitation. It occurs in the 'virgin' abdomen with no anatomic abnormalities nor predisposing factors. It is often seen in Africa and Asia, and seems to be associated with special dietary habits (high fibre diet) especially after a fast causing the incipient weight of the terminal ileum to rotate round the short base of the mesentery. The main problem is to differentiate it from other causes of obstruction that can be treated conservatively.

Central abdominal pain resistant to narcotic analgesia should heighten the suspicion of the diagnosis [17]. Rarer causes of small bowel obstruction are neoplasms (usually metastatic and thus extrinsic) as primary small bowel malignancy is rare. Intussusception in adults is rare and always require a laparotomy as it is commonly due to an underlying malignancy such as lymphoma or carcinoma. Any inflammatory mass such as diverticular, appendiceal, tubo-ovarian ileo-caecal Crohn's etc, may cause small bowel obstruction by blocking the ileocaecal valve or by causing a localized ileus [18,19]. The narrowest part of the small bowel is the terminal ileum which is the preferred site of obstruction by most of the luminal causes. A right iliac fossa mass in a patient with iron-deficiency anaemia from an occult chronic bleeding is caecal carcinoma or other malignancy until proven otherwise. These patients require computer tomography (CT) scanning±colonoscopy for further elucidation [2,19]. Luminal obstruction from gallstone (gallstone ileus), hair (trichobezoar), vegetable matter (phytobezoar) or foreign objects are rare [19]. The rare patient with a Richter's hernia in which only the antimesenteric portion of the small bowel is trapped without bowel obstruction may be undetected on physical examination, and, patients with partial obstruction can be considered at minimal risk of strangulation. Rarely small bowel obstruction can be caused by internal hernias related to mesenteric defects or recesses [9]. A modern clinical example is the internal hernias that develop after a laparoscopic gastric bypass in which small mesenteric defects (transverse mesocolon, enteroenterotomy or behind the Roux limb can be created and there are fewer adhesions to tether small bowel loops and prevent them from herniating causing obstruction and potentially strangulation. In addition patients who have greater degrees of weight loss after laparoscopic Roux-en-Y gastric bypass may be more prone to internal hernia because of loss of the protective space-occupying effect of mesenteric fat [10].

How to tell the aetiology, level and severity of obstruction preoperatively?

The four cardinal clinical features of intestinal obstruction are colicky abdominal pain, vomiting, constipation and abdominal distension. The history, examination and investigation will help tell the aetiology, level and severity of the obstruction. These have considerable bearing on the indications for operation, and on the necessary preoperative preparation.

History: The onset of the obstructive symptoms is usually sudden with high small bowel obstruction but more gradual with low small bowel obstruction. The colicky pain comes with greater frequency in high small bowel obstruction, about every 5 minutes in jejunal obstruction, but every 30minutes in ileal and colonic obstruction. The pain is typically central in small bowel obstruction but where strangulation of the bowel has occurred the pain may become constant and localised. If the colic is in the lower abdomen it is more likely to be due to colon obstruction. Vomiting follows the pain and for high obstructions vomiting

is more profuse and occurs earlier. Initially food contents are vomited but later the vomit becomes faeculent (brown and foul smelling) [1,2,19]. The 24 hour secretory function of the proximal gut is illustrated in Table 2. It gives an indication of the amount of fluid that can be sequestered in the intestines or lost in the vomitus [2,6]. The clinical history may establish other features indicative of the likely aetiology of the obstruction. A history of abdominal surgery may suggest adhesive small bowel obstruction. A past history of colorectal or other intra-abdominal malignancy, recent alteration in bowel habit or the passage of blood is suggestive of neoplasm.

Table 2: 24 hour secretory function of the gut.

Secretion	Amount(l)
Saliva	1.5
Gastric juice	3
Bile	0.5
Pancreatic juice	1
Intestinal juice	3
Total	9

Examination: The examination findings will depend on the stage at which the patient presents. The patient with complete obstruction (no passage of flatus and faeces) are at substantial risk of strangulation (20-40%) but a patient with chronic obstruction may appear generally quite well with normal vital signs [20]. On the other hand the patient who has an acute closed-loop small bowel obstruction may be profoundly ill, toxic, tachycardic, pyrexia and may have a leucocytosis at the time of presentation [21]. A tense, tender, irreducible lump with no cough impulse especially over a hernia orifice with often erythema of the skin is strangulation until proven otherwise. Occasionally, the hernia is internal and not palpable [20,21]. The physical findings would include dehydration, abdominal distension and sometimes visible peristalsis. Dehydration assessed by examination of the mucous membranes and skin turgor is an indication of severe fluid depletion which is more marked in high than low small bowel obstruction. Abdominal distension is usually evident and more marked the more distal the obstruction, but it is more an indication of the site than the extent of obstruction. Swallowed air, gas from bacterial fermentation and nitrogen diffusion from the congested mucosa are all responsible for the increased intestinal gas [5,6]. The abdominal distension is minimal in high small bowel obstruction and more prominent in low. In low small bowel obstruction distension is mainly central. In colonic obstruction distension is mainly in the flanks and upper abdomen. Abdominal distension may be so marked as to render further assessment of the intra-abdominal contents impossible. The cause of the obstruction may be evident (e.g. scars from previous surgery, a tender irreducible hernia, an abdominal mass e.g. intussusception or carcinoma of bowel) [5,6,12]. Rarely a mass be felt, or an irregular enlarged liver may suggest a malignant lesion as the cause of obstruction.

Percussion produces a tympanic note and auscultation high-pitched tinkling, long-lasting bowel sounds. If the obstruction is advanced there may be signs of bowel strangulation (worsening constant pain, toxic patient, tachycardia, hypotension and pyrexia) with reduced or absent bowel sounds (paralytic ileus) [1,6]. It may be clinically difficult to distinguish with any certainty between simple obstruction and strangulation but the later condition is obviously very serious if overlooked [6,20]. Simple obstruction presents with colicky (visceral) pain but no pain (somatic) on coughing as sign of peritonism. However, there is mild generalized abdominal tenderness from the distension with gas and fluid. Strangulation (closed-loop) obstruction usually has an acute onset of severe pain which is constant and associated with cough peritonism [21]. Digital rectal examination is mandatory in intestinal obstruction although rectal cancer is a rare cause of intestinal (large bowel) obstruction unless very advanced. Assessment of the cardiovascular and respiratory systems is necessary in small bowel obstruction as most of these patients will require surgery [6].

Treatment of small bowel obstruction

In the past 15 years, there have only been some modest progress and advancement in the treatment of small bowel obstruction [2,4,6]. It has been demonstrated convincingly by the NCEPOD (National Confidential Enquiry into Perioperative Deaths) that patients with intestinal obstruction who are hypovolaemic have a higher morbidity and mortality if not adequately resuscitated prior to surgery [22]. This is exacerbated by the vasodilation of anaesthesia which may cause catastrophic hypotension and renal failure. Treatment commences with resuscitation by correcting fluid and electrolyte deficits, nasogastric tube decompression and analgesia. There is careful monitoring with fluid balance charts, pulse and blood pressure as resuscitation is continued until the central venous pressure is restored and a consistent adequate urinary output of at least 30mls/hr for an average 70kg patient [2,6,23]. The management of simple obstruction may be either operation or observation depending on the likely cause [24]. If simple obstruction is thought to be due to adhesions conservative treatment is initially indicated as spontaneous resolution will occur in up to 70% of patients with obstruction secondary to adhesion [2,6]. Surgical intervention is necessary when conservative treatment with nasogastric decompression and intravenous fluid resuscitation fails after 48hrs as the patient should not remain obstructed for more than that length of time, or with evidence of peritonitis from strangulation obstruction [2,24,25]. Conservative treatment often succeeds in postoperative obstruction from adhesions or ileus [25]. Conservative treatment may be appropriate for inoperable carcinomatous peritonitis.

Operation is indicated for

a) Strangulation obstruction as soon as patient is rendered fit. The overall operative mortality for strangulated hernia is

10% and so adequate preoperative resuscitation is crucial [2,22-24,26];

b) Obstruction due to some cause that will not settle e.g. obstructed hernia, carcinoma, gallstone ileus etc. In the latter, the obstructing gallstone is removed either by expression or by the use of stone-holding forceps via a proximal transverse enterotomy which is repaired by two layers of suture. The chronic cholecystoduodenal fistula is left undisturbed [2,6].

c) Simple obstruction that fails to settle on conservative treatment. The presence of fever and leucocytosis should prompt inclusion of antibiotics in the initial treatment regimen. After relieving the cause of the obstruction by operative intervention, it is usually necessary to decompress the stomach and the greater part of the small bowel by nasogastric drainage. Intestinal peristalsis is inhibited by gastric distension, and is restored when this is relieved. Antibiotic prophylaxis is usually necessary if obstructed intestine has been opened [2,6,26,27].

Conclusion

Small bowel obstruction remains a common and difficult problem encountered by the abdominal surgeon. Following resuscitation a precise history may indicate the pathology and physical examination supported by basic imaging may indicate where the pathology is. These have considerable bearing on the indications, timing of intervention, and necessary preparation should operation be considered. Appreciation of fluid balance, acid-base-electrolyte disturbance and the importance of pre-operative resuscitation decrease the morbidity and mortality from intestinal obstruction. Advances in minimally-invasive surgery would help minimize adhesion formation, the commonest cause of intestinal obstruction.

Conflict of Interests

The author declares no conflict of interest.

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