ACUTE BOWEL OBSTRUCTION. ETIOLOGY AND PATHOGENESIS. CLASSIFICATION. CLINICAL PRESENTATION. DIFFERENTIAL DIAGNOSIS. CLINICAL PRESENTATION OF DIFFERENT TYPES OF BOWEL OBSTRUCTION. CONSERVATIVE AND SURGICAL TREATMENT

Guidelines for Medical Students

LVIV – 2019
Approved at the meeting of the surgical methodological commission of Danylo Halytsky Lviv National Medical University (Meeting report № 56 on May 16, 2019)

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I. Background

Mechanical small bowel obstruction is one of the most common surgical emergencies. A traditional adage, ‘let the sun never set or rise’ on a bowel obstruction, indicating the need for immediate operative intervention, does not apply to all patients. However, it does highlight the importance of careful evaluation of patients with small bowel obstruction. Aggressive nonoperative and operative management has reduced mortality from 50% to 5% over the past 50 years.

Large bowel obstruction is usually an acute blockage of the colon or rectum occurring in the elderly age group and requiring expeditious medical and surgical treatment. The urgency of management relates to the possibility of rupture of distended or compromised colon with the risk of faecal peritonitis. The three most common causes of mechanical obstruction are carcinoma of the colon, sigmoid volvulus and diverticular disease. Pseudo-obstruction (Ogilvie’s syndrome), where there is acute dilatation of the colon without mechanical obstruction, presents with similar clinical features to an organic obstruction with the same potential complications, but is usually associated with some other illness.

II. Learning Objectives

1. To study the etiological factors of disease, classification of acute bowel obstruction, clinical signs, diagnostic methods, treatment and complications (α = I).
2. To know the main causes of the disease, typical clinical course and complications, diagnostic value of laboratory and instrumental methods of examination and the principles of the modern conservative and surgical treatment (α = II).
3. To be able to collect and analyze the complaints and disease history, thoroughly perform physical examination, determine the order of the most informative examination methods and perform their interpretation, establish clinical diagnosis, justify the indications for surgery, choose adequate method of surgical intervention (α = III).
4. To develop creativity in solving complicated clinical tasks in patients with atypical clinical course or complications of acute bowel obstruction (α = IV).

III. Purpose of personality development

Development of professional skills of the future specialist, study of ethical and deontological aspects of physicians' job, regarding communication with patients and colleagues, development of a sense of responsibility for independent decision making. To know modern methods of treatment of patients with acute bowel obstruction and its complications.

IV. Interdisciplinary integration

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**Future subjects**

**Anesthesiology and Critical Care Medicine**

Clinical signs urgent conditions that occur in patients with complications of acute bowel obstruction, methods of diagnosis and pharmacotherapy

Determine the symptoms of urgent conditions, differential diagnosis and treatment

**Intradisciplinary integration**

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<td>Check Blumberg’s sign, describe plain abdominal film in patient with peptic ulcer perforation</td>
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V. Content of the topic and its structuring

**Classification of intestinal obstruction:**

Due to origin:
- congenital
- acquired

According to the clinical course:
- acute
- chronic

According to the mechanism of development:
1. Mechanical:
   - obstructive (blockage of the intestine from the inside or the outside shrink tumors, cysts, worms, coprolites, gallstones, foreign bodies, cicatricial stenosis of the intestine)
   - strangulative (volvulus)
   - mixed (adhesive, invaginations)
2. Dynamically
   - spastic
   - paralytic

Due to localization of mechanical barriers:
- small bowel obstruction (high, low)
- large bowel obstruction

According to the degree of passage of intestinal contents:
- full
- partial

In addition, during the development of the pathological process are defined:
   - First stage – acute disorders of the intestinal passage
   - Second stage – acute infraction of hemocirculation in intestinal wall
   - Third stage - peritonitis.

**SMALL BOWELL OBSTRUCTION**

**Etiology**
The main factors which can cause small bowel obstruction are:
- Adhesions
- Hernias: ventral, inguinal, femoral, internal
- Neoplasms: malignant (primary/metastatic), benign
- Strictures: Crohn’s disease, ischaemia
- Radiation enteritis
- Intussusception
- Volvulus
- Gallstone ileus
- Bezoar
- Superior mesenteric artery syndrome

Pathophysiology
Small bowel obstruction leads to rapid accumulation of fluid and gas in the bowel proximal to the site of obstruction. In typical cases, there is initial active peristalsis proximal to the obstruction. Within a few hours, the peristaltic activity declines. Oedema and increasing distension supervene. Stasis and bacterial overgrowth make the fluid faeculent. Appearance of faeculent fluid with a foul odour in the vomitus or from a nasogastric tube confirms the diagnosis of obstruction.

Clinical features
Classic presentations of small bowel obstruction include:
- crampy abdominal pain
- nausea and vomiting
- abdominal distension
- constipation.

Patients with a proximal small bowel obstruction are likely to present early (within a day) with pain and vomiting; abdominal distension and constipation are less likely. Patients with a distal obstruction frequently have a more prolonged symptom complex with a 2-3-day history of crampy abdominal pain prior to vomiting; distension and constipation are predominant features. The bowel sounds are initially hyperactive and high-pitched. In delayed presentation, the bowel sounds may be reduced, indicating onset of secondary ileus.

The symptom complex also varies with the underlying aetiology. Small bowel obstruction due to hernia tends to present early and more acutely with a tense and irreducible external hernia, that associated with neoplasm is more indolent and that due to adhesions intermediate in presentation. Recognition of strangulated obstruction with bowel ischaemia and impending perforation is important. Clinical features of bowel ischaemia include constant and severe abdominal pain associated with tenderness and guarding, tachycardia, fever and leucocytosis.

Radiology
Supine and erect abdominal radiographs
Specific radiographic findings suggestive of small bowel obstruction include a dilated small bowel with air-fluid levels, often in a stepladder distribution on the erect film (Fig.1). Presence of colonic gas may indicate an incomplete obstruction or the presence of an adynamic ileus rather than a complete mechanical obstruction.
Fig. 1. Plain X-ray of the abdomen showing a mechanical small bowel obstruction with multiple loops of distended small bowel with ‘step-ladder’ air-fluid pattern in the erect film.

Presence of foreign bodies causing obstruction, such as gallstones, should be noted. Plain radiographs are not always diagnostic. In a proximal obstruction, there may be few radiographic abnormalities.

**Contrast radiography**

The use of barium is unpopular because of the risk of inspissation of barium proximal to the point of obstruction and the potential for peritoneal contamination if bowel perforation is present. A gastrografin small bowel follow-through study will establish the extent (complete vs. incomplete) and degree of small bowel obstruction (Fig. 2). Gastrografin is hyperosmolar and may stimulate peristaltic activity of the small bowel. Caution is exercised in the dehydrated patient because gastrografin may exacerbate dehydration by sequestration of third-space fluid in the intestinal lumen. The intestinal mucosa is not well defined by the water-soluble gastrografin study. A good alternative, providing better anatomic detail, is a mixture of half barium and half water-soluble contrast.

Fig. 2. Gastrografin small bowel follow-through showing an obstruction in the mid-small bowel.
**CT scanning**

Computed tomography (CT) scanning is the study of choice if the patient has fever, tachycardia, localized abdominal pain, and/or leukocytosis. CT scanning is useful in making an early diagnosis of strangulated obstruction and in delineating the myriad other causes of acute abdominal pain, particularly when clinical and radiographic findings are inconclusive. It also has proved useful in distinguishing the etiologies of small-bowel obstruction (SBO), that is, in distinguishing extrinsic causes (such as adhesions and hernia) from intrinsic causes (such as neoplasms and Crohn disease). In addition, CT scanning differentiates the above from intraluminal causes, such as bezoars. The modality may be less useful in the evaluation of small bowel ischemia associated with obstruction. CT scanning is capable of revealing abscess, inflammatory process, extraluminal pathology resulting in obstruction, and mesenteric ischemia and enables the clinician to distinguish between ileus and mechanical small bowel obstruction in postoperative patients. The modality does not require oral contrast for the diagnosis of SBO, because the retained intraluminal fluid serves as a natural contrast agent.

Obstruction is present if the small-bowel loop is greater than 2.5 cm in diameter dilated proximal to a distinct transition zone of collapsed bowel less than 1 cm in diameter. A smooth beak indicates simple obstruction without vascular compromise; a serrated beak may indicate strangulation. Bowel wall thickening, portal venous gas, or pneumatosis indicates early strangulation.

One small series reported a sensitivity of 93%, a specificity of 100%, and an accuracy of 94% for CT scanning in the detection of obstructions. Another series reported a sensitivity of 92% and specificity of 71% in the correct identification of partial or complete SBO.

**MRI**

The accuracy of magnetic resonance imaging (MRI) almost approaches that of CT scanning for the detection of obstructions. MRI is also effective in defining the location and etiology of obstruction. MRI has several limitations, however, including lack of availability (transporting sicker patients is difficult) and poor visualization of masses and inflammation.

**CT Enterography (CT Enteroclysis)**

This modality is replacing enteroclysis in clinical practice. In addition, it is the examination of choice for intermittent small-bowel obstruction (SBO) and in patients with a complicated surgical history (eg, prior surgery, tumors). CT enterography displays the entire thickness of the bowel wall and allows evaluation of surrounding mesentery and perinephric fat. It uses CT-scanning technology to scan thin slices of bowel while simultaneously using large-volume enteric contrast material for imagery. CT enterography is more accurate than conventional CT scanning at finding the cause of SBO (89% vs 50%, respectively), as well as at locating the site of the obstruction (100% vs 94%, respectively). It is useful in patients being managed conservatively (ie, nonoperatively).
Ultrasonography
Ultrasonography is less costly and invasive than CT scanning and may reliably exclude SBO in as many as 89% of patients; specificity is reportedly 100%.

In a small study by Jang et al in which the use of bedside ultrasonography by emergency physicians was compared with radiography for the detection of small-bowel obstruction (SBO), emergency physician performed ultrasonography compared favorably with radiography. Dilated bowel on ultrasonography had a sensitivity of 91% and a specificity of 84% for SBO, while radiography had a sensitivity of 46% and a specificity of 66%.

Laboratory studies
There is no specific laboratory test that is diagnostic of intestinal obstruction. However, with a more protracted history, a hypokalaemic, hypochloraemic metabolic alkalosis may develop. Full blood examination may show leucocytosis if there is impending bowel ischaemia, and anaemia may indicate a malignant cause. Deranged liver function tests with hypoalbuminaemia may be associated with poor nutrition or sepsis.

Therapy
Fluid and electrolyte replacement
Careful assessment of fluid and electrolyte status is important. A patient whose obstruction has been present for many hours, when there has been vomiting and sequestration of large amounts of fluid in the intestinal third-space, may require intravenous administration of several litres of isotonic saline to replace the deficit.

Monitoring
Pulse, blood pressure and tissue turgor are monitored as indices of fluid status. Urine output is also monitored. A urine output of at least 0.5 mL/kg per hour is a useful index of adequate fluid replacement. In critical cases, insertion of a urinary Foley catheter is useful. Central venous or pulmonary artery pressure monitoring is considered in older patients with a history of cardiac disease.

Nasogastric tube
Decompression of the upper gastrointestinal tract is initiated early in the management to avoid vomiting, and to reduce gastric and small bowel distension.

Analgesia
Analgesia is prescribed with caution so as not to mask signs of peritoneal irritation, which may indicate impending bowel ischaemia.

Non-operative management
Most patients with small bowel obstruction undergo an initial phase of resuscitation and decompression. Any signs of intestinal strangulation with vascular compromise should prompt immediate surgical intervention. Non-operative management is continued in patients with a partial small bowel obstruction and without signs of intestinal strangulation. Repeated evaluation of the abdomen and the general status of the patient is important. If there has been no significant improvement after 48 hours, operative intervention is generally indicated.

Operative treatment
In adhesive obstruction, surgery is indicated where there are concerns of intestinal ischaemia or the patient fails to improve after a short period of non-
operative management. Constant, rather than intermittent, pain suggests bowel ischaemia. Bowel obstruction due to hernia in the inguinal or femoral area requires prompt surgery, as the bowel entrapped within the hernia can develop irreversible ischaemia and gangrene. Pre-operative preparations include adequate fluid and electrolyte replacement, prophylaxis with broad spectrum antibiotics covering aerobes and anaerobes, anti-thrombotic prophylaxis with compressive stockings and subcutaneous heparin. Avoidance of aspiration pneumonitis is ensured with adequate nasogastric decompression and a rapid sequence induction of anaesthesia with cricoid pressure until the endotracheal tube has been inserted. Surgery is sometimes easy when a single adhesive and or an external hernia is the cause of obstruction, and surgery may be complex where there are dense adhesions. Closed loop obstruction, with occlusion at both ends of the loop of bowel, may arise from torsion or complex adhesions of the small bowel, and obstructed external hernia. The intraluminal pressure rapidly rises and the risk of perforation is accelerated. The object at surgery is to find the junction of the dilated and collapsed bowel. The viability of a segment of intestine is determined by observation. In doubtful cases, a warm pack is placed over the bowel in question and the bowel re-examined several minutes later. If the bowel is not viable, a simple resection and primary anastomosis is performed. Sometimes, as with carcinomatosis or extensive pelvic adhesions, a side-to-side bypass is the better choice.

Obstruction due to external hernia is usually dealt with through the herniorrhaphy incision. The entrapped bowel is examined prior to returning it to the general peritoneal cavity. The hernia is then repaired. Local signs of inflammation at the hernia site may indicate strangulation of the entrapped bowel or omentum.

**Special problems**

**Recurrent small bowel obstruction**

After the initial operation of adhesiolysis for obstruction, the recurrence rate of further adhesive obstruction is about 20%. Repeated bouts of adhesive small bowel obstruction can be in capacitating: moreover, repeated operative intervention can be met with increasing technical difficulties and further episodes of adhesive obstruction. The first episode of adhesive small bowel obstruction is usually managed by prompt surgical intervention because of the risk of strangulation. When obstruction recurs, a non-operative management with nasogastric decompression and maintenance of fluid and electrolyte balance is generally preferred, provided that there is no evidence of bowel compromise. Increasing pain, fever, leucocytosis, high nasogastric output, lack of bowel function, abdominal distension and increasing bowel dilatation on plain abdominal X-ray are indicators for swift surgical intervention. At surgery, gentle handling of the bowel and precision in dissection is important. A long intestinal tube introduced through a gastrostomy may help to splint the small bowel. Such a tube is left in place for at least 3 weeks but its efficacy has not been fully established.

**Early post-operative small bowel obstruction**

Mechanical small bowel obstruction presenting early in the post-operative period following abdominal surgery presents a diagnostic and therapeutic dilemma. The diagnosis may be obscured by paralytic ileus and the clinical features may be
confused with the ‘normal’ convalescence following a laparotomy. With any prolongation of ileus beyond 5 days, mechanical obstruction should be suspected. Post-operative adhesions are most extensive about 10-21 days after a laparotomy. A gradual process of resolution then occurs. A part from adhesions, other causes of mechanical small bowel obstruction include internal hernias, peritoneal defects and intra-abdominal abscesses.

Strangulation of the bowel in post-operative obstruction is uncommon. Careful repeated observation is important. Nasogastric decompression and replacement of fluid and electrolytes are essential. Parenteral nutritional support is often indicated if the obstructive episode lasts longer than 7 days. Plain radiograph of the abdomen is helpful in diagnosis. The presence of gas throughout the small and large bowel suggests a paralytic ileus. In cases where the diagnosis is uncertain, the use of dilute barium or gastrografin follow-through study will determine the severity of the obstruction and may lead to relief of the obstruction. Timing of surgical intervention is difficult. Most patients will settle with non-operative management. The presence of complete obstruction, intra-abdominal sepsis or an excessively prolonged obstructive course are common indications for exploratory operation. In many situations, localised sepsis may be drained percutaneously under computed tomographic or ultrasonic guidance.

**Internal hernias**

Internal herniation can be related to abnormalities created by prior operations, as from adhesions or in the paracolic or paraileal spaces adjacent to end stomas. In addition, congenital defects causing hernias have been described in the mesenteries of the ileum, transverse colon, sigmoid colon, and that of a Meckel’s diverticulum, as well as in the left paracolic gutter and within the falciform ligament. The presentation is generally in distinguishable from other causes of intestinal obstruction, so that an accurate preoperative diagnosis is rarely made. Surgical repair of the defect should be performed along with resection of any nonviable bowel.

**Metastatic malignant tumours**

A history of neoplasm should not necessarily imply that carcinomatosis is the cause of small bowel obstruction. Some of these patients can have a benign cause of obstruction, such as an adhesive band. Management of patients with documented recurrent malignancy must be individualised. Peritoneal seedlings may lead to multiple narrowed segments. Strangulation is rare as the bowel loops are relatively fixed. Retroperitoneal and mesenteric deposits may contribute to the impaired motility. A minimal-residue diet may reduce obstructive symptoms and acute episodes usually settle with nasogastric decompression. In patients with a relatively good prognosis, operative intervention with resection or bypass may achieve effective palliation.

**Crohn’s disease**

Treatment of small bowel obstruction secondary to Crohn’s disease is usually non-operative initially. Treatment with steroids and metronidazole reduces oedema and inflammation. If obstruction persists, surgery is necessary. A phlegmonous segment is resected and a fibrotic stricture is treated with stricture plasty.
Chronic inflammation with stricture formation can cause mechanical obstruction in some patients. The strictures may be either single or multiple with intervening “skip areas.” Because luminal small-bowel obstruction related to Crohn’s strictures does not lead to strangulation, initial nonoperative management is indicated and is usually successful. In Crohn’s patients who have had prior surgery, however, the etiology for the obstruction could be an adhesive band, and in these cases a strangulating mechanism may exist. Therefore, a decision to operate for acute obstruction in Crohn’s disease must include a careful consideration of the underlying mechanism with the important goal of avoiding bowel infarction and its adverse sequelae.

Although most patients with acute small-bowel obstruction caused by a Crohn’s stricture will improve, recurrent bouts of obstruction can be an indication for operation. Depending upon the number, location, and length of the strictures, either resection or stricturoplasty should be performed. The benefit of stricturoplasty, where feasible, is that it avoids the need for resection and subsequent loss of bowel mucosal surface area, which may be important for preventing the short bowel syndrome that occurs in some patients with recurrent Crohn’s disease.

If a Crohn’s stricture is too long to perform a stricturoplasty, for example, greater than 8 to 10 cm, or if there are separate strictures that are too close to allow for individual stricturoplasties to be performed, resection is indicated. Recurrence rates are unaffected by the presence of microscopic disease at resection margins. As such, it appears that only grossly involved bowel needs to be resected.

The decision to operate for a Crohn’s stricture should be based on clinical parameters and not on the radiologic picture. Many patients remain relatively asymptomatic despite the presence of a “string sign” that indicates severe luminal narrowing. Therefore, although it is important to document objective evidence of stricture formation in patients being considered for operation with Crohn’s and obstructive symptoms, the radiologic appearance in and of itself should not be an indication for surgery.

Endoscopic dilatation has been used as an alternative to either resection or stricturoplasty in some patients with Crohn’s strictures. This technique has generally been employed in patients with terminal ileal disease, a site that can be accessed at the time of colonoscopy. The results with endoscopic dilatation have been generally poor, however, with high failure rates and significant risks of complications such as perforation.

There is an increase in the incidence of carcinoma in Crohn’s disease. The presence of a neoplasm may be suggested in a patient with long-standing Crohn’s who develops an unresolving obstruction. If carcinoma is suggested by the clinical or radiologic picture, then clearly surgical intervention is mandated. In most patients with small-intestinal carcinoma complicating Crohn’s disease, however, the neoplasm is found incidentally.

**Stricture**

Crohn’s disease is among the most common etiologies for small intestinal stricture. Certain drugs are known to cause mucosal ulceration and strictures, most notably entericcoated potassium chloride preparations and the nonsteroidal
antiinflammatory agents. Radiation therapy for intraperitoneal malignancy can lead to stricture formation, especially in the patient who has undergone previous surgery such that adhesions may “fix” the loops of intestine, allowing for greater exposure to isolated segments. Because of problems with healing, obstructing segments of irradiated bowel either should be bypassed or, if a resection is performed, at least one end of an anastomosis should include nonirradiated bowel. Mesenteric ischemia can also lead to stricture formation, the distal ileum being at greatest risk because the ileocolic artery is the last branch of the superior mesenteric artery. Various neoplasms, including carcinoma, carcinoid, and lymphoma, can also cause strictures within the small intestine. In most cases of small-bowel stricture, the obstructive symptoms are chronic and progressive in nature, and the best surgical approach is resection whenever technically feasible.

**Gallstone ileus**

Gallstones may ulcerate through the gallbladder into the duodenum and pass down the small bowel. For a gallstone to cause mechanical small bowel obstruction, it is usually larger than 2.5 cm. The common site of impaction is about 60 cm from the ileocaecal valve because this is the narrowest part of the small bowel are often elderly, presenting with a subacute small bowel obstruction. Plain radiograph of the abdomen reveals a small bowel obstruction with a gallstone in the right lower quadrant and gas in the biliary tree. At surgery, the obstructing gallstone is crushed and emptied into the large bowel. Alternatively, an enterotomy is made and the gallstone removed from the small bowel. The gall bladder is left alone so as not to disturb the cholecyst-duodenal fistula.

**LARGE BOWELL OBSTRUCTION**

**Clinical features of large bowel obstruction**

The typical clinical features are:
- Abdominal pain due to distension and colic.
- Abdominal distension due to retention of faeces and flatus.
- Constipation, and in a complete obstruction this will be absolute, ie. without the passage of faeces or flatus.
- Peritonism if perforation has occurred.
- Vomiting can be a late symptom.

**Etiology of large bowel obstruction**

**Carcinoma of the colon or rectum**

At least 50 % of large bowel obstructions are due to carcinoma. The most common site is the sigmoid colon, accounting for 30 % of all cases. This is not only because the sigmoid colon is a common site for colonic carcinoma, but also because the lumen is relatively narrow and the faeces are firm rather than liquid. The second most common site is the splenic flexure, where the combination of a sharpkink in the colon together with luminal narrowing by the tumour and relatively firm stools leads to blockage. Right-sided obstructions are less frequent because the caecum and ascending colon are relatively capacious and the faecal material is liquid. The features of a right-sided large bowel obstruction may be less obvious than those of
left-sided colon lesions because only a small proportion of the colon is distended. An obstruction at the ileocecal valve will produce features of a low small bowel obstruction.

**Sigmoid volvulus**

In Western countries sigmoid volvulus is essentially a condition of the elderly and frail, often with a long history of constipation and laxatives. In Africa, however, younger age groups can be afflicted and this is probably associated with the very high fibre dietary intake. Cecal volvulus is relatively uncommon and tends to occur in the younger age group. Volvulus of the colon involves twisting of the bowel on its mesentery, leading to ischemia and subsequent risk of perforation of the volved portion of the bowel and the cecum if it becomes over distended because of unrelieved obstruction.

**Diverticular disease**

Diverticular disease can involve any part of the colon but in the vast majority of instances the sigmoid colon is most severely affected. Diverticulosis with subsequent scarring as well as muscular wall hypertrophy can cause stricturing of the colon, which can lead to large bowel obstruction and can be confused with carcinoma.

**Less common causes**

Less common causes of mechanical large bowel obstruction include stricturing as a result of inflammatory bowel disease (both ulcerative colitis and Crohn’s disease) as well as ischaemic and radiation strictures, intussusceptions, adhesions (much more likely to cause a small bowel obstruction) and faecal impaction. Faecal impaction occurs when a faecal mass cannot be evacuated and it can affect any age group, but most commonly occurs in the elderly. The symptoms may be those of in ability to evacuate, but not in frequently and paradoxically patients will present with faecal in continence. This is because the impacted faecal bolus relaxes the rectosphincteric reflex and more proximal liquid stool escapes around the faecal bolus.

**Pseudo-obstruction (Ogilvie’s syndrome)**

Pseudo-obstruction is a form of ileus of the large intestine, and in most patients is associated with some other ongoing medical condition. It tends to affect the older generation, and the symptoms and potential complications are essentially the same as those due to mechanical large bowel obstruction, including perforation. It is believed that the associated medical condition or metabolic abnormality may cause an imbalance of the autonomic nervous system, with a predominance of sympathetic activity.

**Examination and investigations**

Examination of a patient with a typical large bowel obstruction will reveal a distended and tender abdomen, often worst in the right iliac fossa because of cecal distension. Guarding or peritonism will be present if there has been vascular compromise or perforation of the colonic wall. The abdomen is highly tympanitic to percussion, with high-pitched bowel sounds. An abdominal mass might be present but the distension may prevent it being palpable. Digital rectal examination and/or sigmoidoscopy may reveal a rectal or sigmoid carcinoma or tell-tale blood within the
lumen of the bowel indicative of a higher lesion. Sometimes a ‘corkscrew sign’ may be detected at sigmoidoscopy, suggesting volvulus or torsion of the sigmoid colon. The differential diagnosis should include tense ascites and gross bladder distension secondary to urinary retention. A patient with a late large bowel obstruction may be dehydrated and toxic because of vomiting or peritonitis. Peritonitis with a large bowel obstruction is a serious complication with a high mortality rate due to faecal peritonitis, most likely as a result of perforation of the caecum (as a result of Laplace’s Law) (Fig. 3) or at the site of the obstruction, particularly at the point of torsion in a sigmoid volvulus.

Fig. 3. Grossly distended caecum with incipient perforation

The key investigation to be performed urgently is a plain X-ray of the abdomen, which will confirm marked colonic distension. A gastrografin enema should differentiate between a mechanical obstruction and colonic pseudo-obstruction. (Fig. 4). This differentiation is important as it will determine management. A plain X-ray may reveal the typical features of a sigmoid volvulus, with a distended sigmoid colon in the right upper quadrant. Free intraperitoneal gas indicates colonic perforation. A water-soluble contrast enema should define the level of the obstruction and in most instances the nature of the obstructing lesion. Sometimes the use of such water-soluble contrast enemas can be therapeutic by dislodging faeces from an narrowed large bowel lumen. Ultrasound examination of the liver and CT scanning of the abdomen and pelvis may also be useful in determining the presence of occult malignancy and aiding in management planning. Routine haematology and medical assessment is indicated, as in most instances surgical intervention is required.
Clinical Differences Between Small- and Large-Bowel Obstruction

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Management of large bowel obstruction

**Surgery**

Immediate surgery will be required if the patient has overt peritonitis. Such immediate management, however, will usually depend on the result of a water-soluble contrast enema. If a mechanical obstruction is present then it is most likely due to a colonic carcinoma. For a distal obstruction (most commonly a sigmoid carcinoma) where obstruction is complete, relatively urgentsurgery is necessary. Conventionally the most common approach would be a three-staged surgical management. The first stage is establishment of a proximal colostomy followed with
in weeks by a second stage involving resection and anastomosis, and finally some weeks or months later the closure of the colostomy (Fig. 5).

Fig. 5. Management of suspected large bowel obstruction.

A one-stage resection and anastomosis has been considered hazardous because, in general, the patients are elderly and often with co-morbidities. There is usually luminal disparity making anastomosis difficult and the proximal colon is loaded with faeces, which may increase the risk of anastomotic disruption. Recently, however, with improvement in resuscitation and anaesthesia the introduction of a one-stage resection and anastomosis, most often with on-table total colonic lavage to remove faecal material, has been demonstrated as safe and is a technique being used more frequently. Any perforation or sepsis at the site of the carcinoma mandates resection of the lesion, establishment of a sigmoid colostomy and oversewing of the rectal stump (Hartman’s procedure). A second stage is done at a later time to re-establish bowel continuity. Obstructing carcinoma of the splenic flexure and more proximal colon, including the transverse and ascending colons as well as the caecum, will usually be dealt with by a resection and end-to-end ileocolonic anastomosis. In this operation the tumour and all of the proximal distended colon is resected, and the well vascularised and relatively healthy ileum is suitable for anastomosis to the collapsed
Some patients may not be well enough for this on stage procedure and still require a proximal stoma.

**Colorectal stenting**

Self-expandable metal stents are now being used more widely in the management of malignant low left-sided large bowel obstruction. These stents are placed endoscopically under fluoroscopic control through the obstructing lesion (Fig. 6) and can remain in place for a prolonged period where the stent is definitive palliative treatment or alternatively can decompress the colon so that within some weeks a one-stage resection and anastomosis may be possible. The stents are expensive but they appear to be cost-effective. Complications of perforation and bleeding are possible but uncommon, and it is likely this technique will be used more widely in the future.

**Volvulus**

In the first instance after diagnosis of the sigmoid volvulus endoscopic decompression should be attempted. This can be performed with a rigid sigmoidoscope or a colonoscope. Such decompression can be achieved in most instances. If it is performed with a colonoscope it has the advantage of potentially being able to decompress the proximal colon. Endoscopic decompression is not without risk as the instrument then being passed through the spiral lumen at the level of the volvulus may perforate the colon, particularly if there is an area of ischaemia. If decompression is successfully achieved it may be useful to pass a long flatus tube through the lumen of a rigid sigmoidoscope to ‘splint’ the sigmoid colon in the hope of preventing early recurrence. Unfortunately, recurrence tends to occur in about half of the patients. Under these circumstances surgical resection with either end-to-end anastomosis or a Hartman’s procedure is required. In general, if the acute situation is successfully dealt with by decompression, then an elective sigmoid colostomy should be performed when the patient’s physical condition has improved and the bowel is deflated.

![Fig.6. Metallic stenting of an obstructing carcinoma of the sigmoid colon.](image-url)
Cecal volvulus is the second most common type of volvulus, although it is the cause of only 1% of all intestinal obstructions. Most patients are younger and there is a predominance of women. Most patients present with symptoms of a small-bowel obstruction: nausea, vomiting, cramping abdominal pain, and distension. Abdominal plain films will show a markedly dilated cecum (coffee bean); it can be anywhere in the abdomen but the “pelvis of the bean” will point to the colon segment of origin. Thus, for a cecal volvulus, a large air-filled “coffee bean” will occupy the abdomen and the “pelvis of the bean” will be facing the right lower quadrant. Gastrografin study can reveal a birds beak and CT may show a whirl sign.

These patients cannot be reduced endoscopically and require operation for definitive treatment. If the bowel is gangrenous, right hemicolecction with ileostomy is the standard treatment. The mortality of this procedure ranges from 22% to 40%. However, if no perforation is present and the patient is hemodynamically stable, then an ileocolectomy and primary anastomosis may be safely performed. Reduction of the volvulus alone results in a high recurrence rate, 20%.

Volvulus of the transverse colon and splenic flexure do occur, although rarely. Generally the fixation of the transverse colon by the hepatic and splenic flexure and the relatively short mesocolon keep it in place. Anatomical and acquired conditions can predispose patients to this problem. Patients present with symptoms similar to a small-bowel obstruction. These cases are generally treated by endoscopic decompression, followed by resection or colopexy.

**Diverticular stricture**

In general, the principles of surgical management applicable to obstructing carcinoma of the sigmoid colon apply to obstruction due to a diverticular stricture. A definitive resection, whether it is performed at the time of the initial resection of the stricture (i.e. a Hartman’s procedure) or if there is an end-to-end anastomosis, will usually require complete resection of the sigmoid colon to effectively eradicate the diverticulosis. Any sepsis in association with the diverticular stricture, such as a perforation or contained abscess, will usually mandate resection and a Hartman’s procedure, although in some instances drainage of sepsis and a temporary proximal defunctioning stoma may be appropriate.

**Obstructing Colon Cancer**

Colon cancer is the most common cause of large-bowel obstruction. This complication occurs as a presenting manifestation in up to 15% to 20% of patients with colorectal cancer. Obstructing colon cancers are generally caused by larger tumors and have a poorer prognosis. The incidence of obstruction correlates with advancing patient age and is most commonly seen with left-sided colon cancer.

The treatment is dependent on the location of the obstruction. Primary resection and anastomosis generally treat right-sided and transverse tumors. A diverting colostomy or ileostomy is rarely needed. The anastomosis can be performed using either hand suturing or stapling techniques. The leak rate should not exceed 3% with either technique.

The treatment of descending and more distal tumors is more complex and controversial. Historically, there are three procedures: the three-stage procedure, the Hartmann’s procedure, and the subtotal colectomy with primary anastomosis. The
three-stage operation with a transverse colostomy, as an initial procedure, followed
by a resection and anastomosis and finally by closure of the colostomy, is generally
of historical interest only. However, if the patient is too sick to tolerate a definitive
procedure, this is certainly an option.

The second option, and that most commonly utilized, is to resect the colon and
tumor, fashion a colostomy from the proximal bowel, and oversew the distal bowel.
This is commonly referred to as a Hartmann’s procedure, which is incorrect because
that procedure is for rectal cancer in particular. Alternatively, if the distal bowel is of
adequate length, if may be brought up to the abdominal wall, opened, and sutured to
the skin as a mucous fistula. Overall operative mortality is about 10 %. Colostomy
closure rates are approximately 60 %.

Subtotal colectomy with primary anastomosis has become increasingly popular
recently. The procedure is a one-stage operation. Although this operation seems more
extensive, good results can be achieved with a single shorter hospitalization, no
stoma problems, and removal of possible synchronous proximal lesions. Mortality
rates are as low as 3 % in experienced hands, and morbidity ranges between 6 % and
31 %, competitive with the more accepted resection and colostomy procedure. These
data suggest that a subtotal colectomy and primary anastomosis is the preferred
approach in the patient with an obstructing colon cancer on the left side.

**Pseudo-obstruction (Ogilvie’s syndrome)**

If a gastrografin enema confirms the diagnosis of pseudo-obstruction, provided
there is no evidence of colonic perforation, which would mandate urgent surgical
intervention, then conservative measures which address the patient’s general medical
condition including fluid and electrolyte balance are required. If rectal examination or
sigmoidoscopy achieve the passage of flatus then this should be carried out three or
four times each day to continue to decompress the colon. About half the patients with
pseudo-obstruction may respond to this management, but if not then neostigmine,
which is a potent parasympathomimetic, should be administered intravenously. Such
treatment has the potential for complications, including cardiac arrhythmias and
perforation if there happens to be mechanical obstruction. If sigmoidoscopy and
neostigmine or other prokinetic agents such as erythromycin or cisapride are
unsuccessful, then colonoscopic decompression should be attempted. This is likely to
be successful, but without bowel preparation may be dangerous. Satisfactory
decompression may be achieved in most patients, but there is a significant recurrence
rate. If these measures fail then the establishment of a colostomy or caecostomy may
be required.

### VI. Plan and structure of class

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VII. Materials for classes

**Questions** ($\alpha = I, \alpha = II$)
1. Etiology and pathogenesis of acute bowel obstruction.
2. Classification of acute bowel obstruction.
3. Clinical signs of acute bowel obstruction.
4. Laboratory diagnosis of acute bowel obstruction.
5. Role of localization procedures in diagnosing of acute bowel obstruction.
7. Treatment of acute bowel obstruction.

**MCQs** ($\alpha = II$)

1. The most efficient noninvasive diagnostic method for small bowel obstruction is:
   A. Plain abdominal film
   B. Laparoscopy;
   C. Irrigography;
   D. Colonoscopy;
E. Ultrasound examination.
Correct answer: A

2. Investigations in a patient with acute small bowel obstruction would NOT include:
   A. Supine and erect abdominal radiographs
   B. Blood urea and electrolyte estimation
   C. Gastrografin small bowel follow-through
   D. Technetium-labelled iminodiacetic acid (HIDA) scan
   E. Computed tomography of the abdomen
Correct answer: D

3. The following are common causes of large bowel obstruction except:
   A. Intra-abdominal adhesions
   B. Sigmoid volvulus
   C. Carcinoma of the colon
   D. Diverticular disease
   E. Carcinoma of the rectum
Correct answer: A

4. Large bowel obstruction requires urgent treatment because:
   A. Fluid and electrolyte imbalance is often life threatening
   B. Intracolonic bacterial overgrowth leads to septicaemia
   C. There is a significant risk of colonic perforation
   D. Small bowel obstruction with ischaemia will eventually occur
   E. Is best treated surgically by subtotal colectomy
Correct answer: B

5. In acute proximal small bowel obstruction:
   A. The symptoms are prolonged with abdominal distension prior to vomiting
   B. There is a tendency towards dehydration, with hyponatraemia and hypokalaemic, hypochloraeic metabolic alkalosis
   C. The vomitus is usually faeculent
   D. A common cause is gallstone ileus
   E. Decompression with nasogastric tube is not often required
Correct answer: D

**Typical clinical cases (α =II)**

1. A 48-year-old patient admitted to the surgical department with complaints of abdominal pain, repeated vomiting, which does not bring relief. The pain starts 2 hours before admission, after consumption of large amount of food. Patient anxious, pale skin, acrocyanosis, pulse 115 bpm, BP 90/60 mmHg. Abdomen moderately distended in the epigastric region, in the lower parts – sink in. On palpation: tenderness in the epigastrium. On percussion: tympanic sound in the epigastic region, increased peristalsis. On plain abdominal film dillated small intestinal loops. Make diagnosis?
Answer: Small intestine volvulus

2. An elderly nursing home patient is brought to the hospital with recent onset of colicky abdominal pain, distension and obstipation on examination, the abdomen is markedly distended and tympanitic. There is no marked tenderness. Plain abdominal X-ray shows a markedly distended loop located mainly in the right upper quadrant. The likely diagnosis is?

Answer: Sigmoid volvulus.

Atypical clinical cases (α =III)

1. 56-year-old patient admitted to the surgical department with complaints of abdominal pain, repeated vomiting, which does not bring relief. The pain starts 2 hours before admission, after consumption of large amount of food. Patient anxious, pale skin, acrocyanosis, pulse 120 bpm, BP 90/60 mmHg. Abdomen moderately distended in the epigastric region, in the lower parts – sink in. On palpation: tenderness in the epigastrium. On percussion: tympanic sound in the epigastric region, increased peristalsis. On plain abdominal film dilated small intestinal loops. Make diagnosis?

Answer: Small intestine volvulus.

2. A 42-year-old woman is admitted to the emergency department with severe colicky pain, vomiting, and abdominal distention. She has not passed stools or flatus for 48 hours. X-rays of the abdomen confirm the presence of small bowel obstruction. What is the most likely cause of small-bowel obstruction in the patients?

Answer: Groin hernia incarceration, adhesions

VIII. Literature