



INTESTINAL OBSTRUCTION

PRESENTED BY:

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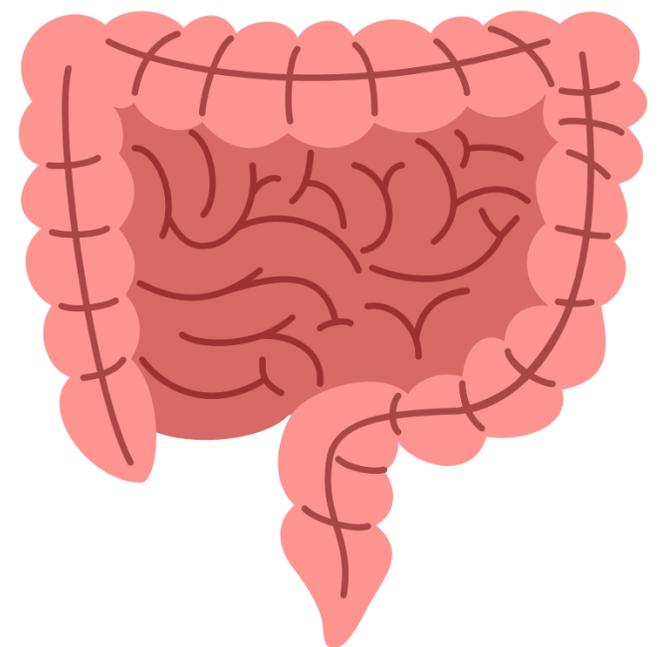
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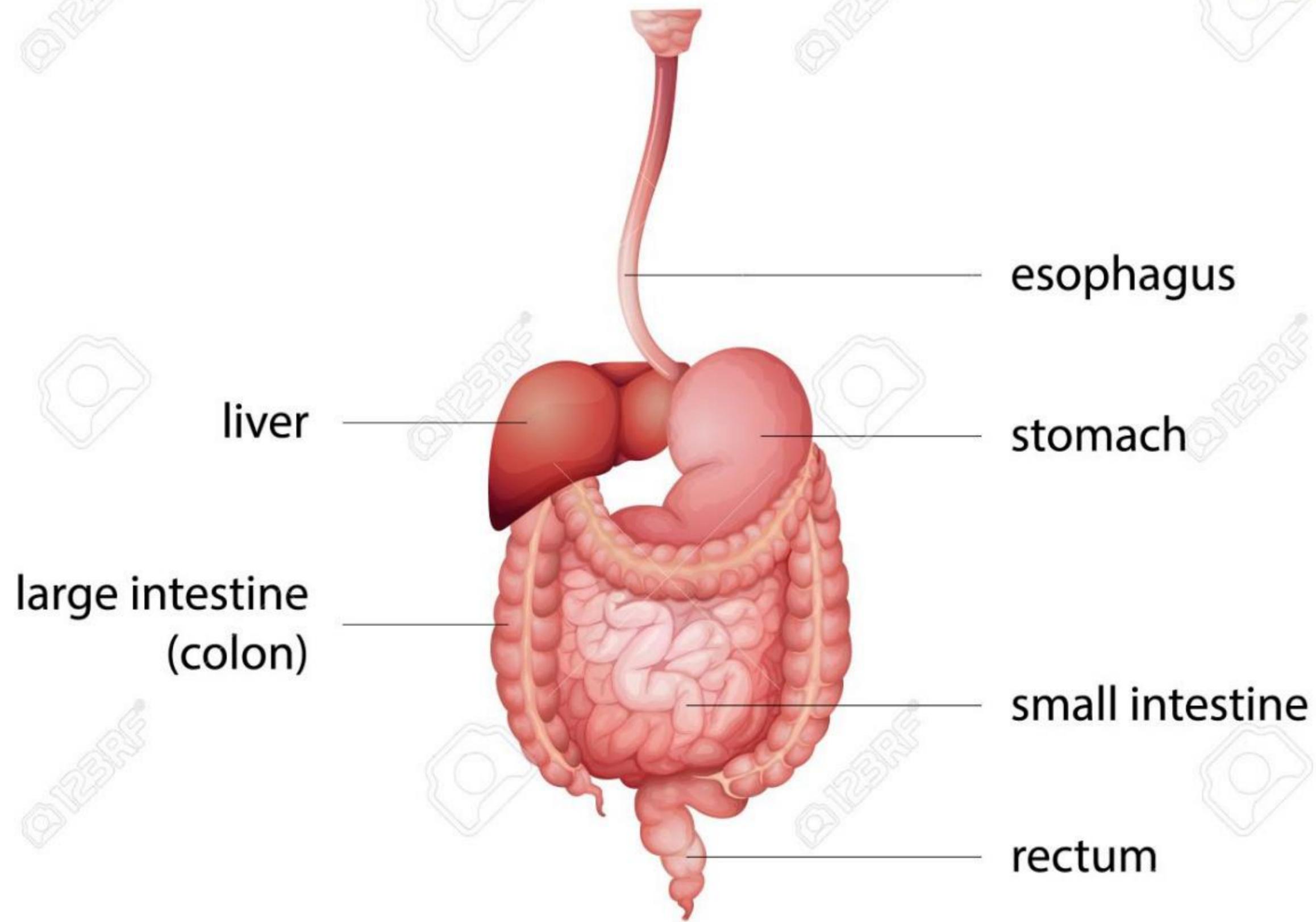
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Human Digestive System

PLUS



Definition:

- *Interruption of normal passage of intestinal content through the small or large intestine due to mechanical barrier or functional impairment.*

Classified according to:

- 1. Motility (mechanical, functional).*
- 2. Onset and the course of obstruction.*
- 3. Site of Obstruction.*

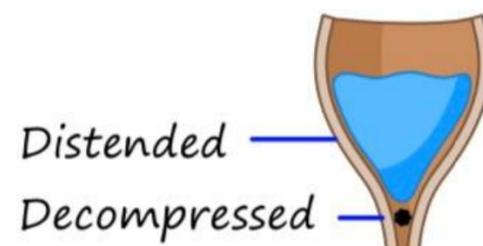
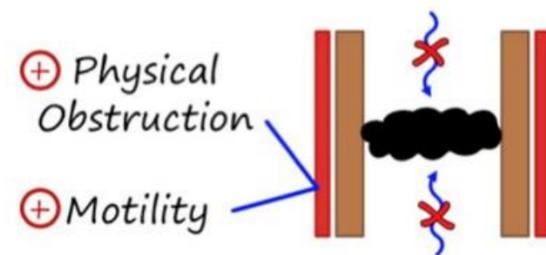
Motility

Mechanical Obstruction(dynamic)

- It is the interruption of normal passage through the bowel due to a **structural barrier** (e.g., a tumor, adhesions), may be complete or partial blockage. Because in the early stage of obstruction peristalsis is heard, its referred to as **dynamic obstruction**.

- *Mechanical bowel obstruction can be classified into the following etiologic categories:*

Mechanical Obstruction



Extrinsic and *Intrinsic*

- **Causes of mechanical obstruction:**

- ***1. Extrinsic compression of the bowel (extramural)***

- *Bowel adhesions*

- *Volvulus*

- *Incarcerated hernia*

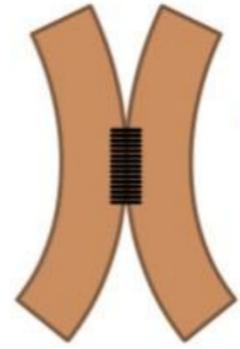
- (e.g., inguinal hernia, umbilical hernia, femoral hernia)*

- *Intra abdominal mass*

- (e.g., metastatic lymphadenopathy, large intra abdominal abscess or cyst)*

a) Surgical Adhesions (Most common cause)

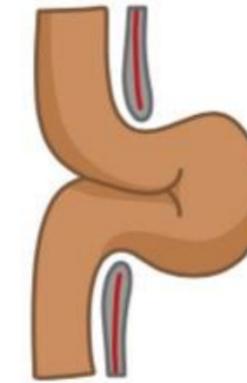
- **Prior abdominal surgeries** →
↑ Fibrotic scarring that entangles
small bowel loops →
↑ Luminal obstruction



Adhesions
- Abdominal
surgeries

b) Hernias

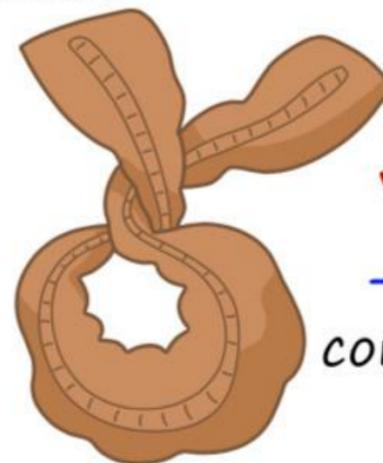
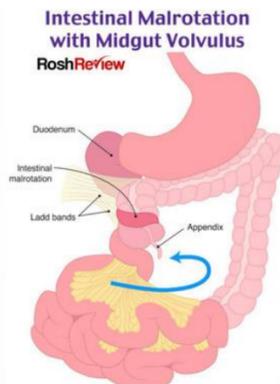
- **Inguinal and Femoral Hernias** →
Small bowel loops slip through
wall defect → Trapped bowel
leads to luminal obstruction



Hernias
- Femoral
- Inguinal

b) Sigmoid Volvulus

- **Chronic Constipation or Megacolon** →
Lengthen the mesentery large bowel causing rotation and
torsion on itself → Luminal obstruction



Volvulus
- Chronic
constipation

• Causes of mechanical obstruction:

2. Intrinsic bowel obstruction)

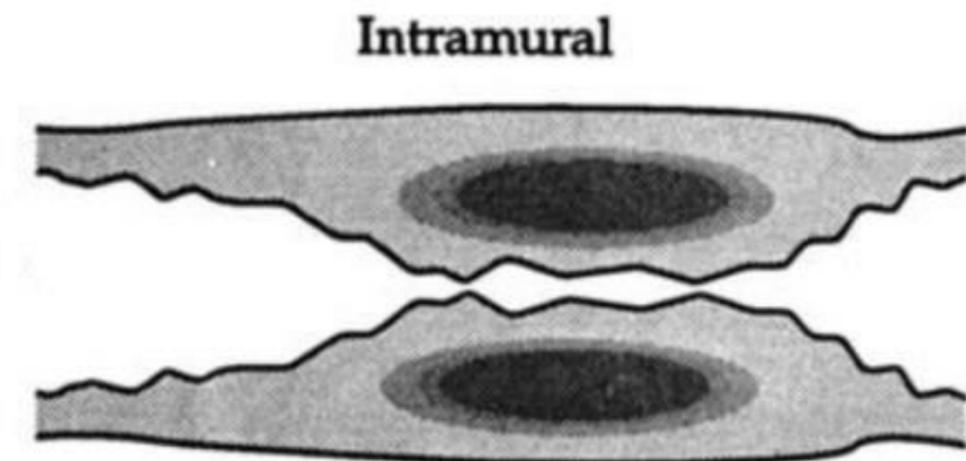
- ***Intramural bowel obstruction:*** *The underlying etiology arises from the intestinal wall. E.g:*

1. Strictures (e.g., IBD, tuberculosis)

2. Intestinal tumors (e.g., colorectal carcinoma, lymphoma)

3. Diverticulitis

4. Intussusception



- **Causes of mechanical obstruction:**

- ***2. Intrinsic bowel obstruction)***

- ***Intraluminal bowel obstruction:*** *The obstructing agent lies within the gastrointestinal lumen. E.g:*

- ***1. Gallstone ileus***

- ***2. Foreign body ingestion***

- ***3. Bezoars (e.g., phytobezoars)***

- ***4. Fecal impaction***

- ***5. Helminthic infection***



• Bezoars

- A **bezoar** refers to a collection of partially digested material that collects in the stomach. Bezoars occur in both humans and animals. Sometimes the material is not digested at all and tightly packages itself in the **digestive tract**. This causes a blockage in the **stomach** or **intestines**.
- Many bezoars are asymptomatic, but some cause symptoms and require medical treatment.

• Bezoars

• ***Types of Bezoars:** Bezoars fall into various categories depending on their composition:*

1. Lactobezoars :come from milk protein and mucus. They can occur in milk-fed infants.

2. Foreign body bezoars: form from **parasitic worms**, plastic, paper, and polystyrene foam cups.

3. Phytobezoars :comprise indigestible food fibers like **cellulose**. These types of fibers are common in fruits and vegetables. Examples are pumpkin, celery, prunes, beets, leeks, raisins, and sunflower seed shells. This is the most common type of bezoar.

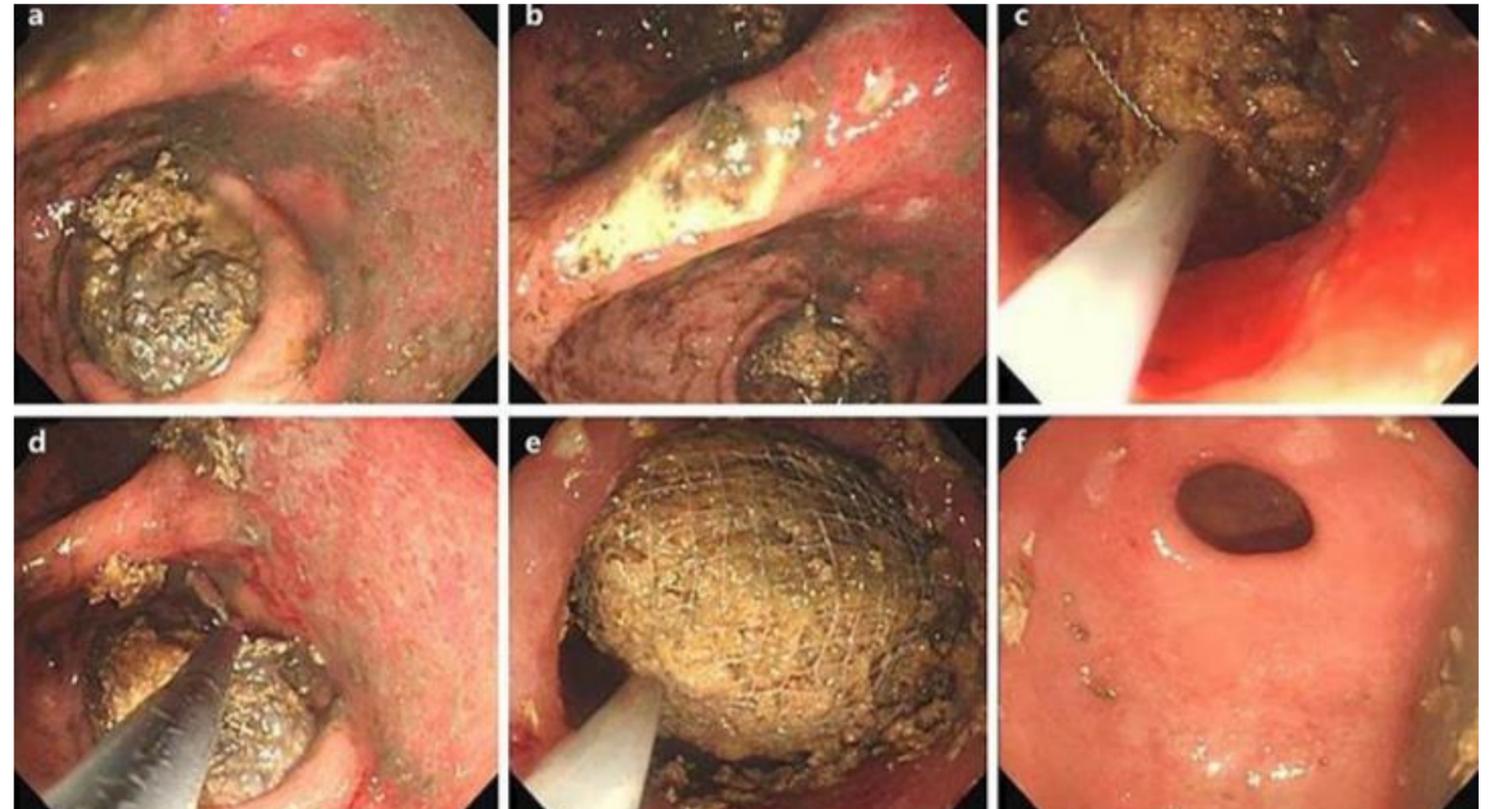
4. Trichobezoars:comprise hair-like fibers that look like clothing fibers. In extreme cases, the compacted fibers fill the stomach and form a tail that extends to the intestines. The condition is known as Rapunzel's syndrome and mostly affects adolescent girls. It may also affect you if you have **developmental disabilities or psychiatric illness**.

• Bezoars

- *Types of Bezoars: Bezoars fall into various categories depending on their composition:*

5. Pharmacobezoars :are another type that forms from medications that don't properly dissolve in the digestive tract. Most of these medications contain **aluminum hydroxide gel** and sucralfate.

6. Diospyrobezoars :form from **persimmon fruit**



Functional obstruction (a dynamic)

- Temporary functional impairment of peristalsis in the absence of a mechanical obstruction.
- **common etiologies:** vascular -nervous - metabolism (**hypokalemia**) trauma (**pelvic or spine fracture**)-post op (more than 72 hour after abdominal surgery) - medication (**anti-cholinergic**).

• Pathophysiology:

Irritation of the bowel and/or inflammation

causing

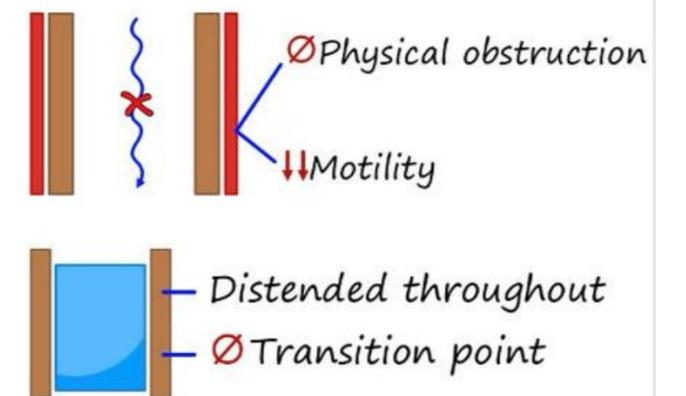
sympathetic nervous system activation and NO release

decreasing/arrested peristalsis

stasis of contents

distention

Functional obstruction

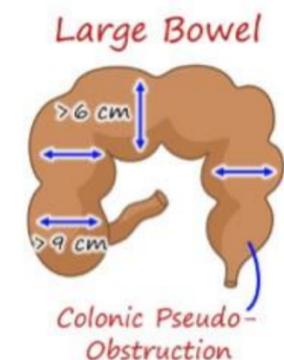


Functional obstruction (a dynamic)

- ***Symptoms:*** Constipation, abdominal pain, abdominal distention, nausea and vomiting -Management is m
- ***Occur in three forms :***
 - 1. pathological ileus.***
 - 2. mesenteric vascular occlusion.***
 - 3. pseudo-obstruction.***

pseudo-obstruction

- It is characterized by the dilation of bowel in the absence of an anatomical obstruction. Patients present with the signs and symptoms of bowel obstruction, including nausea, vomiting, abdominal distention, and obstipation with bowel dilation on x-ray or CT imaging. Pseudo-obstruction can be **acute or chronic**. Acute colonic pseudo-obstruction (ACPO), also known as Ogilvie syndrome, most commonly affects the large intestine from the cecum to the splenic flexure. The exact pathophysiology is unknown, but it has been linked to dysregulation of the autonomic nervous system. Most cases are found in patients who have undergone surgery or are critically ill. After a mechanical obstruction is ruled out, initial management includes bowel rest, nasogastric decompression, intravenous fluid resuscitation, and treatment of the underlying cause.*



Ogilvie's Syndrome

- Functional disorder in which the colon becomes massively dilated in the absence of mechanical obstruction, it result from autonomic dysfunction and severe a dynamic ileus.
- Most commonly occurs in hospitalized patients and is associated with the use of narcotics, bed rest, and comorbid disease.
- Presence of massive dilatation of the colon (usually predominantly the right and transverse colon) in the absence of a mechanical obstruction is diagnostic.

3. Causes of Paralytic Ileus and Ogilvie Syndrome:

a) Peritonitis

- **Secondary Peritonitis** (related to organ perforation) or **Spontaneous Bacterial Peritonitis** (related to cirrhosis) → Inflammation of the adjacent bowels → ↓Peristalsis of small bowel and large bowel

b) Post-Operative

- Related to certain **Anesthetics** → This leads to a direct relaxing effect on the smooth muscle of the bowels → ↓Peristalsis of the small bowel and large bowel

c) Hypokalemia

- **Hypokalemia** → ↓Peristalsis of the small bowel and large bowel

d) Opiate Medication

- **↑Opiate Doses** → ↓Peristalsis of the small bowel and large bowel

- **Onset of Obstruction:**

<i>ACUTE</i>	<i>CHRONIC</i>
Usually occur in small intestine.	Usually seen in large intestine.
Clinical course is rapid	Clinical course is slowly progressive.
Obstruction with sudden onset of severe colicky central abdominal pain e.g. intussusception.	Obstruction with lower abdominal colic and absolute constipation followed by distention e.g. Cancer colon.

• Site of obstruction

1. Large bowel obstruction (LBO): obstruction at the level of the cecum, colon, or rectum

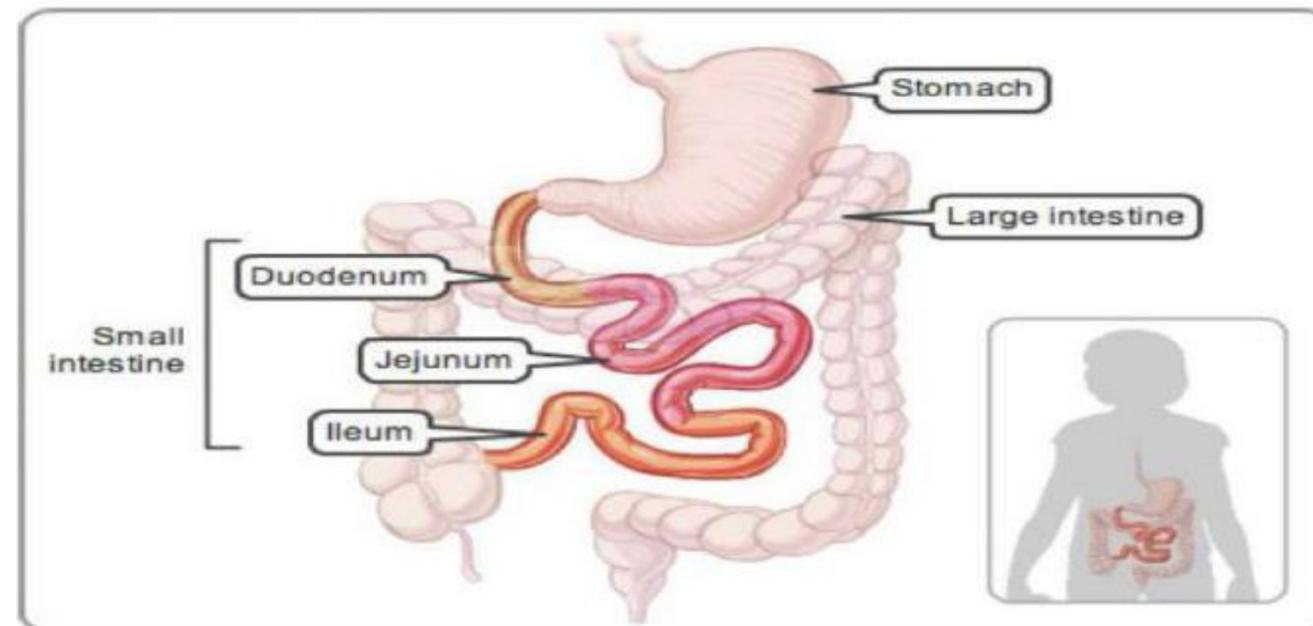
2. Small bowel obstruction (SBO): Can be classified to **high** and **low**

• In **high** small bowel obstruction : **Jejunum.**

• In **low** Small bowel obstruction: **Ileum.**



3. Gastric outlet obstruction (GOO): obstruction at the level of the pyloric channel or duodenum



- **Small bowel obstruction**

Most common cause

1. Bowel adhesions: *(Most common cause of SBO)*

fibrous intraperitoneal strands of connective (scar) tissue between organs and tissues that are not usually physiologically connected

- **Etiology:** *history of abdominal surgery, abdominal tuberculosis*

Abdominal x-ray shows dilation of several small bowel loops

2. Incarcerated hernias: *(second most common cause of SBO)*

• Small bowel obstruction

Other causes:

- Meckel diverticulum
- Strictures (e.g., Crohn disease)
- Malignant tumors or metastases
- Gallstone ileus
- Bowel obstruction **due to** compression of the third portion of the duodenum, between the aorta and the superior mesenteric artery
- May be congenital or acquired as a result of sudden, extreme weight loss.
- Foreign body impaction
- Ascariasis (most commonly at the level of the ileocecal valve)
- Internal hernia

specific to infants and children:

- Congenital intestinal atresia (e.g., duodenal atresia, jejunal atresia)
- Intussusception (e.g., secondary to Meckel diverticulum)
- Congenital strictures and bands (e.g., Ladd bands in intestinal malrotation)

• Large bowel obstruction

Most common causes:

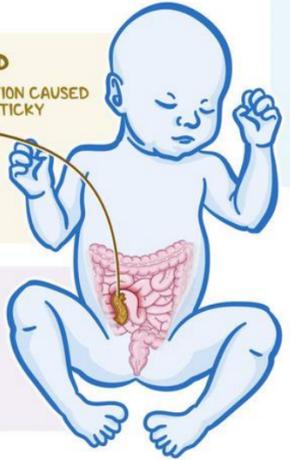
- *Adhesions (e.g., caused by prior abdominal surgery)*
- *Strictures (e.g., inflammatory bowel disease, congenital strictures)*
- *Fecal impaction*
- *Foreign body impaction*

Other causes:

- Malignant tumors (e.g., colorectal carcinoma): most common cause of LBO)
- Diverticulitis
- Volvulus

specific to infants and children:

- *Hirschsprung disease*
- *Congenital strictures and bands (e.g., Ladd bands in intestinal malrotation)*
- *Meconium ileus*
- *Rectal atresia*



BACKGROUND

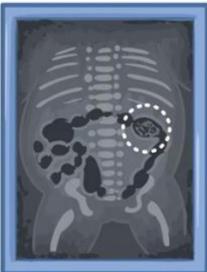
- * SMALL BOWEL OBSTRUCTION CAUSED by UNUSUALLY THICK & STICKY **MECONIUM**
- ~ EARLIEST MANIFESTATION of CYSTIC FIBROSIS
- * **COMPLICATIONS:**
- ~ INTESTINES RUPTURE
- ~ MECONIUM PERITONITIS

DIAGNOSIS

- * PRENATAL ULTRASOUND
- * **ABDOMINAL X-RAY**
- ~ "SOAP BUBBLE" APPEARANCE
- * WATER-SOLUBLE CONTRAST ENEMA
- * DIGITAL RECTAL EXAM
- ~ EMPTY RECTUM

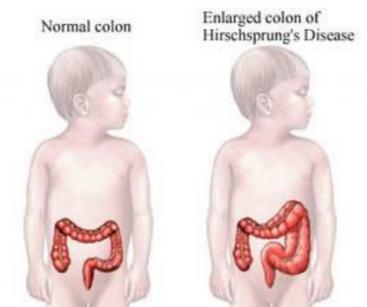
SYMPTOMS

- * FAILURE to PASS MECONIUM within FIRST 12 - 24 HOURS
- * ABDOMINAL DISTENTION
- * BILIOUS VOMITING



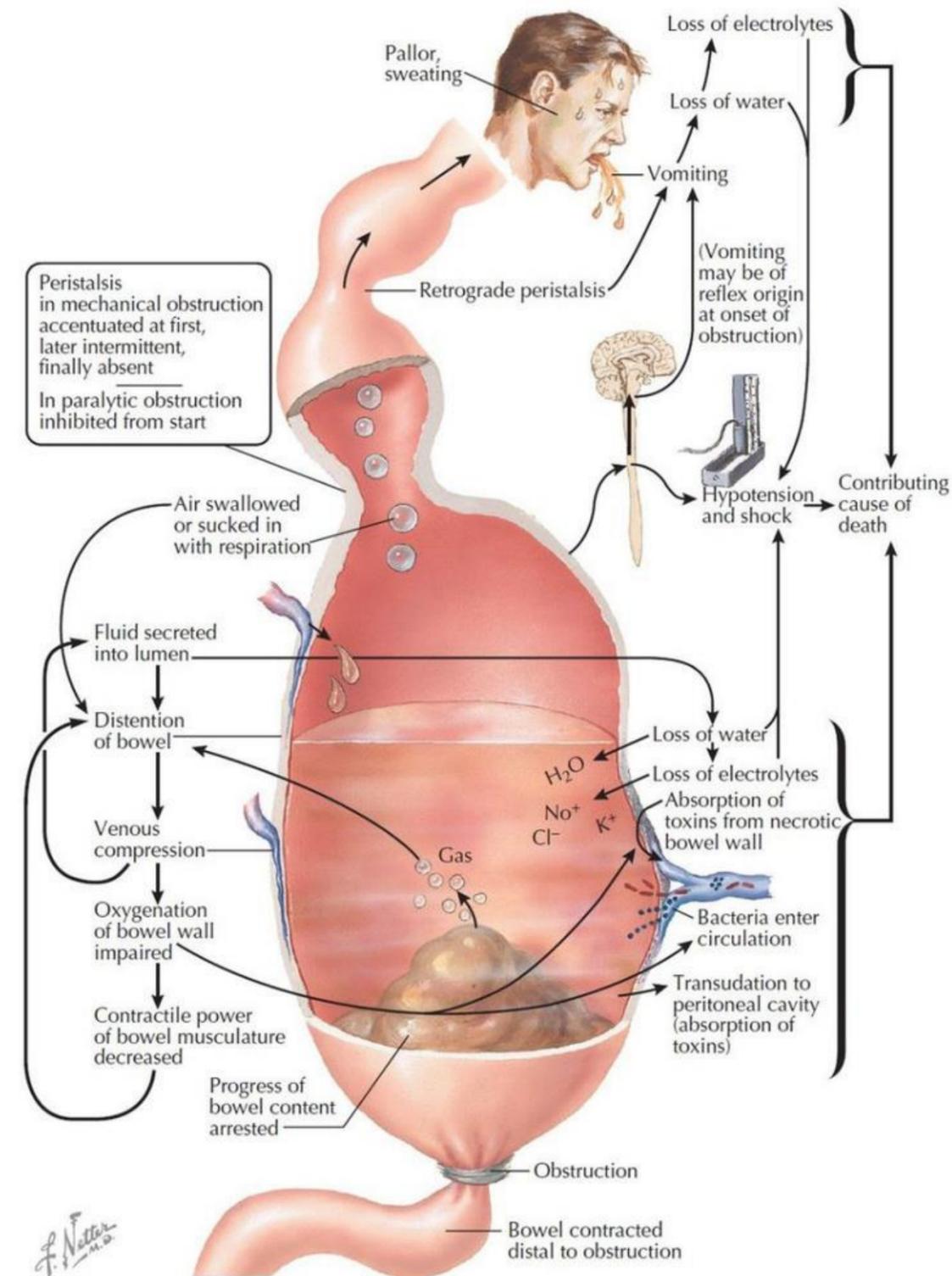
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- **Hirschsprung disease:** (congenital aganglionic megacolon) is an inherited disorder primarily affecting newborns. The condition is characterized by an aganglionic colon segment, usually the recto sigmoid region, which fails to relax leading to functional intestinal obstruction



Pathophysiology

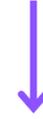
OBSTRUCTION AND ADYNAMIC ILEUS OF SMALL INTESTINE



• Pathophysiology

• Bowel obstruction

- stasis of luminal contents and gas proximal to the obstruction



↑ intraluminal pressure, which leads to the following:

1) **Gaseous abdominal distention** → sequestration of fluids within the distended bowel loops (third spacing) → dehydration and hypovolemia

2) **Vomiting** → loss of fluid and Na^+ , K^+ , H^+ , and Cl^- → hypokalemia, metabolic alkalosis, and hypovolemia

3) **Compression of intestinal veins and lymphatics** → bowel wall edema → compression of intestinal arterioles and capillaries → bowel ischemia, which leads to:

#↑ Bowel wall permeability



translocation of intestinal microbes to the peritoneal cavity



sepsis

#Necrosis and perforation of the bowel wall



peritonitis

#Anaerobic metabolism and lysis of ischemic cells



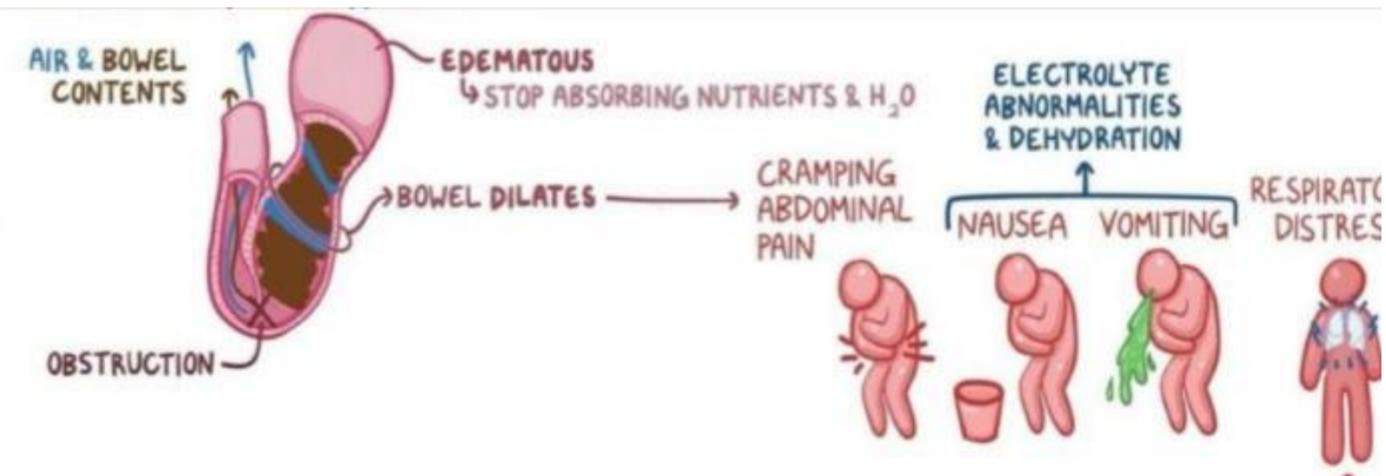
accumulation of lactic acid and release of intracellular K^+



metabolic acidosis and hyperkalemia

• Pathophysiology of mechanical obstruction

1. The bowel distal to the obstruction show normal peristalsis and absorption until it becomes empty and collapses.
2. Initially, the bowel proximal to obstruction dilate and become distended which will lead to visceral pain (first symptom of IO), proximal part try to propel the content so the peristalsis is increased in an attempt to overcome the obstruction which will lead to hyper peristalsis (intestinal colic).
3. If the obstruction is not relieved, the bowel continues to dilate; ultimately there is a reduction in peristaltic strength, resulting in flaccidity and paralysis.
4. The stasis of luminal contents and gas proximal to the obstruction leads to distention and increased intraluminal pressure.



The consequences of intestinal obstruction are not immediately life threatening unless there is excessive bowel dilation or superimposed strangulation.

• **Strangulation / Excessive bowel dilation:**

Compression of intestinal veins and lymphatics

↓
bowel wall edema

↓
compression of intestinal arterioles and capillaries

↓
bowel ischemia, which leads to:

← a. ↑ Bowel wall permeability

↓
translocation of intestinal microbes to the peritoneal cavity

↓
sepsis

b. Necrosis and perforation of the bowel wall

↓
peritonitis

c. Anaerobic metabolism and lysis of ischemic cells

↓
accumulation of lactic acid and release of intracellular K⁺

↓
metabolic acidosis and hyperkalemia

• Pathophysiology

Simple vs Complicated obstruction

Simple bowel obstruction:

- a) Present with the cardinal signs :
(pain, constipation ,vomiting ,distention)
- b) No evidence of complications i.e., no features of:
 - 1. Bowel ischemia
 - 2. Bowel perforation
 - 3. Red flags for complicated bowel obstruction

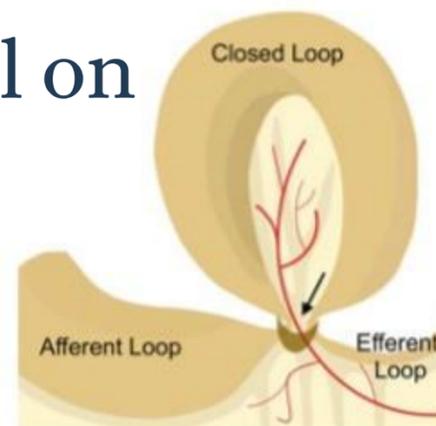
Complicated bowel obstruction:

▶ Red flags :

- a) Change in the character of pain (distension) from colicky to continuous
- b) Peritoneal signs
- c) Bowel sounds absent or reduced
- d) Lab abnormalities: significant leukocytosis, metabolic acidosis, ↑ lactate, ↑ C reactive protein

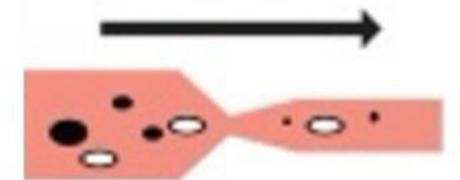
• CLOSED LOOP OBSTRUCTION

- Closed loop obstruction is a **specific type of obstruction** in which two points along the course of a bowel are obstructed at a single location thus forming a closed loop
- Usually this is due to adhesions, a twist of the mesentery or internal herniation.
- In the large bowel it is known as a **volvulus**.
- In the small bowel it is simply known as small bowel closed loop obstruction.
- Obstruction to the blood supply occur either from the same mechanism which caused obstruction or by the twist of the bowel on mesentery.



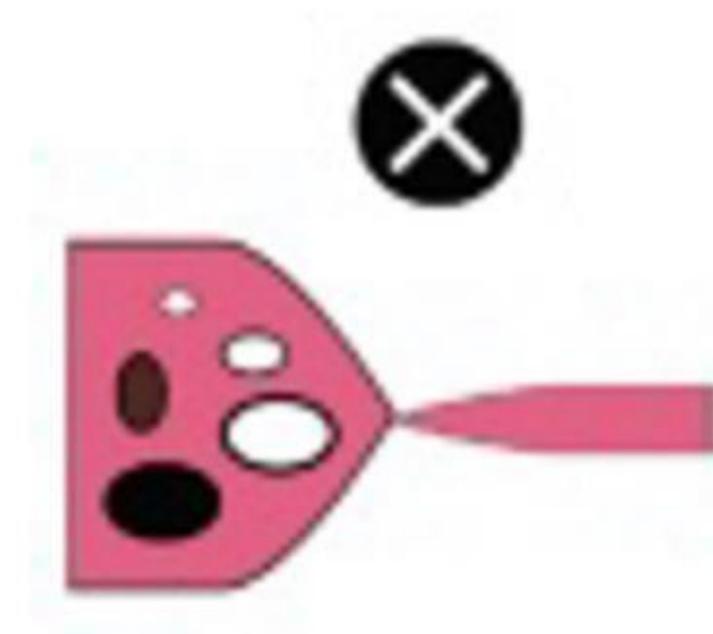
• Partial bowel obstruction

- **Partial obstruction** of the intestinal lumen, allowing a small amount of air and fluid to pass through.
- Clinical features may be **less severe** than in complete bowel obstruction.
- Can be associated with the intermittent passage of flatus and overflow diarrhea.
- Partial bowel obstruction causes gradually progressive symptoms that are typically milder than those caused by complete obstruction. Obstipation is only present in complete bowel obstruction.



- **Complete bowel obstruction**

- **Total obstruction** of the intestinal lumen, preventing the passage of air and fluid
- Rapid progression of clinical features
- Can be associated with obstipation (complete inability to pass stool or gas)



• Clinical features

- The diagnosis of intestinal obstruction is based on the the classic quartet of pain, distention , vomiting and absolute constipation

- The clinical features vary according to:

1. The location of the obstruction;
2. The onset of the obstruction;
3. The presence or absence of intestinal ischemia

• Clinical features

• symptom of simple intestinal obstruction :

1. pain



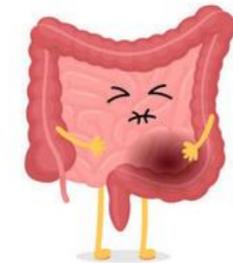
2. distention



3. vomiting



4. absolute Constipation

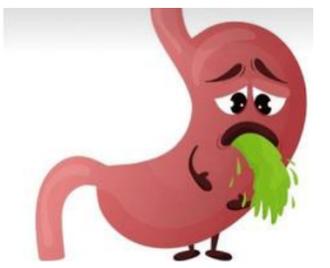


1. Pain (mainly due to distention)

- The first symptom to appear
- Sudden intermittent colicky pain
- pain felt in center of the abdomen (small bowel) or lower abdomen (large bowel).
- pain does not usually occur in paralytic ileus. (no peristalsis), (but the pain may occur as a result of abdominal distention)
- Continuous if perforation or strangulation is present



• Clinical features



2. Vomiting

This occurs due to significant bowel wall dilation proximal to obstruction → **Leading to** backflow of fluid and food contents.

As obstruction progresses, the character of the vomitus alters from digested food when the **obstruction occurs in high bowel** (high frequent), to feculent material when the **obstruction occurs in low bowel** (less frequent), as a result of the presence of enteric bacterial overgrowth.

- **Pyloric obstruction :**

- watery and acidic vomitus
- Uncommon and late symptoms

- **Long standing low bowel obstruction:**

- feculent material.
- Strangulation → bloody vomitus.



• Clinical features



3. Abdominal Distention

- degree of distention is dependent on the site of the obstruction .
- Generalized in large bowel obstruction
- Epigastric or hypogastric in small bowel obstruction and Typically less severe than in LBO

4. Constipation

Once an obstruction is complete and the bowel below is empty, absolute constipation develops. This means that neither feces nor flatus is passed. This occurs early in lower large bowel obstructions and late in high small bowel obstructions.



• Strangulation → Perforation → peritonitis

- The pain becomes constant and severe tenderness and rebound tenderness and loss of abdominal movement with respiration.
- fever and tachycardia.
- **Shock:** May be neurogenic from pain, hypovolemic, toxic or septic.

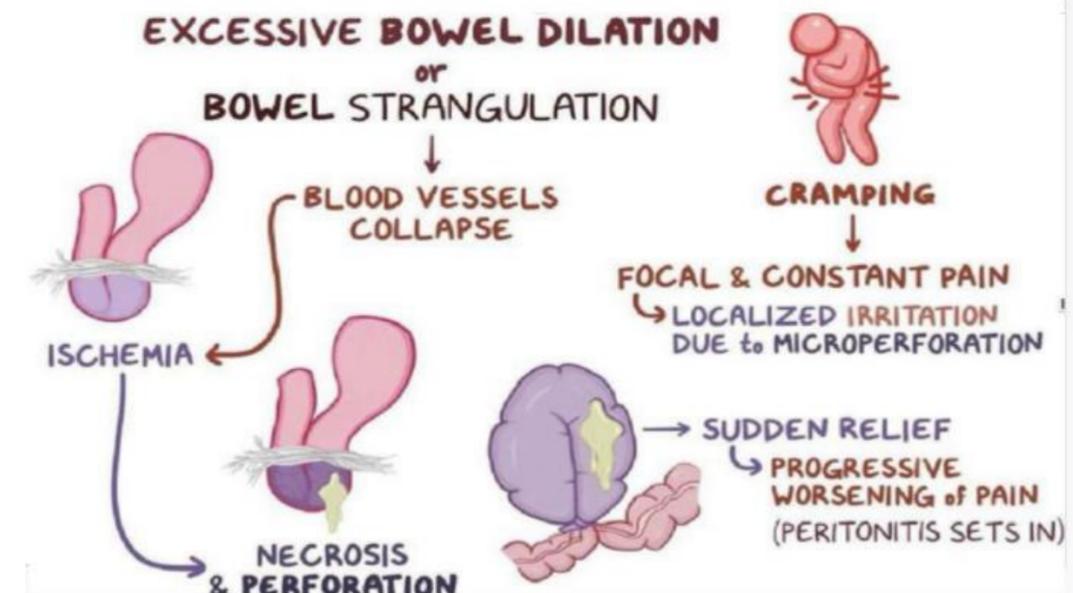
- **Strangling obstruction:** is obstruction with compromised blood flow; it occurs in nearly 25% of patients with small-bowel obstruction.
- It is usually associated with hernia, volvulus, and intussusceptions.
- Strangling obstruction can progress to infarction and gangrene in as little as 6 h, Venous obstruction occurs first, followed by arterial occlusion, resulting in rapid ischemia of the bowel wall.
- The ischemic bowel becomes edematous and infarcts, leading to gangrene and perforation

Toxic absorption from the retained fluid

↓
toxic shock

Fluid and electrolytes imbalance due to vomiting

↓
hypovolaemic shock .



• Other clinical features



• **Visible peristalsis:**

- may be present if the abdomen is examined carefully.
- Mostly seen in proximal loops.
- Borborygmi is quite loud ,does not require stethoscope to hear it.
- In auscultation sound of hyper peristalsis coinciding with attack of colic characteristic feature of intestinal obstruction.

• **Bloating :**

- The accumulation of chyme and gas gives rise to a feeling of fullness and causes bloating.
- This may also give rise to high-pitched gurgling sounds from the abdomen.



• Other clinical features



• **FATIGUE :**

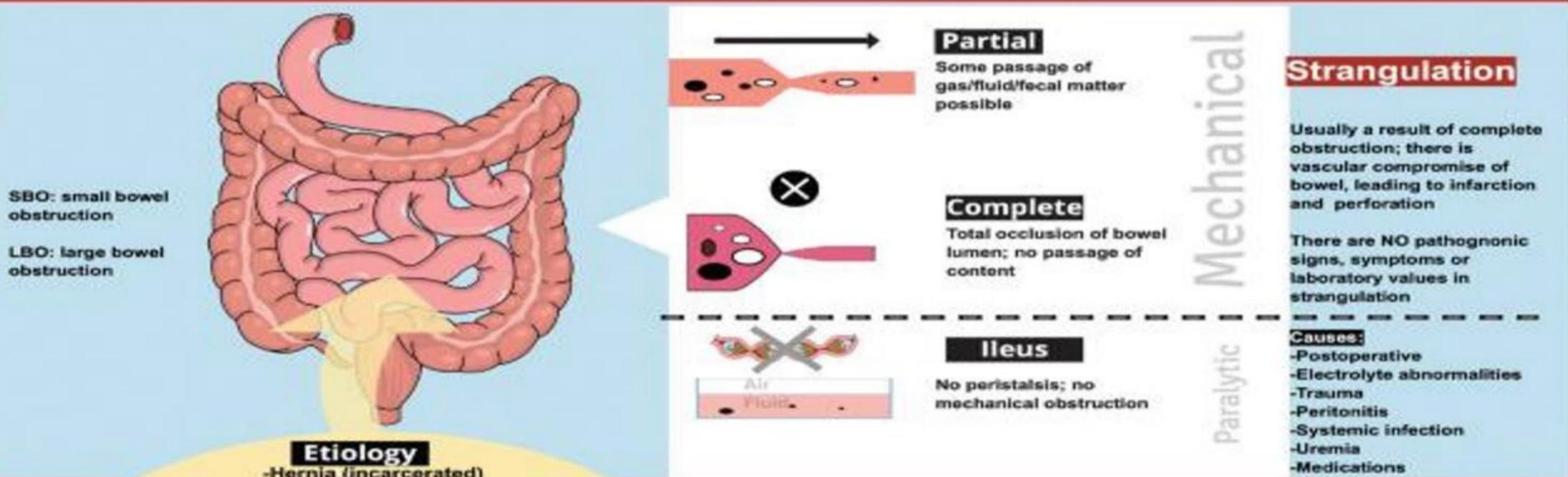
- Obstruction and the resulting digestive inability hampers the absorption of vitamins and other nutrients from food, leading to weakness, headache and dizziness. Even regular activities may make the individual feel exhausted and drowsy

• **INFREQUENT URINATION:**

- Dehydration due to diarrhea and vomiting, results in the loss of body fluids and electrolytes. As a response to this, the body tries to retain water through lowered urine output.

	HIGH bowel	LOW bowel
BEGINNING	Acute	Slow, insidious
GENERAL CONDITION	Early compromise	preserved
PAIN	Crampy pain in paroxysm	Less intensity
VOMITING	Early, profuse, biliary	Late, feculent may be absent
ABDOMINAL DISTENTION	Moderate, upper quadrant	Early, intense
CONSTIPATION	+	+++
ELECTROLYTES	Cl, K, Na rapid loss	Late hydro electrolytic imbalance

Bowel Obstruction



- Etiology**
- Hernia (incarcerated)
 - Adhesions
 - Cancer
 - Intussusception
 - Volvulus
 - Crohn's disease
 - Radiation enteritis
 - Bezoars
 - Gallstone
 - External compression

Symptoms

Variability in symptomatology according to site and cause of obstruction; affected part of bowel very important (upper small bowel/lower small bowel/large bowel)

Pain
-Epigastric
-Umbilical
-Colicky
-Poorly localized

Vomiting
-Starts sooner in proximal obstruction
-Vomitus first **GASTRIC**, then **BILIOUS**, then **FECULENT**

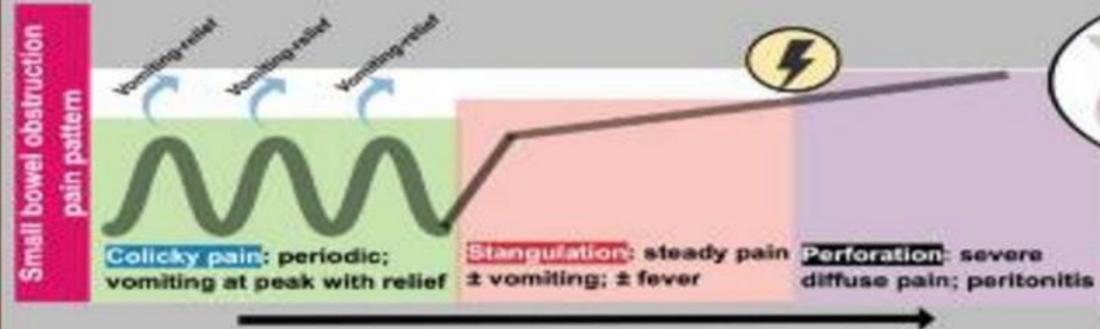
Obstipation
-Absence of flatus/stool
-Complete obstruction: flatus+content can pass for some time

Distention
-Proximal obstruction: LESS distention, **MORE** pain
-Distal obstruction: **MARKED** distention, **LESS** pain

Tenderness
Increased with:
-Distention
-Strangulation
-Perforation
-Local vs Diffuse
RIGIDITY+Tenderness

Peristalsis
Metallic sounds; absence implies strangulation, perforation, ileus

Shock
Hypotension, Tachycardia, Hypothermia



1 High SBO:
-Acute symptoms
-Early vomiting
-Pain greater
-Distention infrequent

2 Low SBO:
-Less severe pain
-Vomiting: later
-Distention: later
-Peristalsis visible in thin patients

3 LBO:
-Pain less acute/no pain
-Vomiting: infrequent
COMPETENT ILEOCECAL V.
-closed loop obstruction
INCOMPETENT ILEOCECAL V.
-reflux into small bowel; resembles partial SBO

• Examination findings

• *Inspection:*

- Scar
- Distension, **central** in small bowel obstruction and **peripheral** in large bowel obstruction
- Visible peristalsis

• *Palpation:*

- Abdominal mass may suggest carcinoma or strangulated bowel.
- Rigidity and rebound tenderness , indicates ischemia and peritoneal irritation.

• Examination findings

• *Percussion:*

- Tympanic because of gas filled bowel
- Tenderness on percussion indicates the presence of peritonitis.

• *Auscultation:*

- Increased high-pitched bowel sounds (early) or the absence of any bowel sounds (late)
- Metallic clicks as pressure is raised if much gas is present in the bowel.
- Gurgling borborygmi if gas and fluid are present in the bowel.
- Silence if generalized peritonitis or paralytic ileus is present.



• Examination

- **Digital rectal examination:** Determines whether there is any fecal impaction or abnormal masses and it helps to assess the consistency and presence of stool, which can indicate the severity

Impacted feces

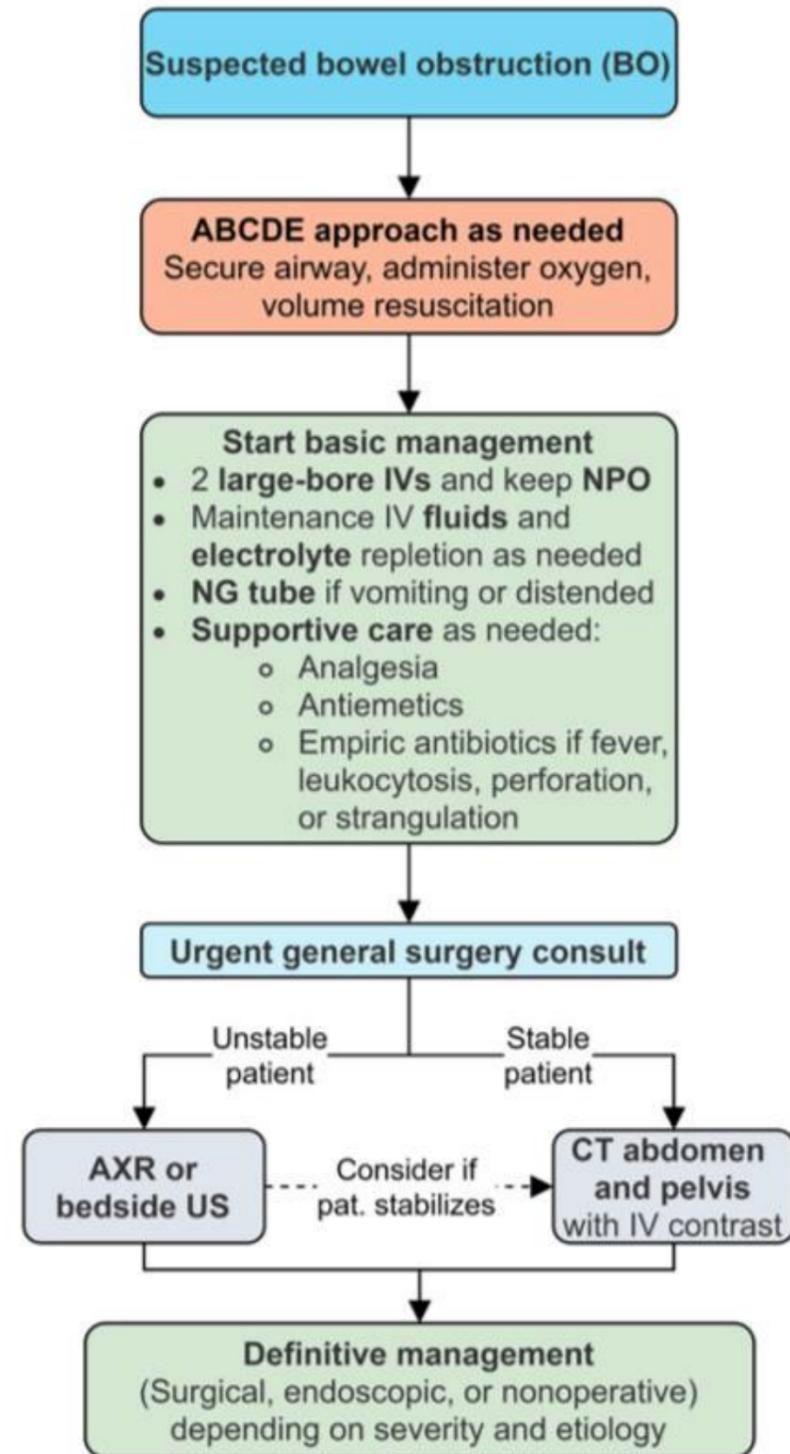
Rectal cancer

Blood on finger: which maybe present with mesenteric artery occlusions, intussusception or Volvulus.

Empty rectum: it can be a significant finding and may necessitate further investigation to determine the cause of the obstruction and the overall condition of the patient.

• Management

- Bowel obstruction is an emergency and should be detected and managed early to minimize the risk of bowel perforation and strangulation, and the subsequent development of sepsis. The initial management of bowel obstruction is similar to that of undifferentiated acute abdomen.



• Management

- **ABCDE approach:** Evaluate vital signs, volume status, and the need for invasive monitoring.
- **Initial management.**
 - NPO status
 - Obtain IV access with two large-bore peripheral IVs; simultaneously draw blood for urgent laboratory studies.
 - IV fluid resuscitation
 - Electrolyte repletion as needed
 - Insert a nasogastric tube in patients with recurrent vomiting and/or significant abdominal distention.
- **Administer supportive care as needed.**
 - Parenteral analgesics
 - Parenteral antiemetics
 - Empiric antibiotics for intraabdominal infections (not routinely recommended for simple bowel obstruction) [8][9]
 - If fever and/or leukocytosis are present [3]
 - For strangulated or perforated bowel obstruction

• Management

- **Definitive management .**

- **Imaging:**

depends on the type of bowel obstruction and hemodynamic stability of the patient

- **Acute bowel obstruction :**

- **Stable patients:** CT abdomen and pelvis with IV contrast
- **Unstable patients:** Consider abdominal series x-ray or abdominal ultrasound first, along with urgent surgical consultation.

- **Subacute bowel obstruction**

- **Preferred:** CT abdomen and pelvis with IV contrast
- **Alternatives:** MRI with and/or without IV contrast, water-soluble contrast challenge, and specialized dynamic contrast studies

• Investigations

• **BLOOD EXAMINATION:**

CBC (Complete blood count):

- A rise white cell count will indicate an infection.
- Increase hematocrit.
- Normal or slight rise in W.B.C count: simple mechanical obstruction.
- Moderate rise in W.B.C count(15000-20000):strangulation.
- Very high rise in W.B.C count(30000-40000):primary mesenteric vascular occlusion.

Serum Urea & electrolytes:

- Derangement may be seen with vomiting & diarrhea.
- hyponatremia and hypocalcemia .
- Dehydration will be reflected in raised serum urea and creatinine.

Serum Amylase: It is non specific test & may be raised in cases of small intestinal obstruction.

Metabolic acidosis:

- It occurs due to combined effects of dehydration ketosis and loss of alkaline secretion.
- Very common in distal intestinal obstruction.

Ruly's tube and suction: brings a large amount of fluid in simple occlusion aspiration ->partial release of pain while in strangulation no effect.

NOTE: Leukocytosis, metabolic acidosis, and elevated serum lactate in a patient with suspected bowel obstruction are suggestive of **bowel ischemia**.

- **Imaging Modality**

1. **X-Rays**

2. **CT-Scan**

3. **US**

• Abdominal series x-ray

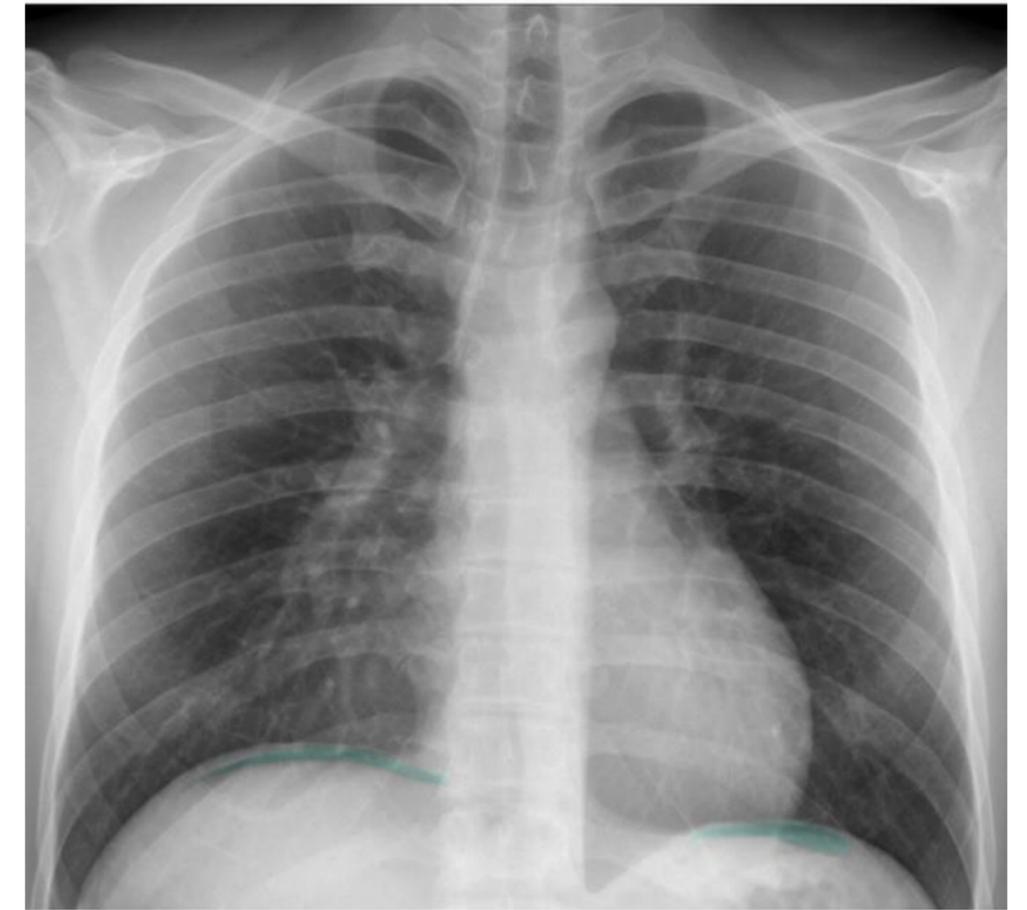
- **Indication:** most appropriate initial test in **hemodynamically unstable** patients or in resource-poor centers

• Findings:

- Proximal bowel dilatation
- Minimal or no intraluminal air distal to the obstruction
- **Stepladder sign** (best seen on an upright view): **multiple air-fluid levels** and stacked dilated loops of small bowel
- Chest x-ray : Air under the diaphragm is an indicator of bowel perforation.
- See also “Radiological signs of mechanical bowel obstruction.”

• Important considerations : X-rays have a number of limitations.

- Variable sensitivity (50–65%)
- Can not reliably identify the site of obstruction, underlying etiology, or extent of complications
- Do not influence the management of acute bowel obstruction to the same extent as CT abdomen



• Pneumoperitoneum

- X-ray chest (PA view)
- Free intraperitoneal gas (green overlay) is visible under both the right and left hemidiaphragms.

- **Dilatation of bowel loops proximal to the obstruction**

- **3-6-9 rule :**

- To help guide the identification of bowel dilatation on imaging
- Transverse diameter greater than the following indicates dilation:

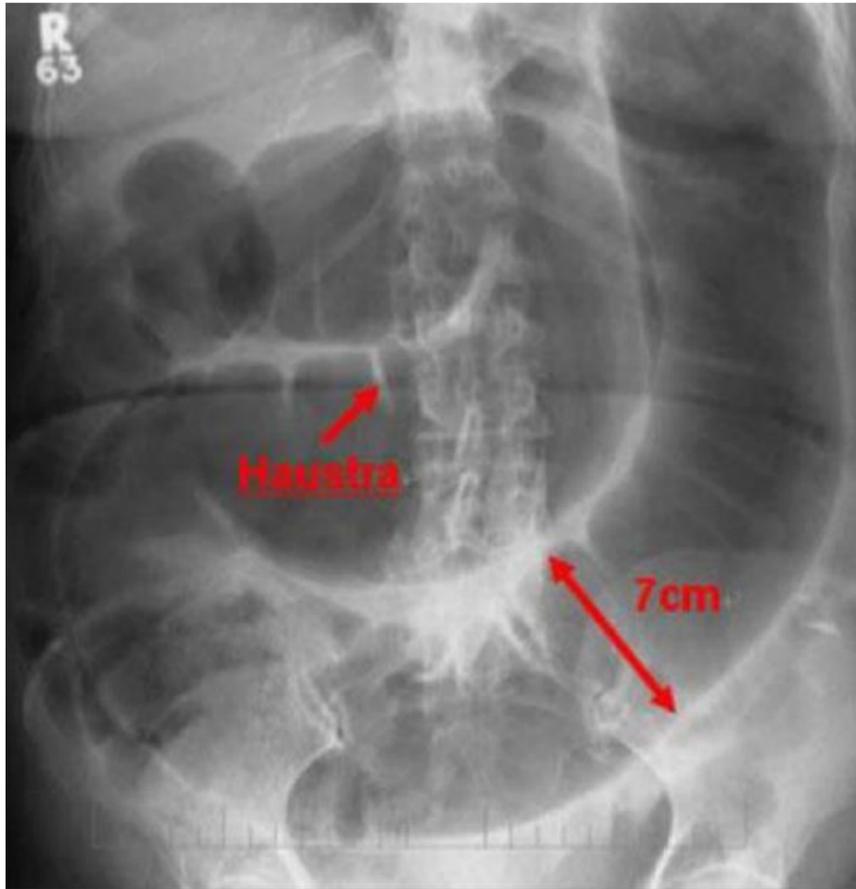
- Small bowel > 3 cm
- Large bowel > 6 cm
- Cecum > 9 cm

- SBO: Dilated loops are predominantly central.
- LBO : Dilated loops are predominantly peripheral.



Small bowel dilatation

• **How to differentiate between the jejunum, ileum and the colon ?**



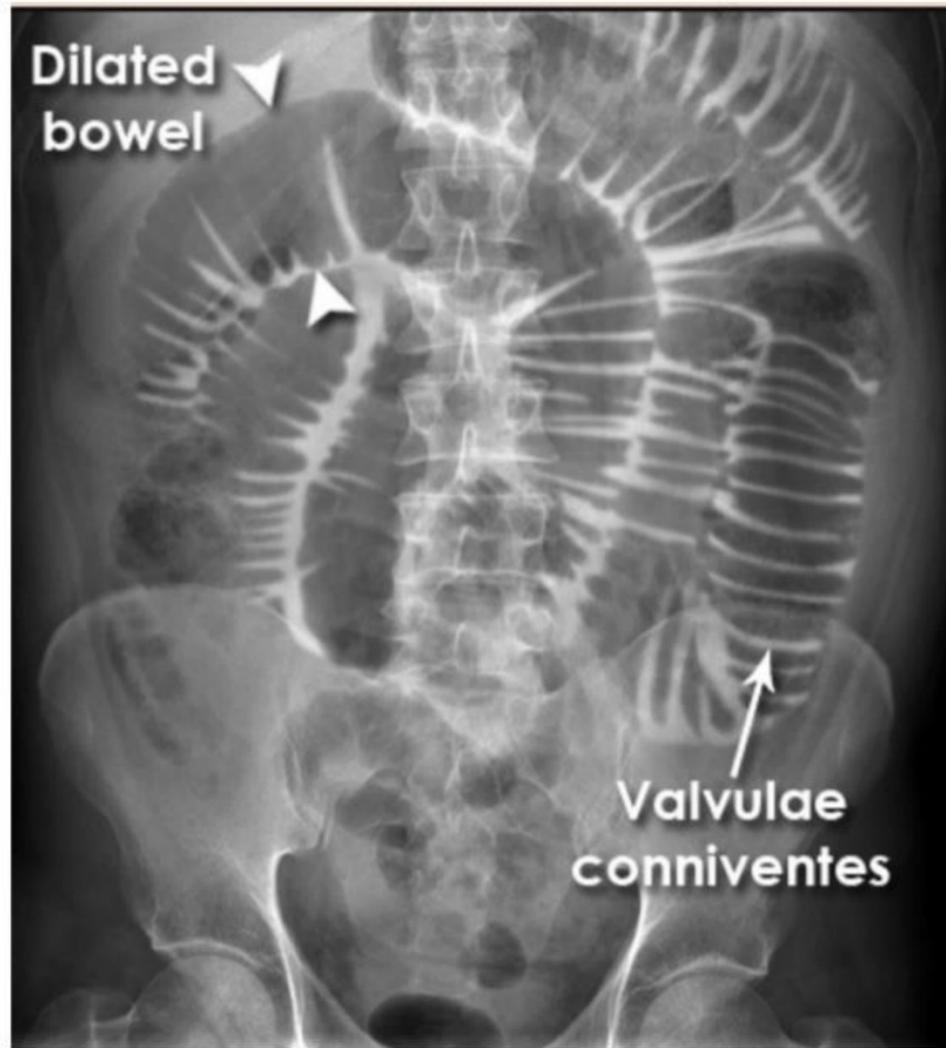
Peripheral distention
Presence of haustration



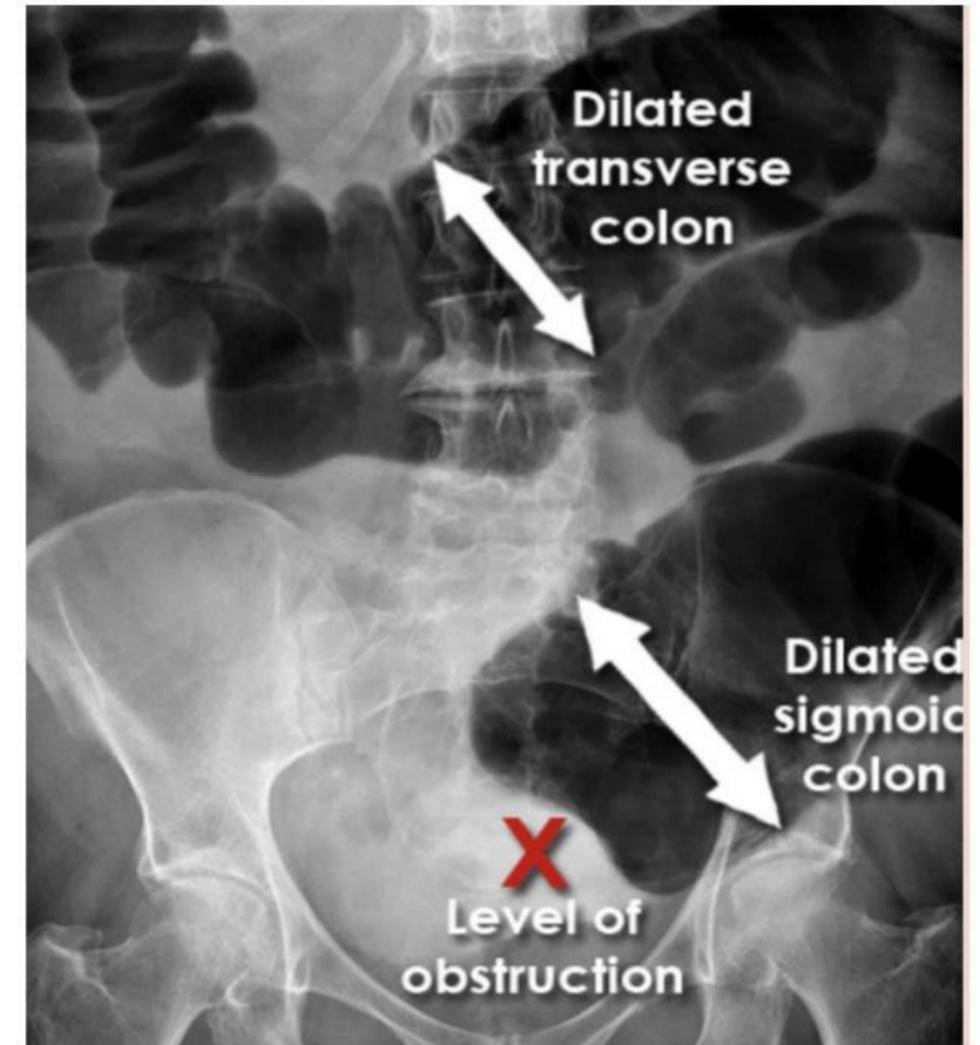
The ileum is
characterized by
structureless tube



The jejunum is
characterized by the
presence of plicae
circulares



SBO: Dilated loops are predominantly **central**



LBO : Dilated loops are predominantly **peripheral**

Sigmoid Volvulus

Findings include:

- Massively dilated colon
- Haustra usually absent
- "Coffee bean" sign



Cecal Volvulus

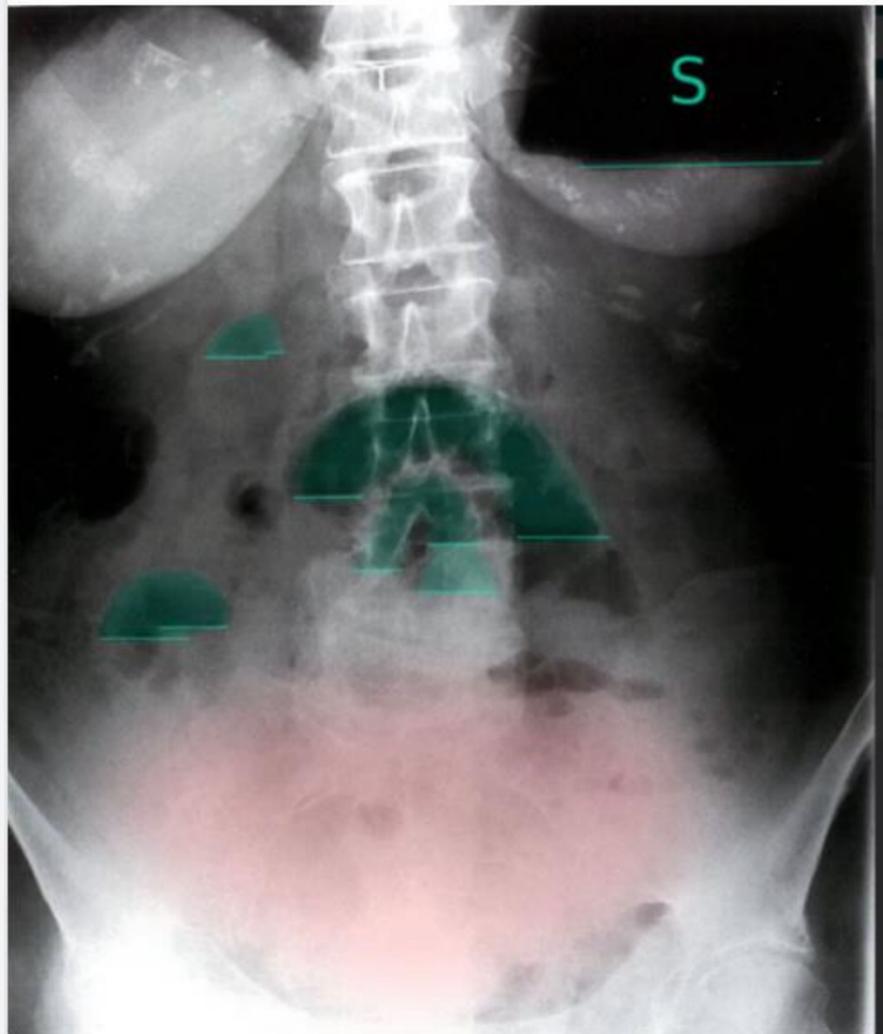
Findings include:

- Massively dilated colon
- Haustra usually present
- Lack of colon in RLQ



• Air-fluid level

- Visible on upright or decubitus views
- Common criteria for diagnosing SBO
- > 2 air-fluid levels
- Air-fluid level diameter > 2.5 cm
- Air-fluid levels of different heights visible within the same bowel loop



- **X-ray abdomen** (AP view, erect position)
- Multiple air-fluid levels (green overlay) are visible in the mid-abdomen. The opaque appearance of the pelvis (red overlay) is due to fluid-filled loops of small bowel. There is a precitand des in tus radiographs can lve lave uprees in at are noe dentiabl on supine radiographs, Air-luid levels can indicate leus or mechanical obstruction. A lack of distal gas and air-fluid levels at different heights in the same bowel loop (differential air-fluid levels) suggest obstruction.

• CT abdomen and pelvis (golden standard)

Indications

- With IV contrast: most appropriate initial test in hemodynamically stable patients with acute bowel obstruction
- With water-soluble oral contrast: Consider in patients with subacute bowel obstruction and no evidence of complications.
- Without contrast: for patients with a contrast allergy

Findings

- a distinct transition point where bowel caliber changes from normal to abnormal
- dilated bowel loops proximal to the transition point
- *small bowel >3.0 cm
- *large bowel >5 cm
- a small bowel size threshold of 2.5 cm increases sensitivity for partial small bowel obstruction
- collapsed or normal caliber bowel distal to the transitional point
- bowel wall thickening
- surrounding mesenteric fat stranding indicating inflammation
- twisting of the mesentery in cases of volvulus

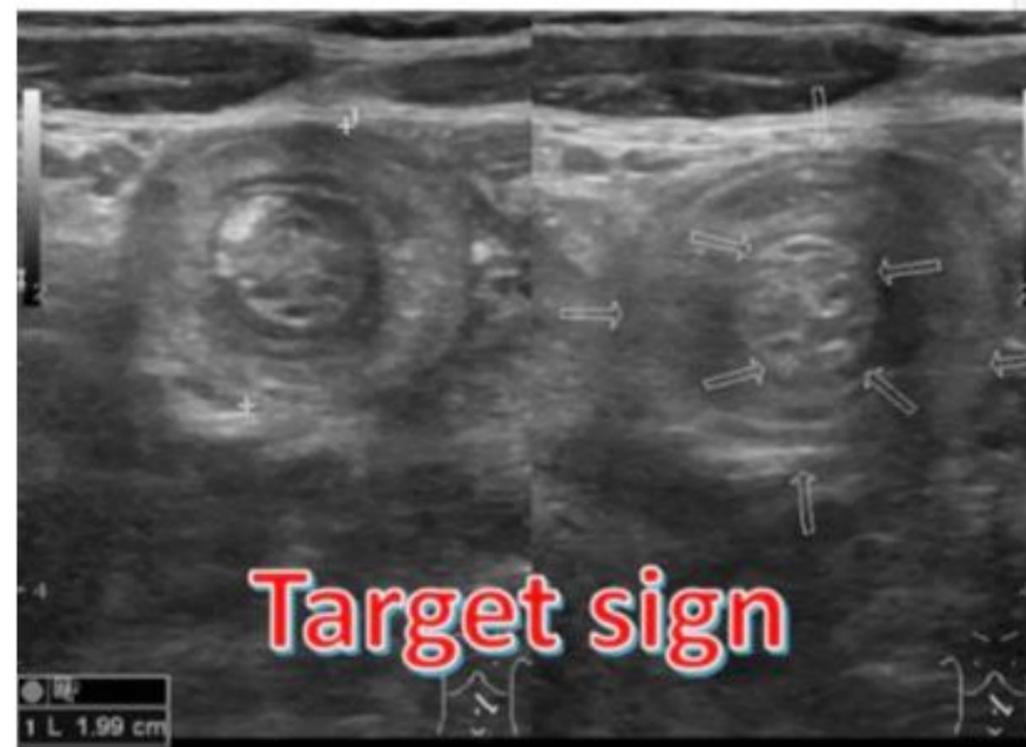
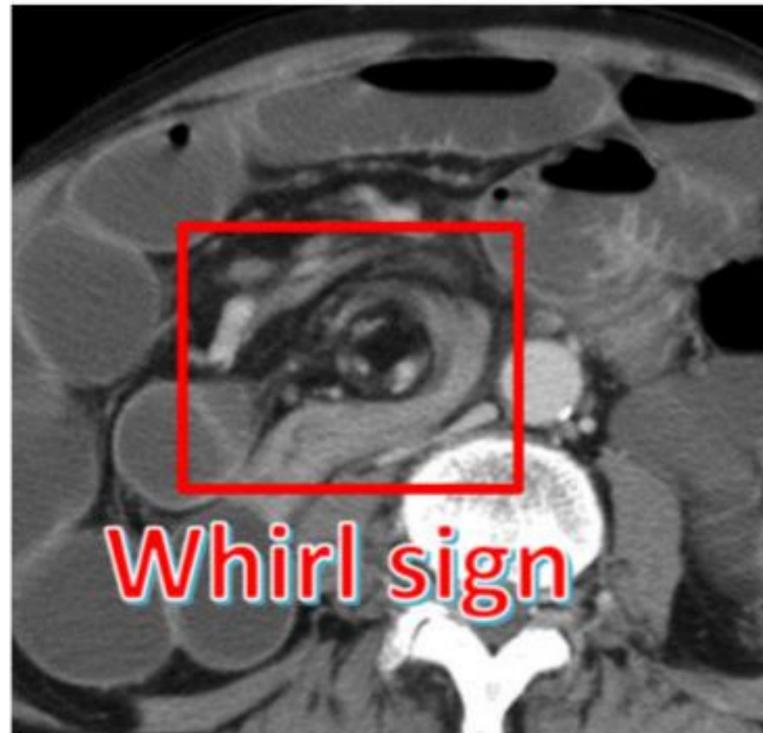
If bowel obstruction is identified it is important to assess for complications and assess the viability of the involved bowel:

- pneumoperitoneum indicating perforation
- bowel ischemia
- strangulation
- as for ischemia but for bowel within a hernial sac

• CT abdomen and pelvis (golden standard)

- Sometimes the imaging can give us a clue to the underlying cause of the obstruction, examples:

Whirl sign in volvulus
Target sign in intussusception
Diverticuli.





Dilated small bowel

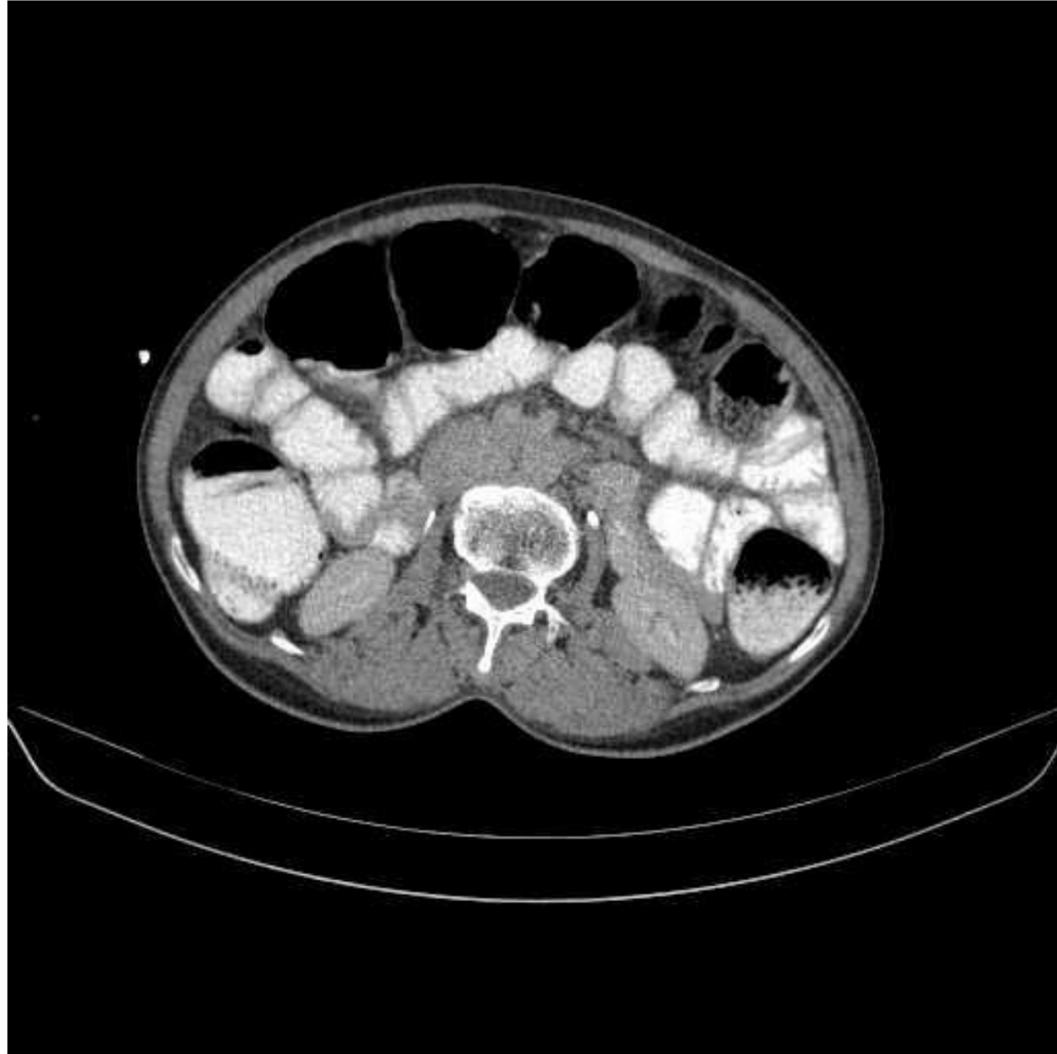
- CT abdomen (IV contrast; axial plane) of a patient with small bowel obstruction
- Numerous dilated loops of small bowel (examples indicated by green outline) are present in the abdomen, some of which contain fluid levels (dashed line). Small bowel dilation can be caused by mechanical obstruction or adynamic ileus.



Small bowel obstruction

CT abdomen (IV contrast; coronal plane)
Significant dilatation of mid and distal small bowel loops can be seen (asterisks).
These findings are typical of small bowel obstruction.

Functional obstruction

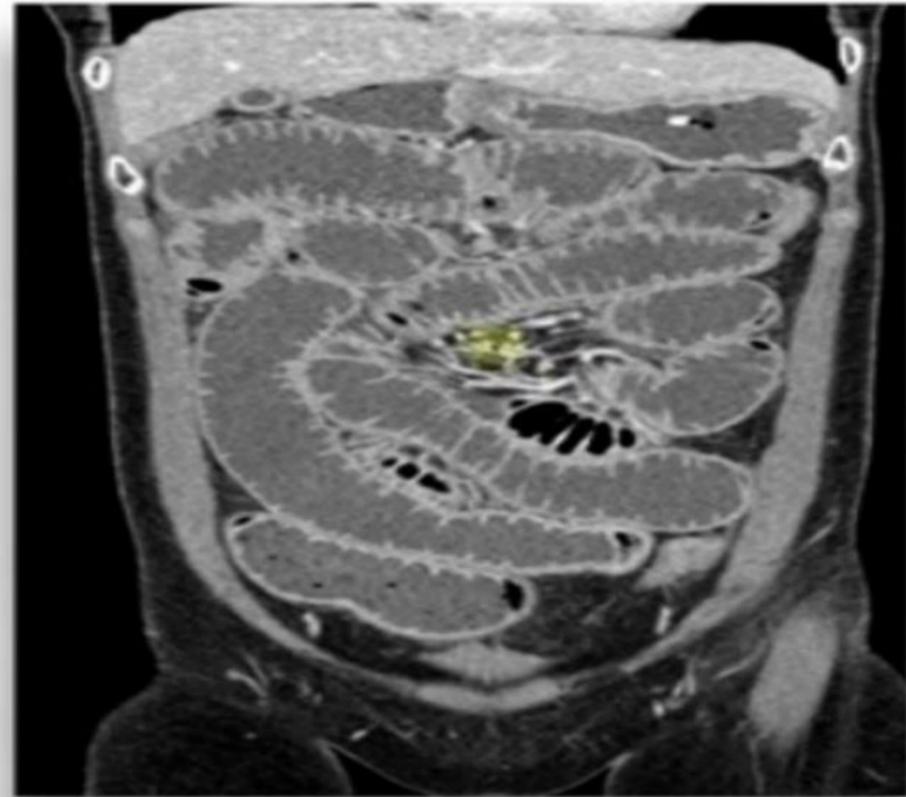


paralytic ileus ct scan



Ogilvy ct

Mechanical obstruction



SBO CT general

SBO ct
general



LBO general

LBO ct

• Abdominal ultrasound

POCUS or formal ultrasound can be performed.

- **Indication:** Hemodynamically unstable patients (may be preferred over abdominal x-ray)

- **Findings**

- Multiple fluid-filled dilated bowel loops > 2.5 cm in diameter adjacent to collapsed bowel loops (most specific finding)

- Thickened bowel wall

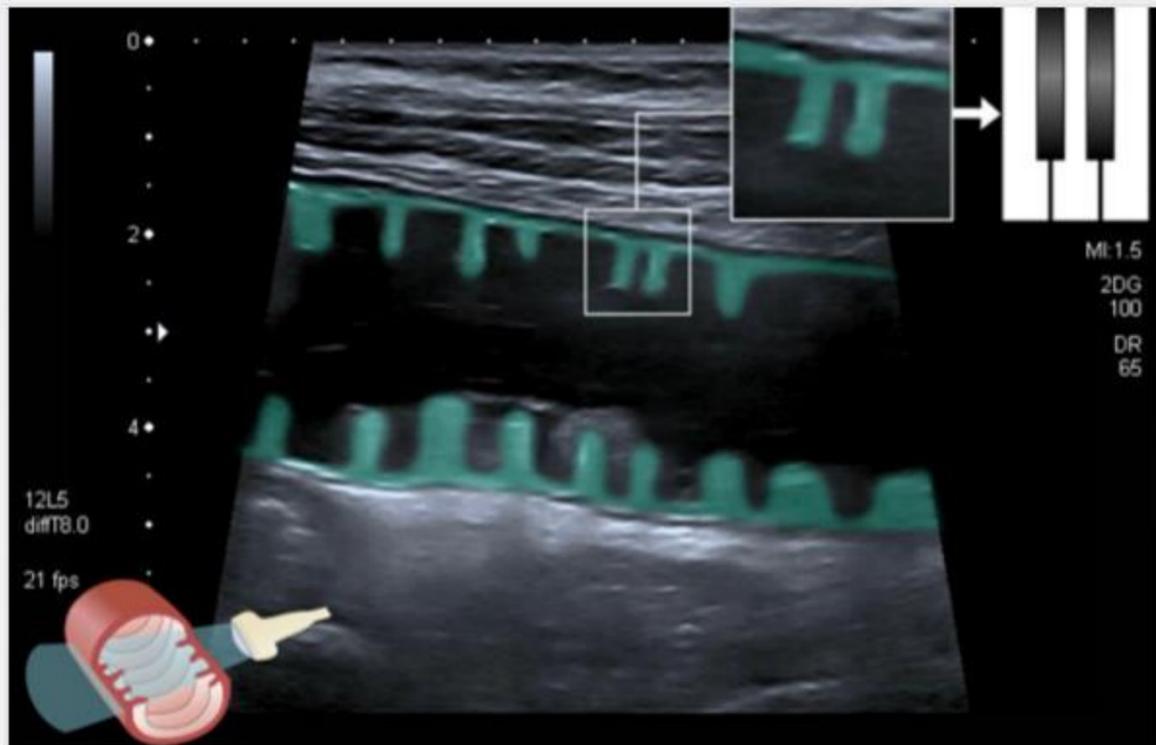
- *Prominent plicae circulares of dilated small bowel loops
(sometimes referred to as the **keyboard sign**)

- *Altered peristalsis

- ~Increased (early finding) or decreased/absent (late finding)

- ~**Pendular peristalsis:** dysfunctional so-called “to-and-fro” peristalsis

- *Intraperitoneal fluid accumulation may be present.



Piano key sign in dilated small bowel

Ultrasound abdomen (small bowel loop; longitudinal plane)

The anechoic fluid-filled loop of small bowel is imaged through its center. The plicae circulares (circumferential mucosal folds) are seen as hyperechoic finger-like projections (green overlay), resembling the keys of a keyboard.



Dilated small bowel

Ultrasound abdomen (left lower quadrant; oblique plane) |

The plicae circulares (circumferential mucosal folds) can be seen as hyperechoic linear structures (green overlay) extending across the periphery of the anechoic fluid-filled loop of small bowel.



Ultrasound abdomen

A longitudinal image of a loop of small bowel shows abnormal mural thickening (arrows). Normal bowel has an average mural thickness in the range of 3-5 mm, depending on the degree of distention.

Star: ascites

• Barium enema vs contrast (water-soluble) enema

- **Indication:** suspected distal LBO if CT is unavailable

- **Findings:** Tapering of the bowel lumen at the site of obstruction

- ***Complete bowel obstruction:** contrast not visible beyond the obstruction .

- ***Partial bowel obstruction:** small amount of contrast visible beyond the obstruction

- **NOTE :**



- Contrast enema helps differentiate complete bowel obstruction from partial bowel obstruction. Barium enema is contraindicated if bowel perforation is suspected (water-soluble contrast enema can be used instead).



Apple core sign

Fluoroscopy (barium enema; lateral view)

An apple core sign (also called napkin ring sign; green overlay) is seen in the distal descending colon. It is the result of annular constriction by a colorectal carcinoma.



Bird beak sign in cecal volvulus

Fluoroscopy (single contrast barium enema; AP view; supine position)

As a result of axial torsion of the cecum, the barium column tapers (green overlay) until it eventually terminates at a point of complete obstruction (arrowhead). This appearance has been termed the "bird beak" sign. A featureless loop of gas-filled bowel in the left upper quadrant (white arrows) may represent the dilated cecum proximal to the point of obstruction.

- **Water-soluble contrast challenge (WSCc)**

- **Indication:** SBO, to differentiate partial SBO from complete SBO
- **Procedure:** A water-soluble contrast medium is administered orally or via an enteric tube, followed by abdominal x-ray 8 and 24 hours after ingestion.
- **Normal WSCc:** contrast reaches the colon within 24 hours of administration

- **NOTE:**

WSCc is also used to evaluate response to nonoperative management.

• Treatment

- depends on the severity and etiology of the obstruction and clinical presentation of the patient:

1) Conservative treatment : In case of simple bowel obstruction with no evidence of underlying malignancy) complications (e.g., partial bowel obstruction or postoperative ileus)

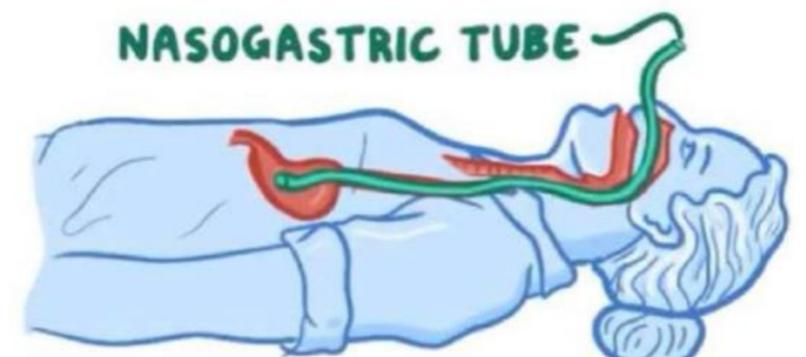
2) Interventional treatment : Endoscopic intervention

3) Surgery

4) Identify and treat the underlying cause (e.g., treat the underlying malignancy)

• Conservative treatment

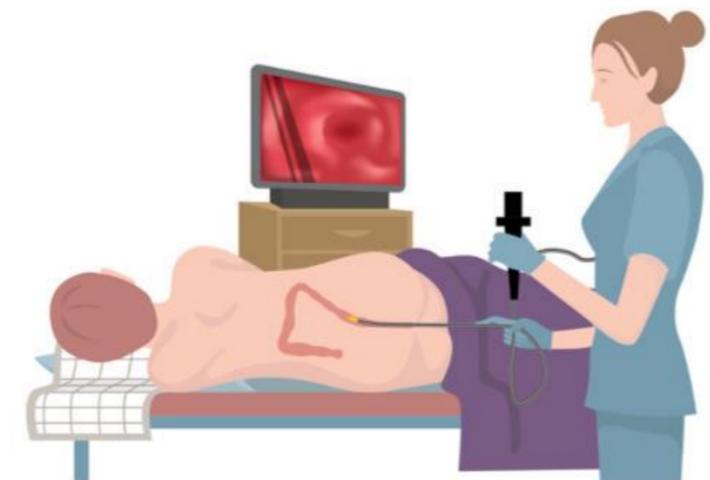
- **Initial measure**
- **Bowel rest (NPO)**
- **Supportive care**
- IV fluid therapy (initial fluid resuscitation followed by maintenance fluid therapy)
- Electrolyte repletion
- Parenteral analgesics (non opioid analgesics are preferred)
- Prophylactic antibiotic therapy is not routinely indicated for simple bowel obstruction that is being managed non operatively
- **Nasogastric decompression, consider NG tube in:**
- Persistent vomiting
- Significant upper GI distention
- Complete bowel obstruction
- Volvulus



- Gastrointestinal decompression is done with a small flexible nasogastric tube that's inserted through the nose and into the stomach to help empty the dilated bowel.

- **Endoscopic intervention**

- Endoscopic interventions can be considered for bowel obstruction with no signs of strangulation or perforation.
- **indications:**
 - Inoperable malignant bowel obstruction:
Consider placement of stents and decompression tubes.



- **Surgical operation**

- **Indications**

- 1) **Complicated bowel obstruction** (i.e., signs of ischemia, perforation, or clinical deterioration)
- 2) **Closed-loop bowel obstruction** (hernia , volvulus)
- 3) **Failure of nonoperative management** (i.e., no improvement after 3 days ofNOM; clinical deterioration/development of complications during NOM)
- 4) **Underlying etiology necessitates surgical intervention** (e.g., surgery for inguinalhernia ;enterolithotomy for gall stone ileus)

- **Procedure: exploratory laparotomy**

- 1) **Operative decompression**
- 2) **Management of the obstruction** (e.g., adhesiolysis, hernia reduction, cecopexy ,tumor resection)
- 3) **Resection of gangrenous bowel with restoration of intestinal transit or creation of a stoma**

• **Surgery - Management of the obstruction**

• **Treatment of adhesive obstruction**

- Initially treat conservatively provided there are no signs of strangulation; should rarely continue conservative treatment for longer than 72 hours.
- At operation, divide only the causative adhesion(s) and limit dissection .
- Repair serosal tears; invaginate (or resect) areas of doubtful viability.
- Laparoscopic adhesiolysis in the hands of advanced laparoscopic practitioners
- In case of recurrent adhesions repeat adhesiolysis (enterolysis).

- **Surgery - Management of the obstruction**

- **Treatment of Volvulus**

- **Cecal volvulus is treated according to the viability of the cecum.**

~Viable cecum is reduced at the operation after being decompressed with a needle. A cecopexy (fixation of the cecum to the right iliac fossa) or cecostomy is then performed.

~Right hemicolectomy is performed for non-viable cecum.

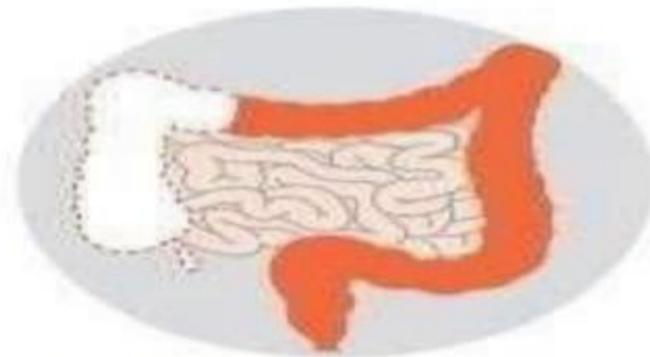
- **Sigmoid volvulus is treated temporarily with untwisting by Flexible sigmoidoscopy or rigid sigmoidoscopy**

- **Surgery - Management of the obstruction**

Treatment of malignancy

treated by resection & anastomosis (follows the colorectal cancer guidelines)

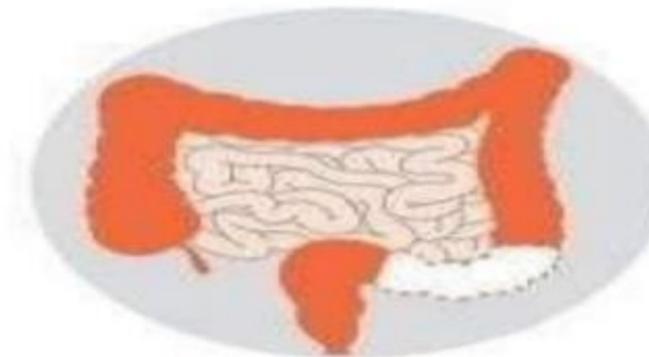
○ Area removed



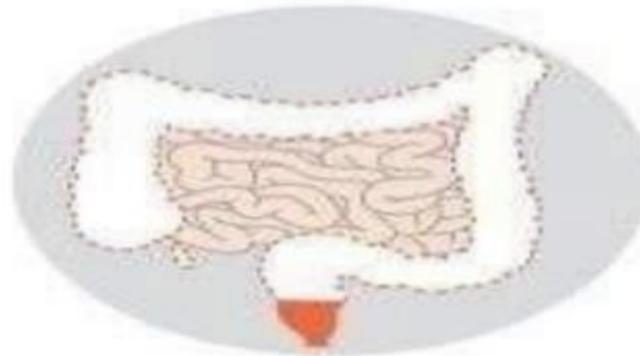
Right hemicolectomy
The right side of the colon is removed.



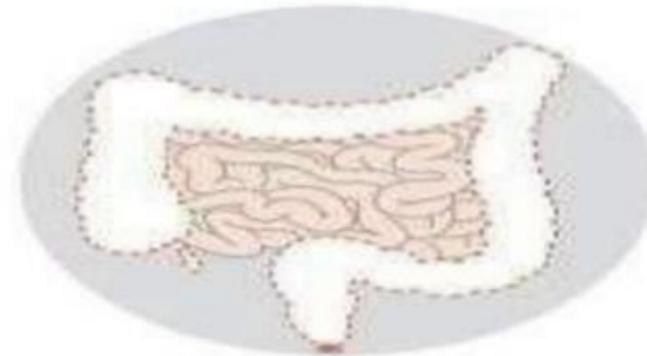
Left hemicolectomy
The left side of the colon is removed.



Sigmoid colectomy
The sigmoid colon is removed.



Subtotal or total colectomy
Most or all of the colon is removed.



Proctocolectomy
All of the colon and the rectum are removed.

Bowel Obstruction

Definition: Partial or complete blockage of the small or large intestine.

Presentation



High Small Bowel

- 1- Billious vomiting -> Early!
- 2- Minimal abdominal distention.
- 3- Minimal dilatation of bowel in the Abd X-Ray.

Low Small Bowel

- 1- Peri-umbilical pain.
- 2- Delayed vomiting.
- 3- Prominent dilated bowel loops in the Abd X-Ray.



Large Bowel



- 1- Obstipation & abdominal distention.
- 2- Lower abdominal pain.
- 3- Distention of the proximal colon in the Abd X-Ray.

Management:



Medical/Conservative

Surgical/Invasive



THANK YOU