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BOWEL OBSTRUCTION: IMAGING AND EMERGENCY MEDICAL MANAGEMENT

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Abstract:

Introduction: *Bowel obstruction develops when the regular flow of intraluminal contents is obstructed. Obstruction can occur in the small or large bowel, which can be either functional or mechanical. In nearly 80% of cases of mechanical intestinal obstruction, the small bowel is involved. Ischemia, which aggravates up to 42% of intestinal obstructions, considerably raises bowel obstruction-related mortality. Twenty percent of admissions involving "surgical abdomens" are due to bowel obstructions. Radiology is crucial for confirming the diagnosis and determining the root of the problem. Emergency management of bowel obstruction often comprises aggressive fluid resuscitation, bowel decompression, analgesic and antiemetic therapy when clinically necessary, and early surgical consultation.*

Aim of the Study: *The purpose of this review is to familiarise radiology residents and other practitioners with the imaging findings indicative of intestinal blockage and to highlight problems necessitating emergency surgical intervention. The evaluation will concentrate on radiography and CT., which are the two most often utilized imaging techniques for suspected intestinal obstruction.*

Methodology: *The review is a comprehensive research of PUBMED since the year 1997 to 2021*

Conclusion: *Understanding the treatment of patients with small and large bowel obstruction is crucial for colon and rectal surgeons. For the majority of suspected intestinal blockages, computed tomography is typically the most suitable and accurate diagnostic imaging modality. Plain radiography and contrast imaging/fluoroscopy are two additional frequently used imaging modalities. Ultrasonography and magnetic resonance imaging are less often used imaging modalities. No matter the imaging modality employed, the interpretation of imaging should follow a methodical, systematic approach to guarantee diagnostic accuracy.*

Keywords: *Bowel obstruction, small bowel obstruction, large bowel obstruction, imaging, computed tomography, abdominal radiography, contrast enema, small bowel follow-through, Ultrasound, magnetic resonance imaging, emergency treatment, etc.*

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INTRODUCTION:

Colorectal surgeons frequently encounter patients with suspected small bowel obstruction (SBO) or large bowel obstruction (LBO), so it's critical to comprehend the examination and management of these patients. Small intestinal blockages account for about 75% of all mechanical bowel obstructions. After a restorative proctocolectomy, up to 25% of people may develop SBO, and 10% of patients within three years of a colectomy experience this. SBO can be caused by a number of pathologies connected to colorectal surgery, such as postoperative adhesions, Crohn's disease, diverticulitis, and parastomal hernias, among others. Even the most seasoned clinicians may struggle to treat and evaluate LBO due to its complexity. [1]

In the United States, SBO accounts for up to 16% of surgical admissions and more than 300,000 procedures each year, accounting for 2-4% of emergency visits for abdominal pain. Nearly 80% of mechanical blockages take place in the small intestine, while occasional obstructions can happen in the large intestine as well. Up to 30% of patients with SBO may have strangulation, which is regrettably a significant complication rate for patients. Patients who are elderly are especially vulnerable to blockage and its repercussions.[2]

Etiology of Bowel Obstruction

There are many causes, but the most frequent one is adhesion diseases following abdominal surgery. Of all cases of SBO, postoperative adhesions account for 75–80%. After surgery, adhesions can develop in one-third of patients, leading to more than a million days spent in hospitals. Congenital (such as midgut volvulus, ileal atresia), bowel wall disease (such as intussusception, stricture, tumor), extrinsic (such as compression from mass, volvulus), and intraluminal disorders (such as meconium ileus, gallstones, foreign body, bezoar) are other causes of SBO. After adhesions, other causes of SBO include hernias (the most prevalent cause in developing nations), foreign bodies, radiation, endometriosis, and infections (which are also common in developing nations and include tuberculosis). The most frequent cause of bowel blockage in patients who have never had intra-abdominal surgery is a hernia with small bowel incarceration. Older patients with suspected SBO but no history of abdominal surgery and without a hernia should be checked for cancer. [3,4]

List of causes of bowel obstruction [4]

Small Bowel Obstruction	Large Bowel Obstruction
Adhesions	Colorectal cancer
Hernias (external and internal)	Diverticulitis
Neoplasm (extraintestinal and primary)	Volvulus
Crohn's disease	Crohn's disease
Gallstones	Noncolorectal malignancy
Malrotation	Endometriosis
Duplication cysts	Ischemic stricture
Diverticulitis	Radiation
Infection (tuberculosis, intestinal parasites, etc.)	Hernia
Hematoma	Adhesions
Ischemic stricture	Fecal impaction
Intussusception	Foreign body
Endometriosis	
Radiation	
Foreign body	

Diagnosis and Imaging Modalities

A crucial component of contemporary care of both LBO and SBO is diagnostic imaging. While the history and physical examination still serve as the foundation of evaluation, clinical assessment by itself is insufficient to diagnose intestinal obstruction and provide therapy guidelines. In patients with suspected obstruction, imaging aids in addressing a number of important parameters, such as the following: [5]

a) The level of obstruction
b) Cause of Obstruction
c) The presence of severe or complicated obstruction

These criteria assist the surgeon in making important decisions regarding emergency surgical and nonsurgical care. Given the significance of imaging in the assessment of suspected bowel obstruction, the colorectal surgeon should make an effort to be skilled in the interpretation of all bowel obstruction imaging modalities.

Plain Radiograph

Due to their quick acquisition, low cost, widespread availability, and low radiation exposure, plain abdomen radiographs have traditionally been advised as the initial imaging modality for suspected obstructions. Plain X-rays may frequently diagnose obstructions promptly, differentiate between SBO and LBO, rule out pneumoperitoneum, and, in a small number of circumstances, pinpoint the source of the blockage, such as colonic volvulus or gallstone ileus.[4]

However, roughly 50 to 80% of intestinal blockage diagnoses using plain radiographs are accurate. Furthermore, a definite etiology of a blockage is only occasionally provided by simple abdomen radiographs. The specificity of plain radiographs for LBO is only moderate, in part due to mimicry of acute colonic pseudo-obstruction creating false positives, and plain radiographs are poor at recognizing closed loop or strangulated obstructions in the setting of SBO. Therefore, it is frequently still required to get further information using computed tomography (C.T.), even when conventional abdomen radiographs seem to confirm a diagnosis indisputably. [6]

Both single images and films of abdominal radiography are available. Abdominal radiograph accuracy has been demonstrated to increase with imaging in both dependent (supine) and non-dependent (upright) postures. An upright chest X-ray or lateral decubitus abdomen film should be performed to check for pneumoperitoneum when the likelihood of perforation is taken into account. It is important to take note of the patient's orientation when examining plain abdomen radiographs since the interpretation of images taken in dependent vs. non-dependent situations varies. On plain radiographs, the small bowel and big colon can be identified based on appearance and position. Radiographically, the small bowel exhibits distinctive circular folds called plicae circulares or valvulae conniventes, which appear as thin lines across the full diameter of the small bowel. In contrast, the haustral folds of the big bowel do not extend the full diameter of the colon.[7]

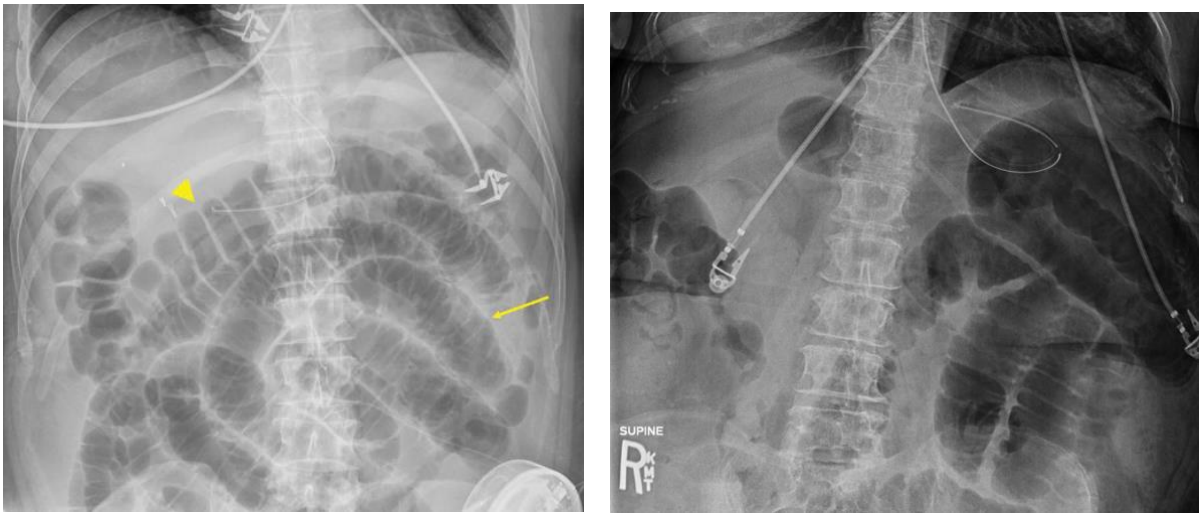

Fig. 1 Postoperative ileus with (thin arrow) distended small bowel with plicae circulares and (large arrowhead) large bowel with haustra and Supine abdominal X-ray of small bowel obstruction: dilated small bowel and paucity of colonic gas. [4]

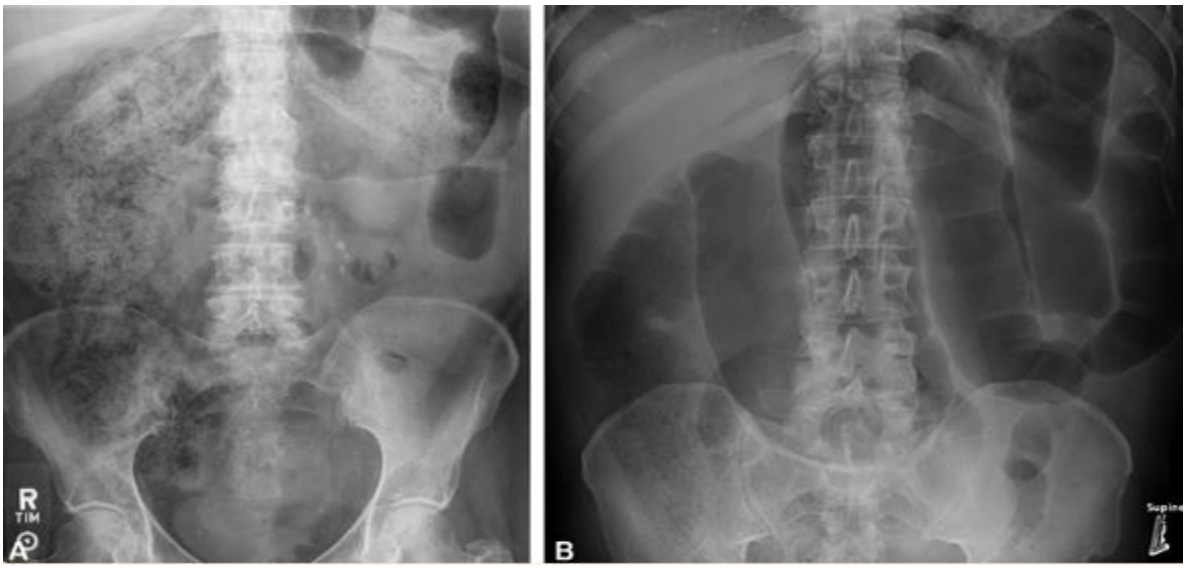

Fig. 2 (A) Abdominal X-ray of large bowel obstruction (LBO), demonstrating significant proximal colonic fecal load. (B) Abdominal X-ray of LBO demonstrating significant transverse colon redundancy and distention.[4]

Diagnostic Radiographic signs for bowel obstruction: [8]

Small Bowel Obstruction	Large Bowel Obstruction
Supine or prone: 1. Dilated small bowel > 2.5–3 cm 2. Paucity of colorectal gas 3. Stretch sign 4. Gasless abdomen 5. Dilated stomach	1. Dilated colon > 6 cm or cecum > 9 cm 2. Paucity of rectal gas 3. +/− small bowel dilation depending on duration and presence of closed loop
Upright or decubitus: 1. Multiple air-fluid levels 2. Air–fluid level wider than 2.5 cm 3. Air–fluid levels in the same small bowel loop of unequal heights 4. String-of-beads sign	

Computed Tomography

The cost, speed, and availability differences between C.T. and routine X-rays have closed as C.T. technology has advanced. More than 95% of SBO and LBO diagnoses can be made with C.T. The conventional method of using plain radiographs as the initial imaging modality in assessing patients with suspected intestinal obstruction has been called into doubt as a result. If it's not contraindicated, intravenous (IV) iodinated contrast should be given during a C.T. scan to assess a potential intestinal obstruction.[8,9]

Although it has not been demonstrated that the use of IV contrast significantly alters the sensitivity of C.T. for the diagnosis of intestinal blockages, it can enhance evaluation for gut wall ischemia. In some clinical situations, enteric contrast should also be used. Depending on the clinical suspicion, several enteric contrast injection indications are used for C.T. evaluations of suspected intestinal blockages. In general, oral contrast prior to C.T. should be avoided in situations with suspected high-grade SBO. In this situation, residual fluid in the bloated small intestine functions as a natural, neutral contrast agent, providing the same degree of diagnostic precision as oral contrast. [9]

Proximal dilation with distal decompression is the key C.T. finding for diagnosing intestinal obstruction. A small bowel diameter of more than 2.5 cm, a colon diameter of more than 6 cm, and a cecal diameter of more than 9 cm are all considered indicative of intestinal dilation on a C.T. scan. Cross-sectional imaging frequently enables precise anatomic localization of the site of blockage in addition to excellent diagnostic accuracy by identifying a transition zone (T.Z.) where dilated proximal bowel transitions to nondilated distal bowel. [10]

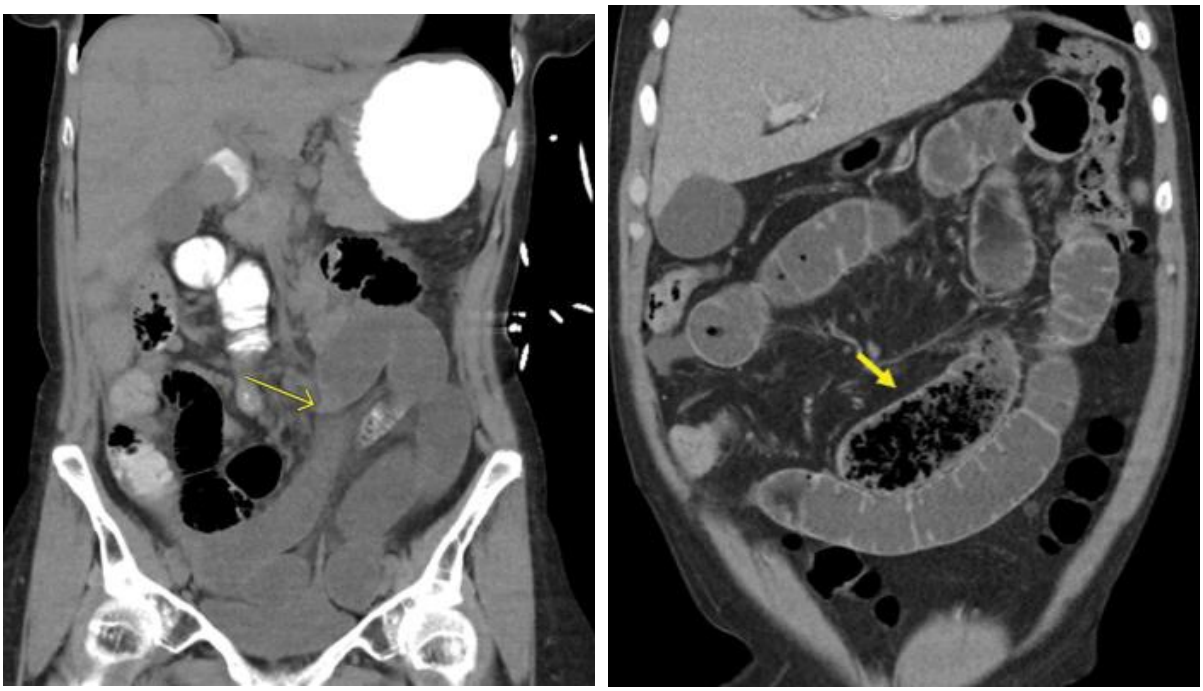

Fig. 3 C.T. without IV contrast demonstrating a transition point (right) in the mid-abdomen with a smooth taper due to a postoperative adhesive small bowel obstruction and Coronal CT: "small bowel feces sign" (left) immediately proximal to a Crohn's stricture. [4]

Contrast Imaging Fluoroscopy

Contrast imaging/fluoroscopy investigations are essential frequent adjuncts that can help clarify certain clinical problems and direct therapeutic intervention, even if C.T. and plain X-ray are often the most appropriate initial imaging modalities for patients with suspected intestinal blockage. Historically, the use of the fluoroscopic unprepped contrast enema was crucial in making the first diagnosis of acute LBO. Contrast enema's indications are currently more restricted as a result of the development and widespread use of multidetector C.T., and it is mostly used to supplement C.T. findings. Evaluation of equivocal cases of LBO, when it can help distinguish LBO from acute colonic pseudo-obstruction, and the evaluation of equivocal cases of colonic volvulus are grounds for diagnostic contrast enema. [11]

Ultrasound

Despite being a first-line test, C.T. is costly and exposes patients to significant radiation exposures. In order to diagnose SBO, both comprehensive and bedside Ultrasound have been considered. Rapid diagnosis and repeated evaluations without radiation exposure are two advantages of Ultrasound. However, because it is operator-dependent, more testing may be required in circumstances where the operator is less proficient, or the diagnosis is in doubt. SBO is commonly diagnosed on Ultrasound when the lumen of fluid-filled small bowel loops is dilated, often from $2.5 to 3 cm, even if definitions vary slightly. However, the range in the definition of dilatation is between 1.5 and 3 cm. By looking at the location where the dilated bowel transitions into the regular bowel, one can assess the possible etiology and degree of obstruction of the SBO. The placement of the bowel loops and the arrangement of the valvulae conniventes can be used to determine the degree of obstruction.[12]

Fig. 4 Ultrasound with findings consistent with dilatation of the small intestine and obstruction.[13]

Magnetic Resonance Imaging

MRI is a type of imaging technique that can assess for bowel obstruction, despite being mostly employed to diagnose and track Crohn's disease. Lack of ionizing radiation, better soft tissue contrast, the capacity to provide dynamic information regarding intestinal distention and motility, and relatively safe intravenous contrast agents are benefits of MRI over C.T. MRI has a high level of diagnostic sensitivity and specificity. [14] Because collapsed intestinal loops may conceal lesions or mimic disease, they must be optimally distended for MRI to detect SBO. This is due to the possibility that insufficiently distended segments could misinterpret an unusually thicker intestinal wall. Two major methods are employed to achieve small-bowel distention: 1) Magnetic resonance (M.R.) enteroclysis with contrast administered orally, and 2) M.R. enterography with contrast administered intravenously. [14]

CT/MR Enterography and Enteroclysis

In contrast to standard C.T. or MRI, specific techniques used in C.T. enterography (CTE), M.R. enterography (MRE), and CT/MR enteroclysis enable greater visualization of the intestine. They are primarily employed in the context of Crohn's disease, but they can also be used to assess recurring or chronic low-grade SBOs with unknown causes. Between the two modalities, the overall accuracy of Crohn's disease diagnosis is comparable. [15]

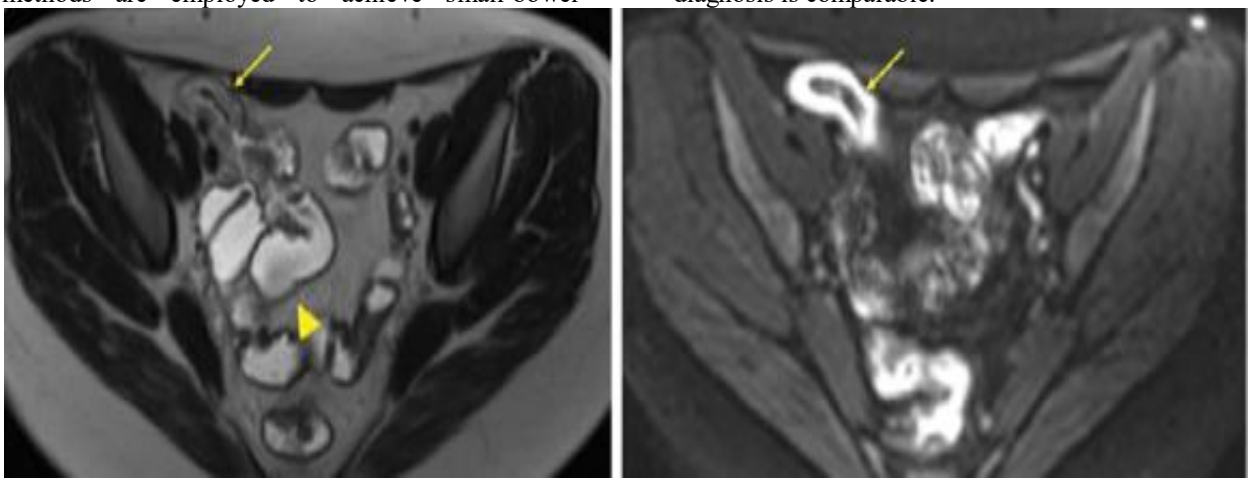

Fig. 5 MRE T2 axial HASTE sequence image in a patient with Crohn's ileitis revealing ileal stricture (thin arrow) & small bowel dilation (Left) and MRE trace diffusion-weighted sequence image in the same patient revealing high-signal intensity in the ileus (right) consistent with active Crohn's disease.[4]

Emergency Management

Bowel obstruction, especially small bowel obstruction (SBO), is often treated in the emergency department (E.D.) with aggressive fluid resuscitation, bowel decompression, analgesic and antiemetic therapy when clinically necessary, early surgical consultation, and antibiotic delivery. In order to protect against gram-negative and anaerobic organisms, antibiotics are utilized.[13]

A nasogastric (N.G.) tube can be inserted to start the initial decompression process by sucking up G.I. contents and preventing aspiration. Monitor airway, breathing, and circulation (ABCs). It's critical to monitor blood pressure and the condition of the heart in a subset of individuals, especially those who are elderly or have other medical concerns. [13, 16]

As soon as a patient develops bowel obstruction, the aim of the evaluation is to spot hemodynamic instability, the existence of strangulation or intestinal ischemia, and the requirement for urgent surgical intervention. These choices should be made at the same time as CPR. SBO patients should get intravenous resuscitation, symptomatic relief with analgesics and antiemetics, and bowel rest. Dehydration and hypovolemia call for intravenous fluid resuscitation with electrolyte replacement.[16]

The EAST guidelines for general op" rate management are shown: [17]

Recommendation	Level
1. Patients with generalized peritonitis or other evidence of clinical deterioration (fever, leukocytosis, tachycardia, acidosis, continuous pain) should undergo timely surgical exploration.	1
2. Patients with no evidence of clinical deterioration can safely undergo nonoperative management initially.	1
3. C.T. findings consistent with bowel ischemia require a low threshold for operative intervention.	
4. Laparoscopic treatment of SBO is a viable option compared with laparotomy in selected cases.	1
5. Water-soluble contrast should be considered for patients with partial SBO that has not resolved in 48 h	2
	2

Nasogastric (N.G.) tube decompression can help with symptom management, especially in people who have distension, discomfort, acute nausea, and vomiting. Nebulized lidocaine may facilitate N.G. installation and lessen insertion pain. [18]

CONCLUSION:

Bowel Obstruction is frequently caused by small intestine obstruction and results in fluid and gas collection and is a common reason for E.D. admissions. Surgical intervention is more frequently needed to treat fully complex SBO. Prior to abdominal surgery, a history of constipation, abdominal distension, and irregular bowel sounds are among the most accurate history and physical findings. The symptoms of strangulation, such as fever, hypotension, widespread abdominal discomfort, and peritonitis, should be carefully examined by doctors. In the E.D., imaging is necessary. Plain radiographs cannot rule out a diagnosis, but C.T. and U.S. are reliable diagnostic tools. I.V. fluid resuscitation, analgesia, and deciding whether operational or nonoperative treatment is necessary are all included in management. The insertion of a nasogastric tube is beneficial for individuals who have severe abdominal pain, vomiting, and distension. Strangulation and those who don't respond to nonoperative therapies require surgery.

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