Intestinal Obstruction

Done by :

- Yousef Abdallah
- Sojoud Nasser
- Ajyad Qawabah
- Omar abdallah
- Reem Gharaibeh

Supervised by:

Dr. Mohammed Nofal

Definition

Any form of impedence to the normal passage of intestinal content through the small or large intestine due to mechanical barrier or functional impairment.

Classified according to:

- Motility (mechanical, functional).
- Onset and the Course of Obstruction.
- Level of Obstruction.

Motility
Mechanical Obstruction

In which the peristalsis is working against a mechanical obstruction. WE HAVE ANATOMICAL PROBLEM. May be complete or partial blockage.

Because in the early stage of obstruction peristalsis is heard , its referred to as dynamic obstruction .

causes of mechanical obstruction:

1. extramural: eg. Adhesion , hernias (obstructed and strangulated) ,tumor , annular pancreas.

2. Intramural: eg. Congential (atresia and stenosis) , inflammatory (chrons disease, chronic divertuclitis), tumor (colorectal cancer), volvulus , intussusception.

3. Intraluminal:eg. Fecal impaction, foreign body , parasitic infestation , gall stone

functional obstruction (adynamic)

In which there is no mechanical obstruction; peristalsis is absent or inadequate .

Occur in three form :

1- pathological ileus .

2- mesenteric vascular occlusion .

3- pseudo-obstruction .

Onset of Obstruction:

1) Acute

- Usually occur in small intestine.
- Clinical course is rapid
- Obstruction with sudden onset of sever colicky central abdominal pain

  e.g. intussusception

2) Chronic

- Usually seen in large intestine.
- Clinical course is slowly progressive.
- Obstruction with lower abdominal colic and absolute constipation ,followed by distention

e.g. Cancer colon

Level of Obstruction:

1. High small bowel obstruction.
2. Low small bowel obstruction .
3. Large bowel obstruction.

Pathophysiology

Simple vs Complicated obstruction

Simple bowel obstruction:

- Present with the cardinal signs

(constipation ,pain ,vomiting , distension)

- No evidence of complications i.e., no features of:

1. Bowel ischemia
2. Bowel perforation
3. Red flags for complicated bowel obstruction

Complicated obstruction:

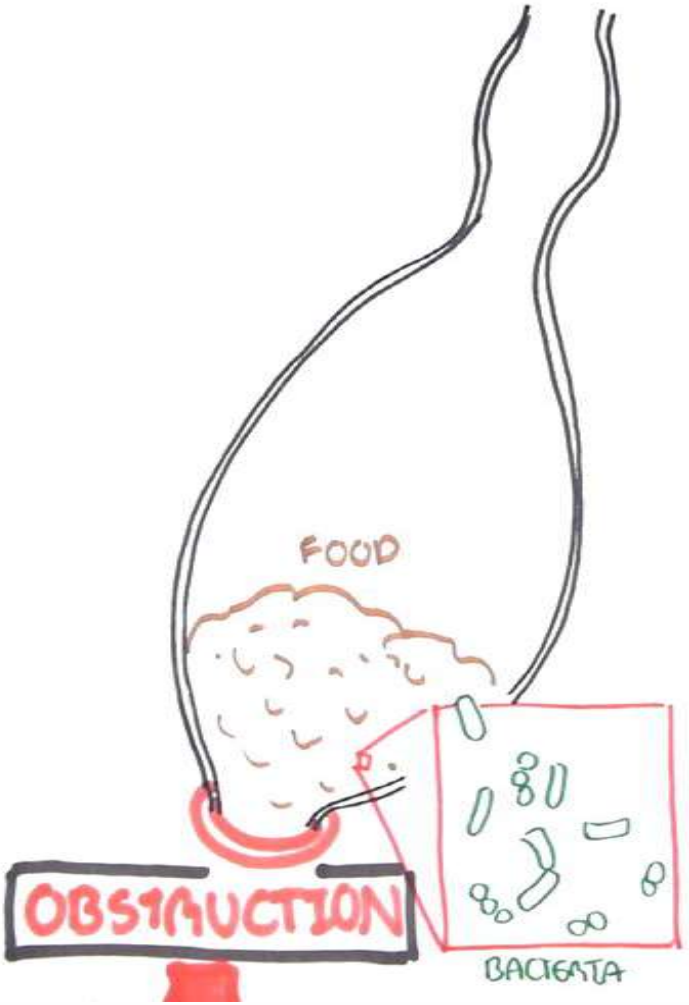
RED FLAGS:

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

Pathophysiology (Summary)

1. Proximal segment

- Hyperperistaltic phase
- Antiperistaltic phase
- Stage of dialation
- Fluid accumulation
- Gas accumulation
- Increased tension
- Ischemia



2. Distal segment

- Collapsed

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 hyperperistalsis (intestinal colic).

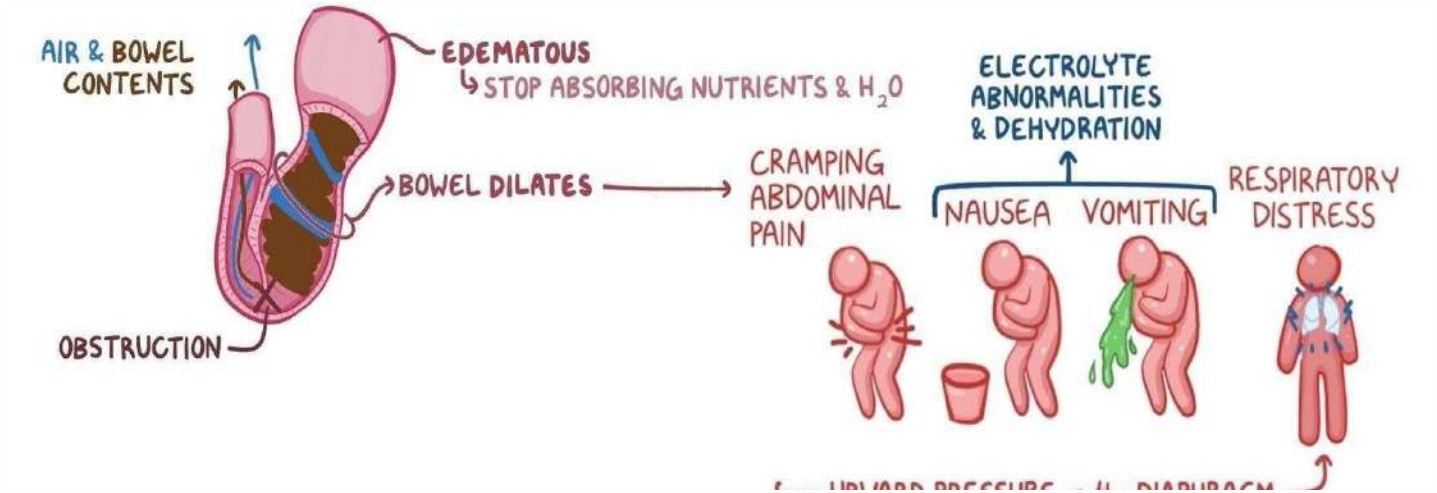
3. If the obstruction is not relieved, the bowel continues to dilate due to the accumulation of swallowed air and increased intestinal secretions, ultimately there is a reduction in peristaltic strength, resulting in flaccidity and paralysis.

4. The stasis of luminal contents and gas proximal to the obstruction leads to distension and increased intraluminal pressure.

Continue ...

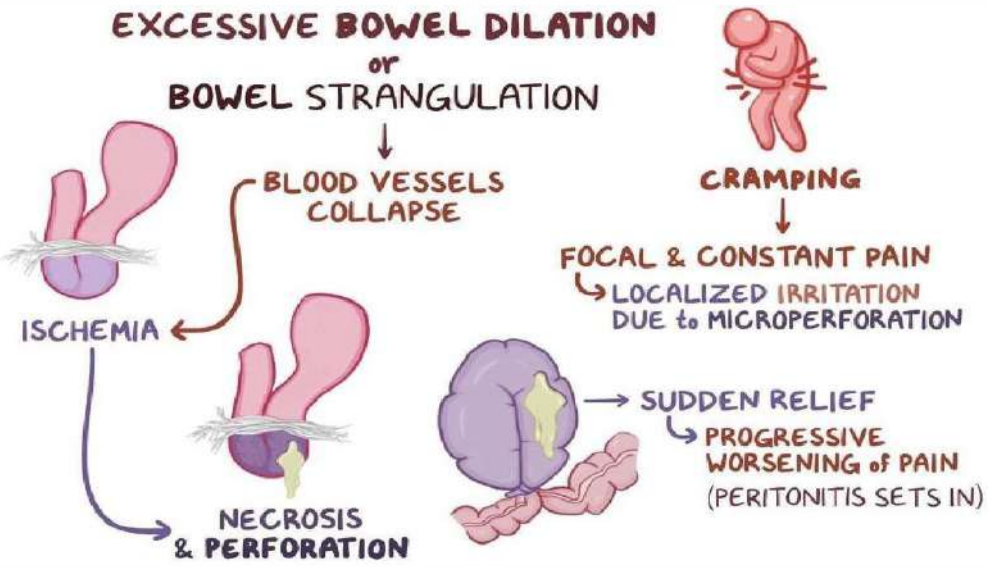
↑ intraluminal pressure, leads to the following:

1. **Venous congestion** → diffusion of fluids and gases to the intestinal lumen →sequestration of fluids within the distended bowel loops → dehydration and hypovolemia with significant loss of electrolytes and H2O
2. **Vomiting** → loss of fluid and Na^+, K^+, H^+, and Cl^- → hypokalemia, metabolic alkalosis, and hypovolemia



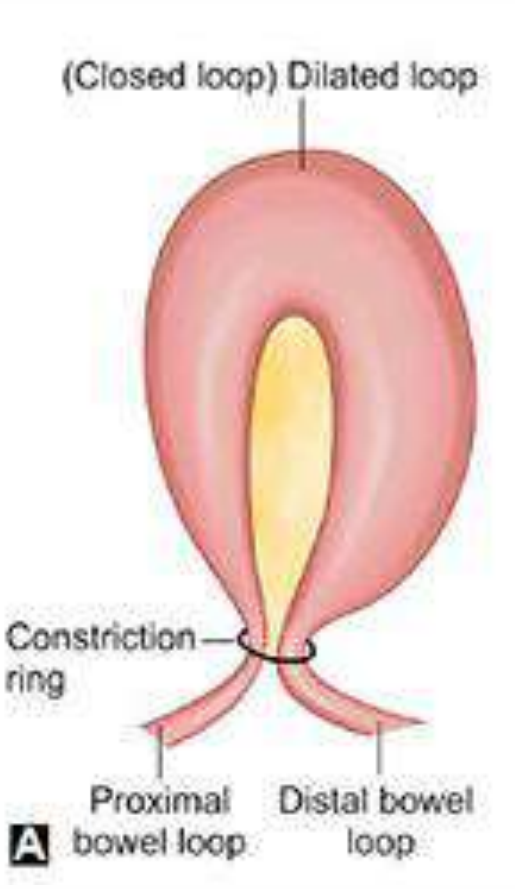
The consequences of intestinal obstruction are not immediately life-threatening unless there is excessive bowel dilation or superimposed strangulation

- **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



Closed loop obstruction

- This occurs when the bowel is obstructed at both the proximal and distal points .
- The distension is principally confined to the closed loop; distension proximal to the obstructed segment is not typically marked.
- A classic form of closed-loop obstruction is seen in the presence of a malignant stricture of the colon with a competent ileoceacal valve



Clinical features

The clinical features vary according to:

- the location of the obstruction
- the duration of the obstruction
- the underlying pathology
- the presence or absence of intestinal ischemia.

Signs:

1) Dehydration with significant water and electrolyte deficits, such as hyponatremia and hypokalemia. Continuing fluid loss will result in tachycardia and hypotension. Pyrexia is mild.

2) The distended abdomen is resonant to percussion on the anterior aspect but is dull towards the flanks.

Symptoms:

1. Pain (caused by hyperperistalsis) - The first symptom to appear – pain felt in center of the abdomen(small bowel)accompanied by hyperperstaltic rush (can be easily heard by stethoscope) or felt in lower abdomen/suprapubic region(large bowel).

2. Vomiting -The more distal the obstruction, the longer the interval between the onset of symptoms and the appearance of nausea and vomiting. is a marked feature of high small-bowel obstruction but is rarely encountered in colonic obstruction. As obstruction progresses, the character of the vomitus alters from digested food to faeculent material, as a result of the presence of enteric bacterial overgrowth.

3. abdominal Distension -degree of distension is dependent on the site of the obstruction .The lower the site of obstruction the more bowel is available to distend, becomes progressively more marked the lower the obstruction is situated and may reach extreme degrees in low colonic obstruction. It is caused by accumulation of gas and fluid within the obstructed bowel.

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

Clinical features of complicated intestinal obstruction

Strangulation → Perforation → peritonitis

1) The pain becomes constant and sever
2) tenderness and rebound tenderness and loss of abdominal movement with respiration.
3) fever and tachycardia.
4) Shock: May be neurogenic from pain, hypovolaemic, toxic or septic.

- Fluid and electrolytes imbalance due to vomiting → hypovolaemic shock.

- Toxic absorption from the retained fluid → toxic shock

Small bowel obstruction

- **Definition :**

Small bowel obstruction (SBO): obstruction at the level of the duodenum, jejunum, or ileum

- **Dynamic type / Mechanical bowel obstruction :**

In which peristalsis is working against a mechanical obstruction.

- **Adynamic / functional obstruction :**

There is no mechanical obstruction .
Peristalsis is absent or inadequate

Paralytic ileus
Pseudo-obstruction

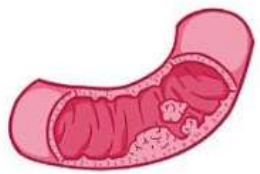
SMALL BOWEL OBSTRUCTION (SBO)

INTRALUMINAL CONTENTS CAN'T get THROUGH

MECHANICAL

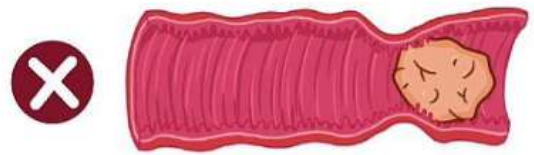
ADHESIONS

HERNIA



TUMOR

FUNCTIONAL



↓ / ABSENT PERISTALSIS (ILEUS)

CONSERVATIVE MANAGEMENT or SURGICAL INTERVENTION

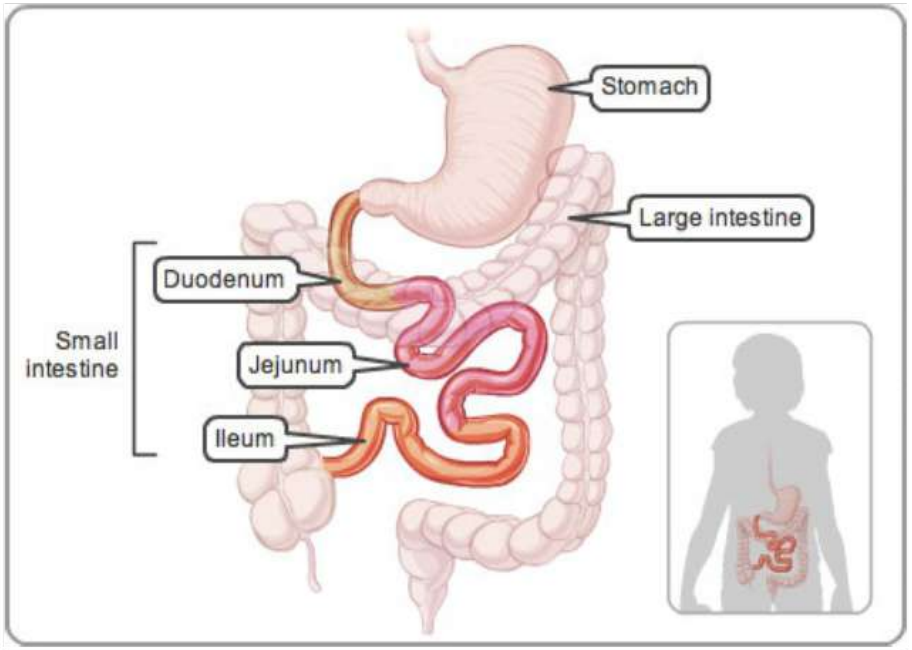
Small bowel obstruction

- High level SBO

  Duodenum and jejunum

- Low level SBO

  Ilium



Features of obstruction

- In high small bowel obstruction

  Vomiting occurs early, is profuse and causes rapid dehydration.

  Distension is minimal .

- In low small bowel obstruction

  Pain is predominant with central distension.

  Vomiting occurs later.

Benign causes of small bowel obstruction

Dynamic causes

Extramural

1. Adhesions
2. Hernia

Intra mural

1. Stricture
2. Intussusception
3. Volvulus

Intra luminal

1. Gall stones
2. Foreign bodies

Adynamic

1. Paralytic ileus
2. Pseudo-obstruction

Extramural / extrinsic bowel obstruction :

- The underlying etiology arises outside the intestinal wall.

- *Adhesions*
- *Hernia*

Intestinal adhesions

Are bands of fibrous tissue that form between intestinal loops / between intestine and abdominal wall .

Most common cause of intestinal obstruction in Western countries

Causes

1. Surgery (most common)
2. Inflammation (cholecystitis, pancreatitis, peritonitis).

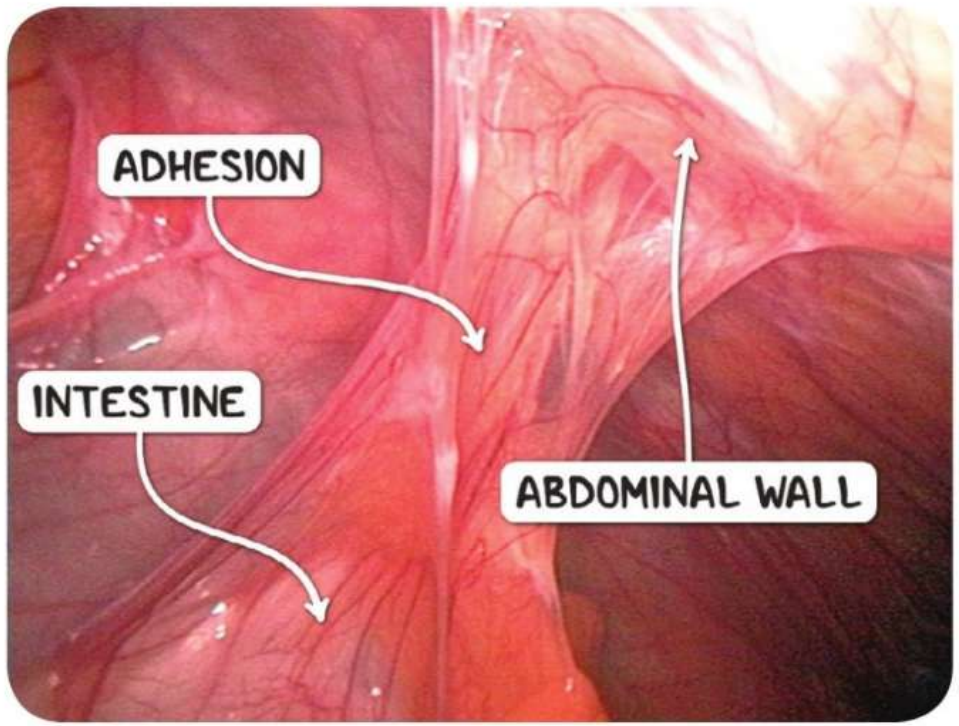


Figure 34.9 Intraoperative view of abdominal adhesions.

Intestinal adhesions

Pathology

Any source of peritoneal irritation

➡️ Results in local fbrin production

➡️ Which produces adhesions between apposed surfaces.

Diagnosis

- ➡️ DIAGNOSTIC IMAGING

  X-ray

  Detect obstruction; small intestine dilation

- CT scan, ultrasound

  Exclude other obstructive causes

Intestinal adhesions

Treatment

Laparoscopic adhesion excision

When laparotomy is required, although multiple adhesions may be found, **only one may be causative.**

If there is absolute certainty that this is the cause of the obstruction, **this should be divided and the remaining adhesions can be left in situ unless severe strangulation is present.**

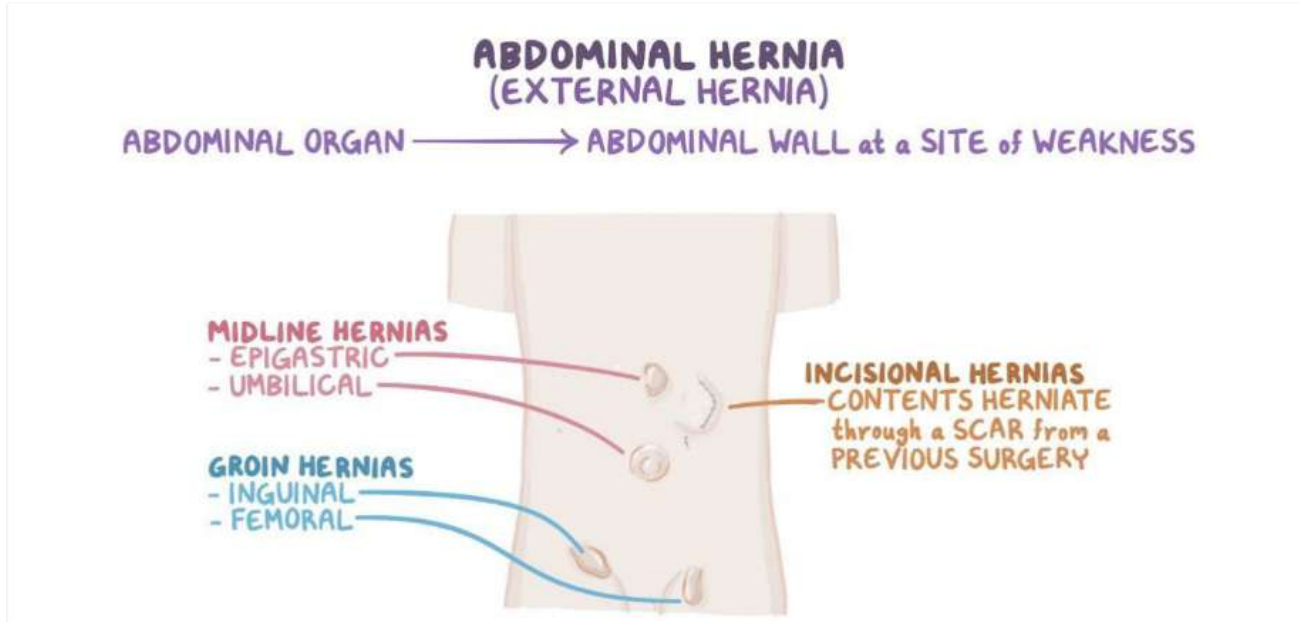
Division of these adhesions will only cause further adhesion formation.

Hernias

Small intestine entrapped in :

1. Retroperitoneal fossae
2. Congenital defect.

Internal abdominal hernia



External abdominal hernia

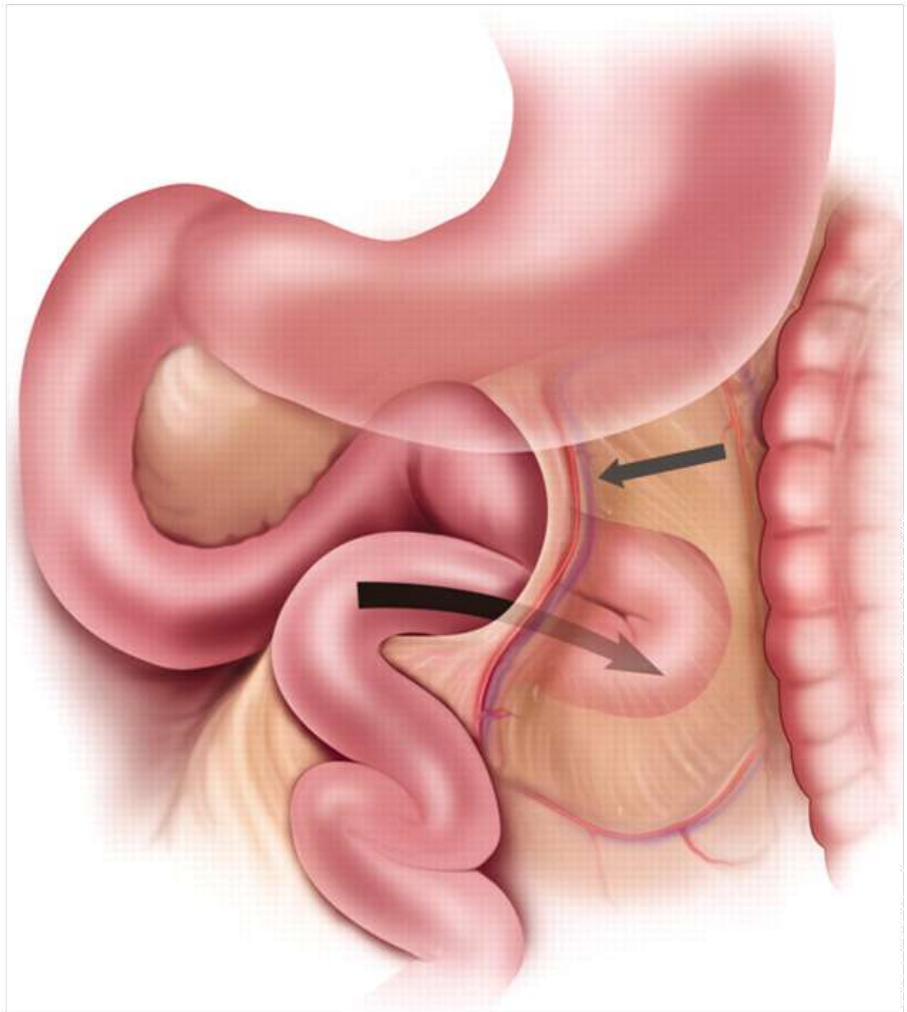
Internal hernia

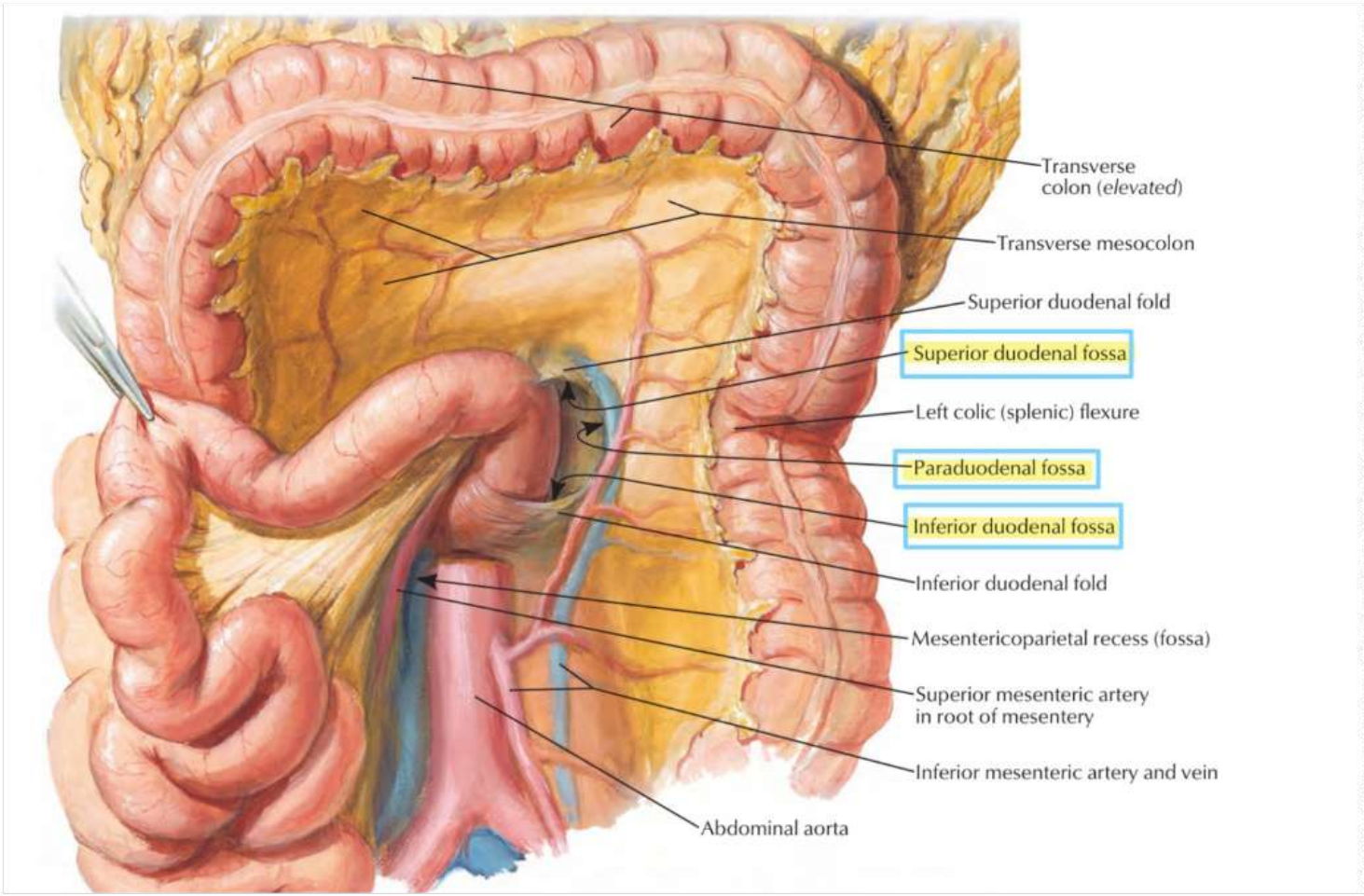
➡️ Occurs **when a portion of the small intestine becomes entrapped in one of the retroperitoneal fossae** or in a **congenital mesenteric defect.**

The following are potential sites of internal herniation (all are very rare):

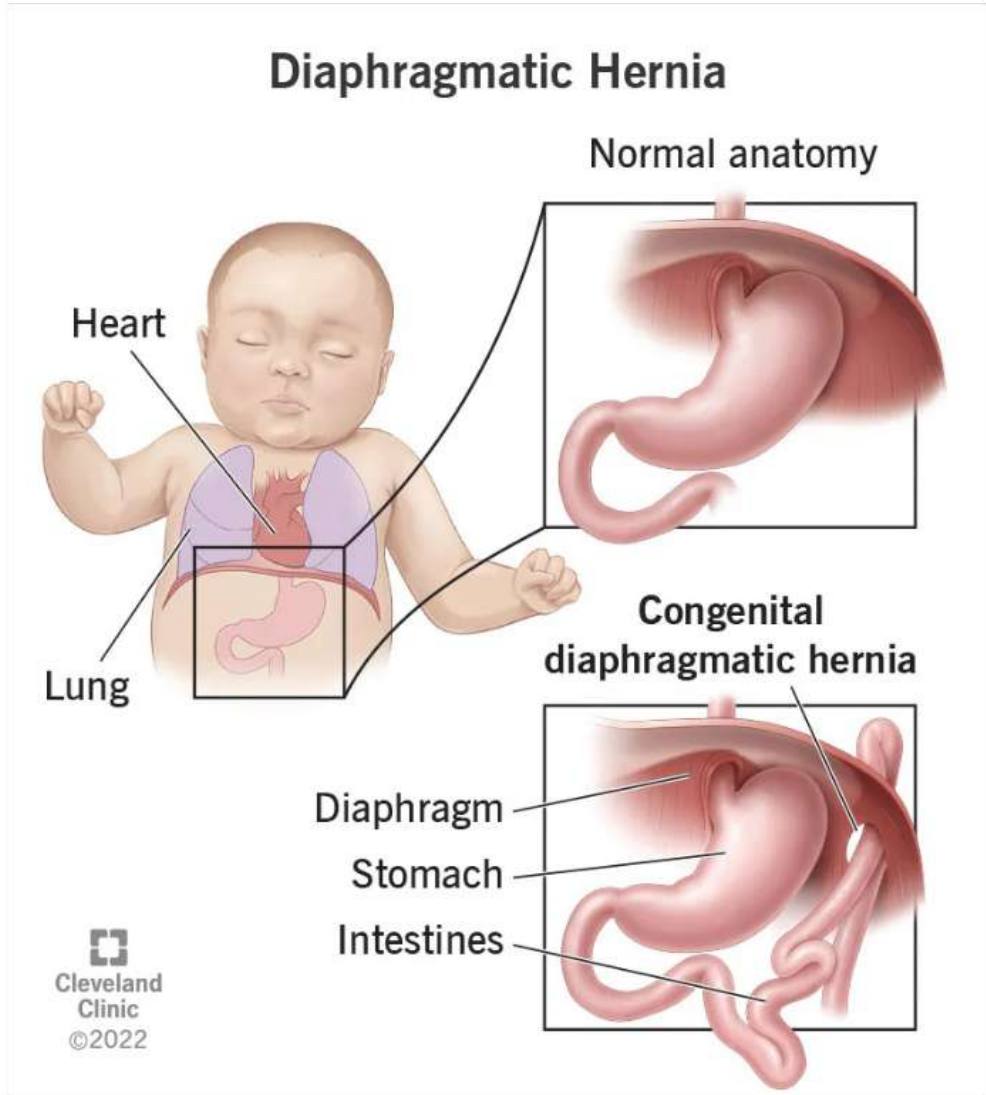
- Congenital or acquired diaphragmatic hernia .
- Duodenal retroperitoneal fossae;

Internal hernias : *paraduodenal hernia*





Internal hernias : *Diaphragmatic hernia*



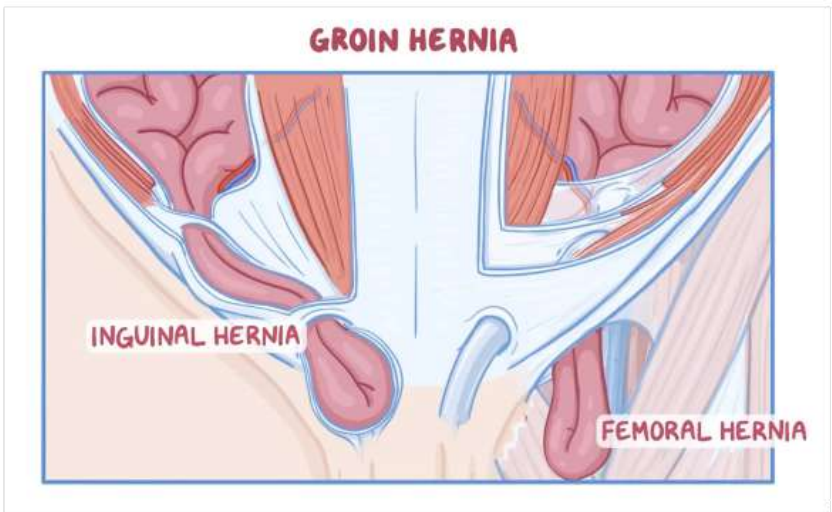
External abdominal hernias

Irreducible hernia : *contents cannot be completely returned to the peritoneal cavity*

- *Indirect Inguinal hernia*
- *Femoral hernia*

Incarcerated/strangulated :

1. *Severe abdominal pain*
2. *Tenderness*
3. *Erythema*
4. *Fever*
5. *Nausea , vomiting*



Treatment:

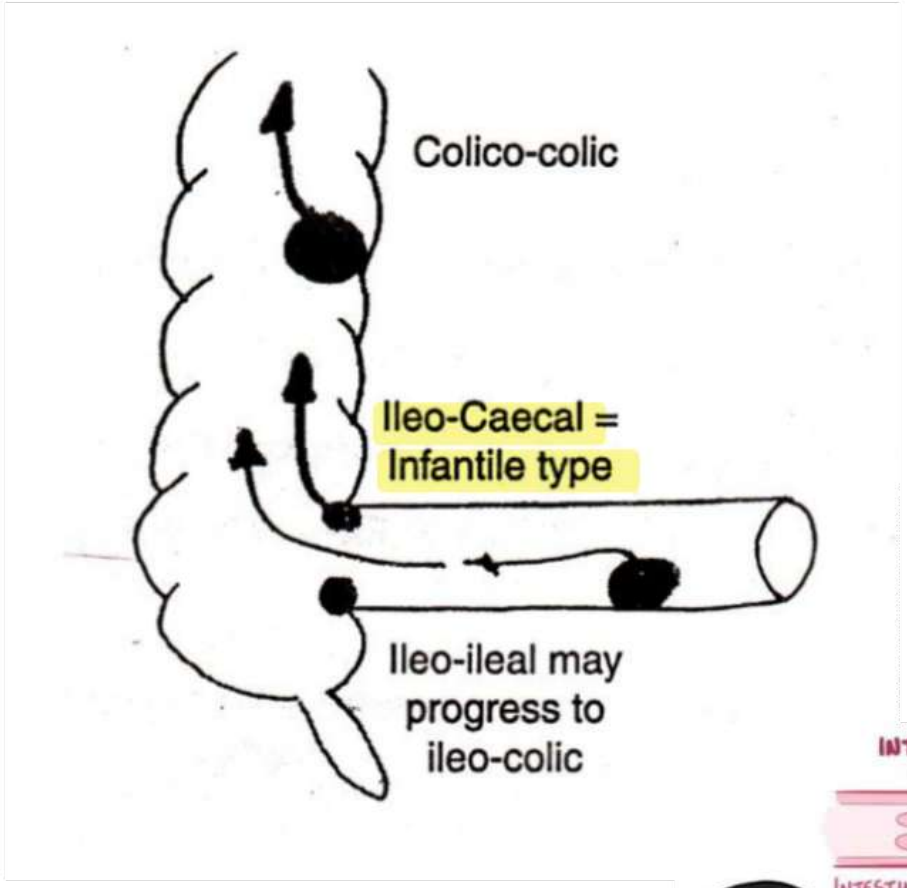
Laparoscopic hernia repair and a standard mesh is inserted

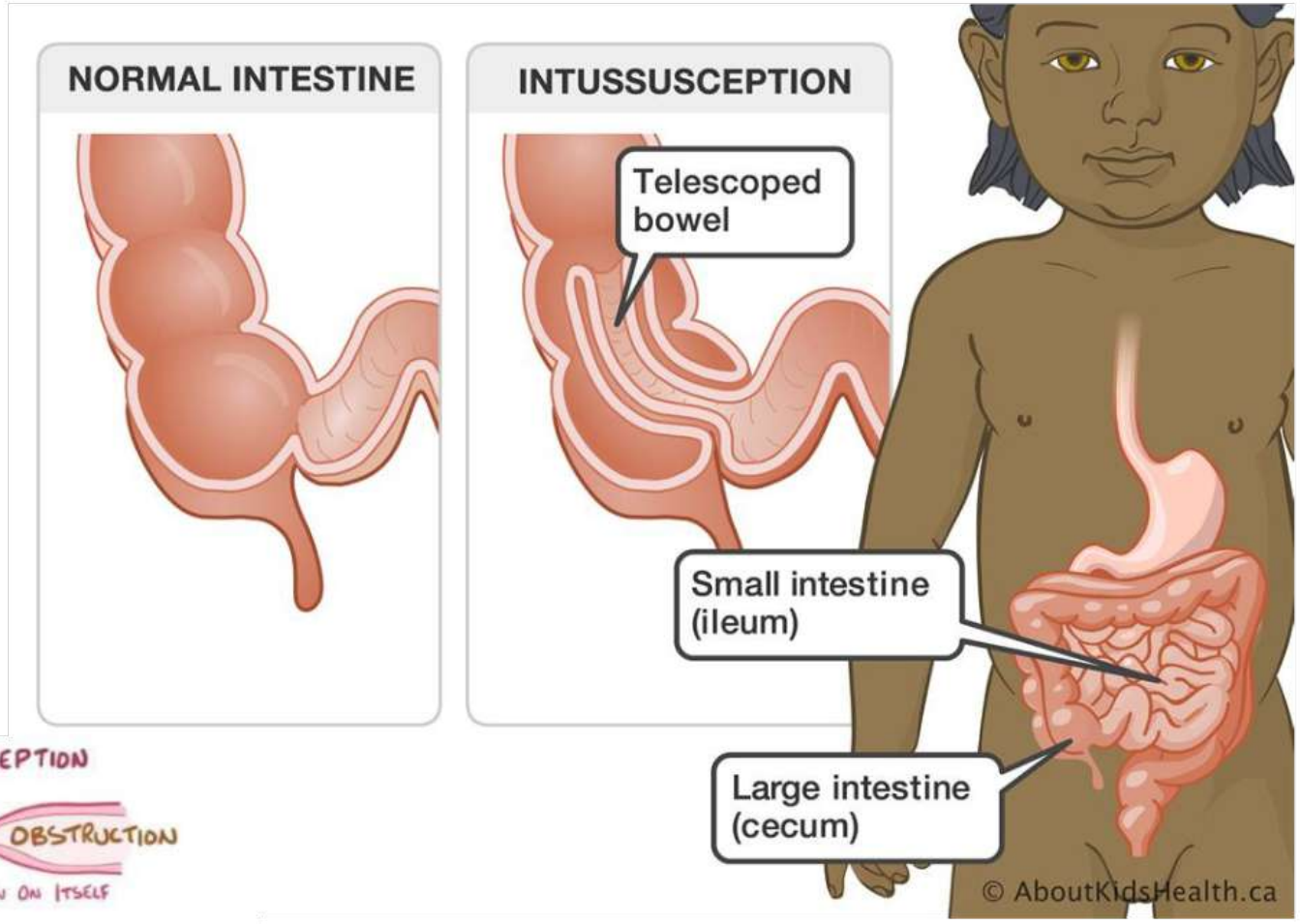
Intramural bowel obstruction :

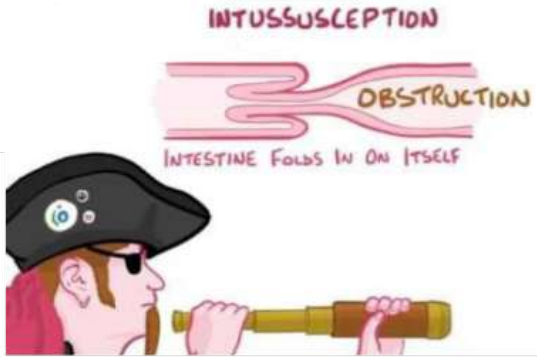
- The underlying etiology arises from the intestinal wall.

- *Strictures*
- *Intussusception*
- *Volvulus*

Intussusception



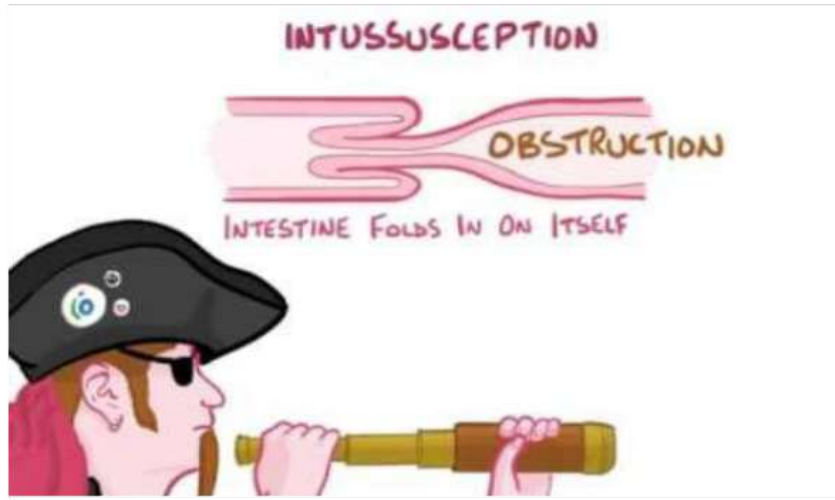




Intussusception :

Pathology and causes

Is a medical condition in which a part of the intestine has invaginated into another section of intestine.



- Usually **proximal loop invaginate into the distal bowel.**
- Rarely distal loop may invaginate into the proximal loop this is called **retrograde intussusceptions.**

- **Ileocecal region most commonly affected**

Intussusception

Pathology

- *May be idiopathic/caused by abnormal structure (causes pathological lead point)*
- *-> ⬆️ peristalsis causes one part of bowel to move ahead into the adjacent section -> bowel telescoping -> ⬆️ pressure, impaired venous return -> bleeding, bowel ischemia infarction .*

Lead point ??

A Lead point is a lesion or variation in the intestine that is trapped by peristalsis and dragged into a distal segment of the intestine, causing intussusception .

➡️ Meckel's diverticulum , polyp, tumor, hematoma can act as a lead point for intussusception .

Etiology

Children

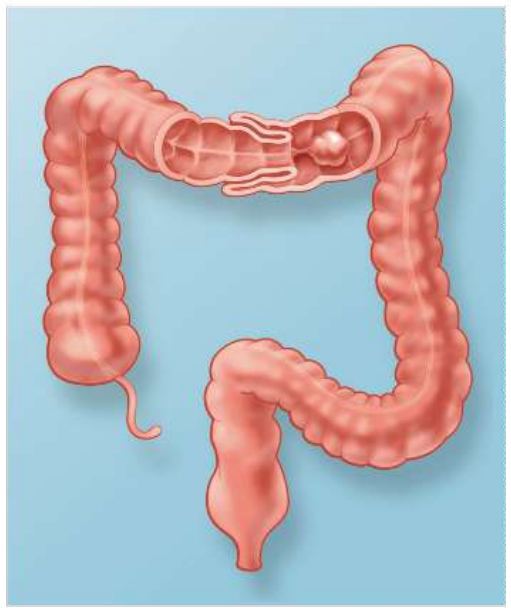
- 90% are idiopathic without a leading point)
- Mostly in iliocaecal region .
- Leading point :

1. Post infection lymphoid hyperplasia (Peyer's patches)
2. Meckel's diverticulum .

Adult type

Always with a lead point – polyp

Peutz-Jeghers syndrome / tumor



Intussusception : Clinical presentation

History

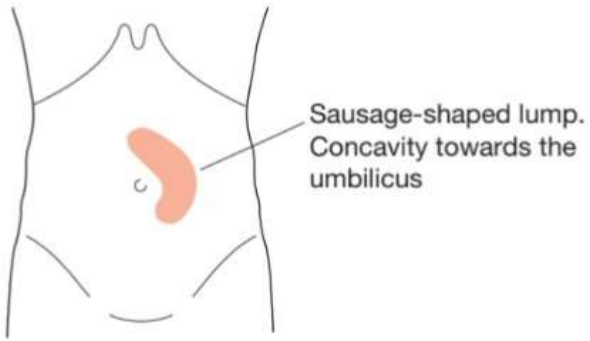
- ***Colicky abdominal pain*** (sudden screaming or crying spells), often with legs drawn up, with asymptomatic intervals: *Acute attacks occur approx. every 15–30 min.*

- Vomiting (initially nonbilious)

Intussusception : Clinical presentation

- *On physical exam :*

1. *Abdominal tenderness*
2. *Palpable sausage-shaped mass in the RUQ* , and an "emptiness" or retraction in the RLQ (*Dance sign*) during palpation
3. High-pitched bowel sounds on auscultation



- *"Red Currant jelly" stool:*

Dark red stool (resembling currant jelly) may be noticed in passed stool or during digital rectal examination (usually a late sign).

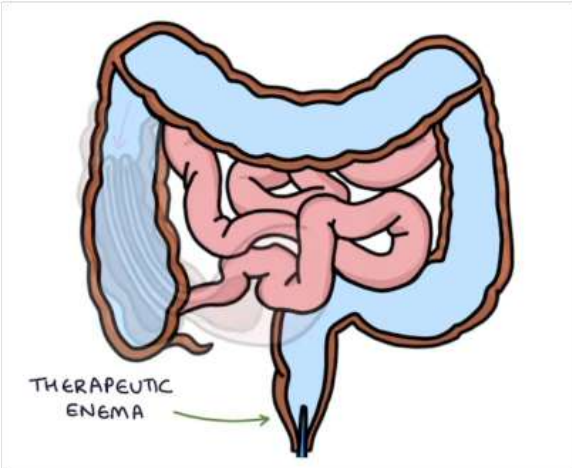
Intussusception : Clinical presentation

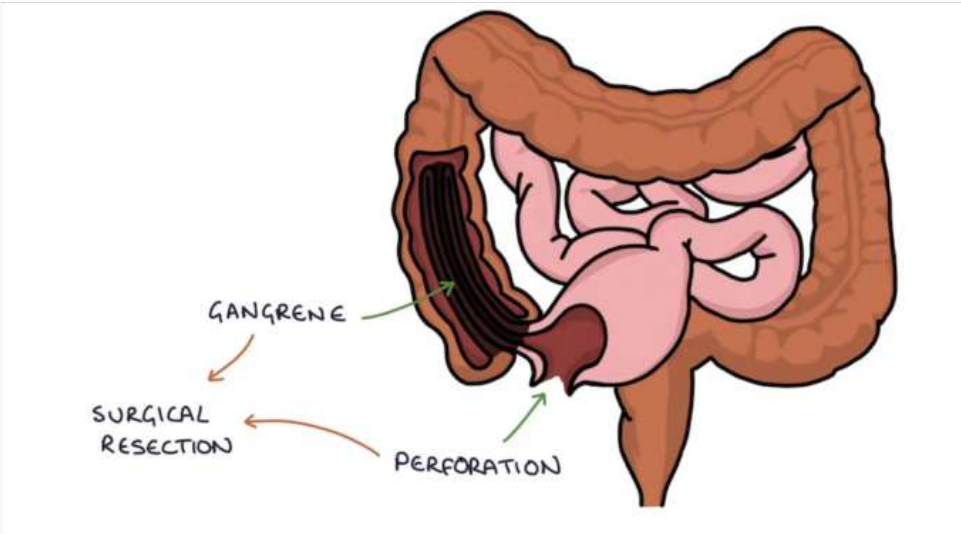
Diagnosis

- If clinical suspicion is high : perform an enema.

- If the diagnosis is unclear at presentation or pathological lead points are suspected : perform an ultrasound or abdominal x-ray to confirm the diagnosis.

Intussusception : Management





Air reduction enema

Success is recognised if air flows into the small bowel and symptoms and signs resolve.

Contraindicated if there is peritonitis, perforation or shock.

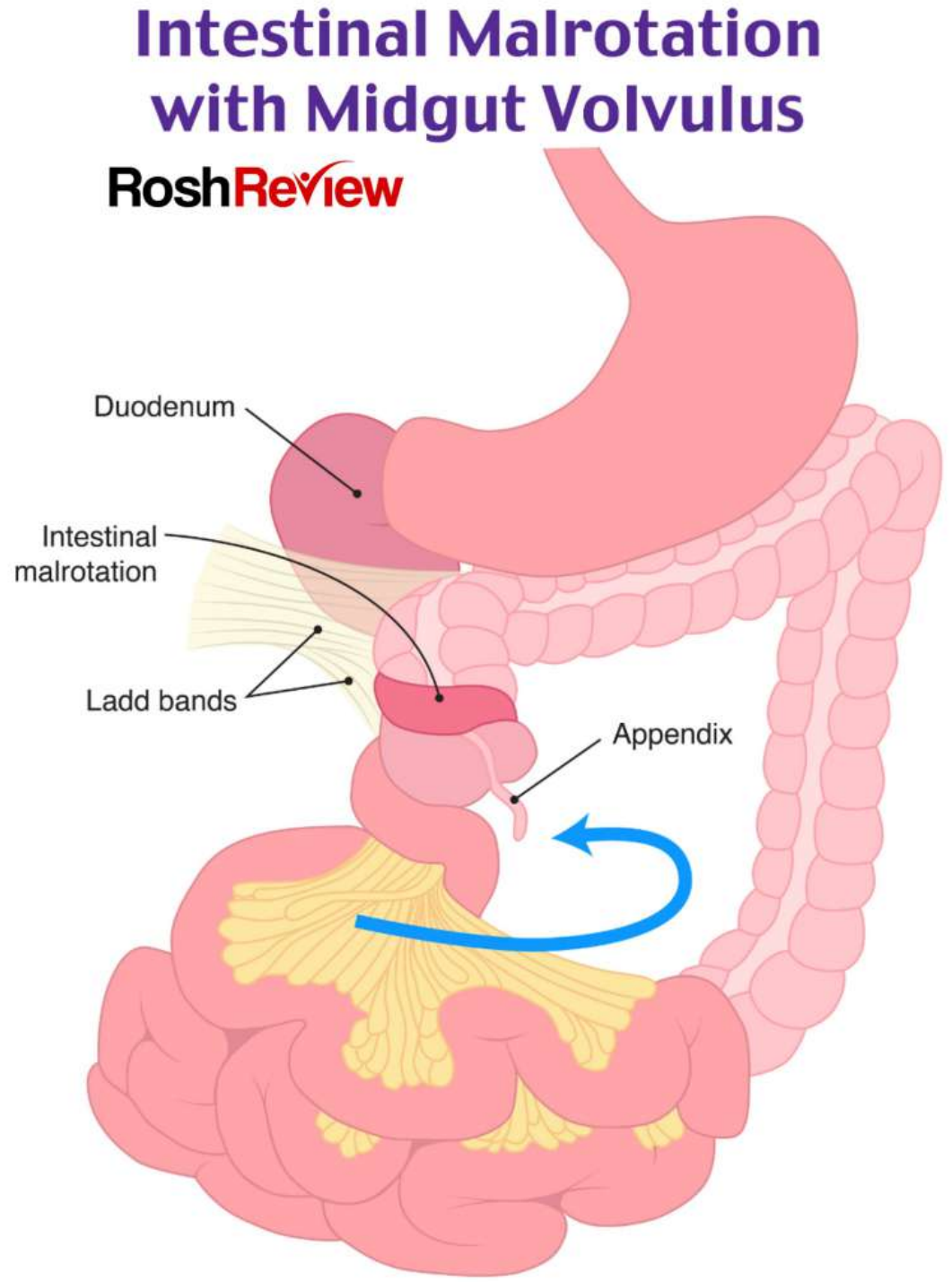
More than 70% are reducible non-operatively.

Operative reduction is performed open or laparoscopically.

Midgut Volvulus

Twisting of a loop of bowel around its mesentery so that the mesenteric vessel and the lumen of the bowel become occluded.

➡️ Obstruction of the bowel.



- **Mesenteric veins become obstructed** as a result of the mechanical twisting ➡️ ischaemia .

Volvuli may be primary or secondary

- **Primary**

Is caused by **congenital malrotation of the gut, abnormal mesenteric attachments or congenital bands.**

Examples include **volvulus neonatorum .**

- **Secondary**

More common

➡️ Is due to **rotation of a segment of bowel around an acquired adhesion .**

Volvulus neonatorum

Pathology

Gut normal rotations in utero give the small bowel mesentery its broad, stable base, running from the duodenal-jejunal (DJ) fexure in the left upper quadrant to the caecum in the right lower quadrant.

Incomplete rotations leave the mesentery with a **narrow, unstable base at risk of twisting**.

Sometimes, fibrous **Ladd's bands** run between a central upper abdominal caecum and the right lateral abdominal wall, obstructing the duodenum .

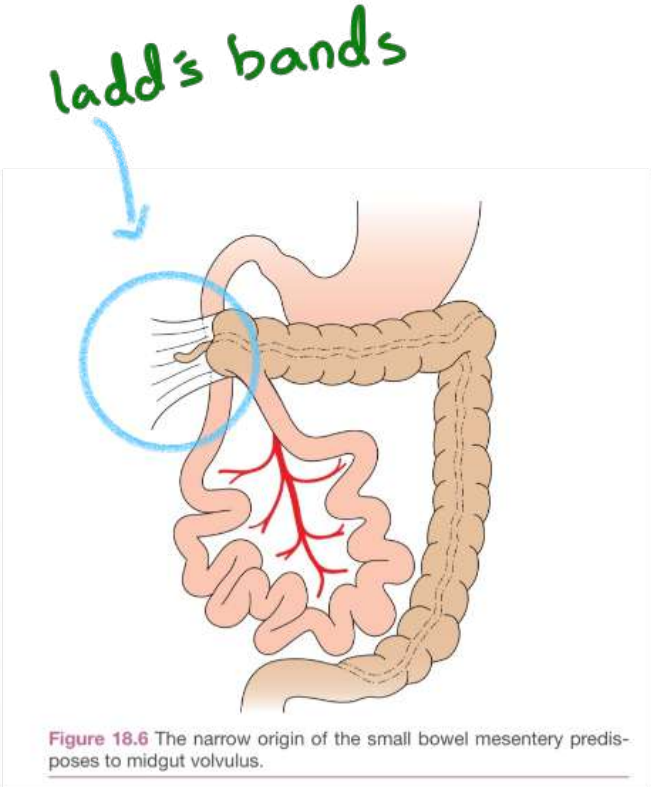
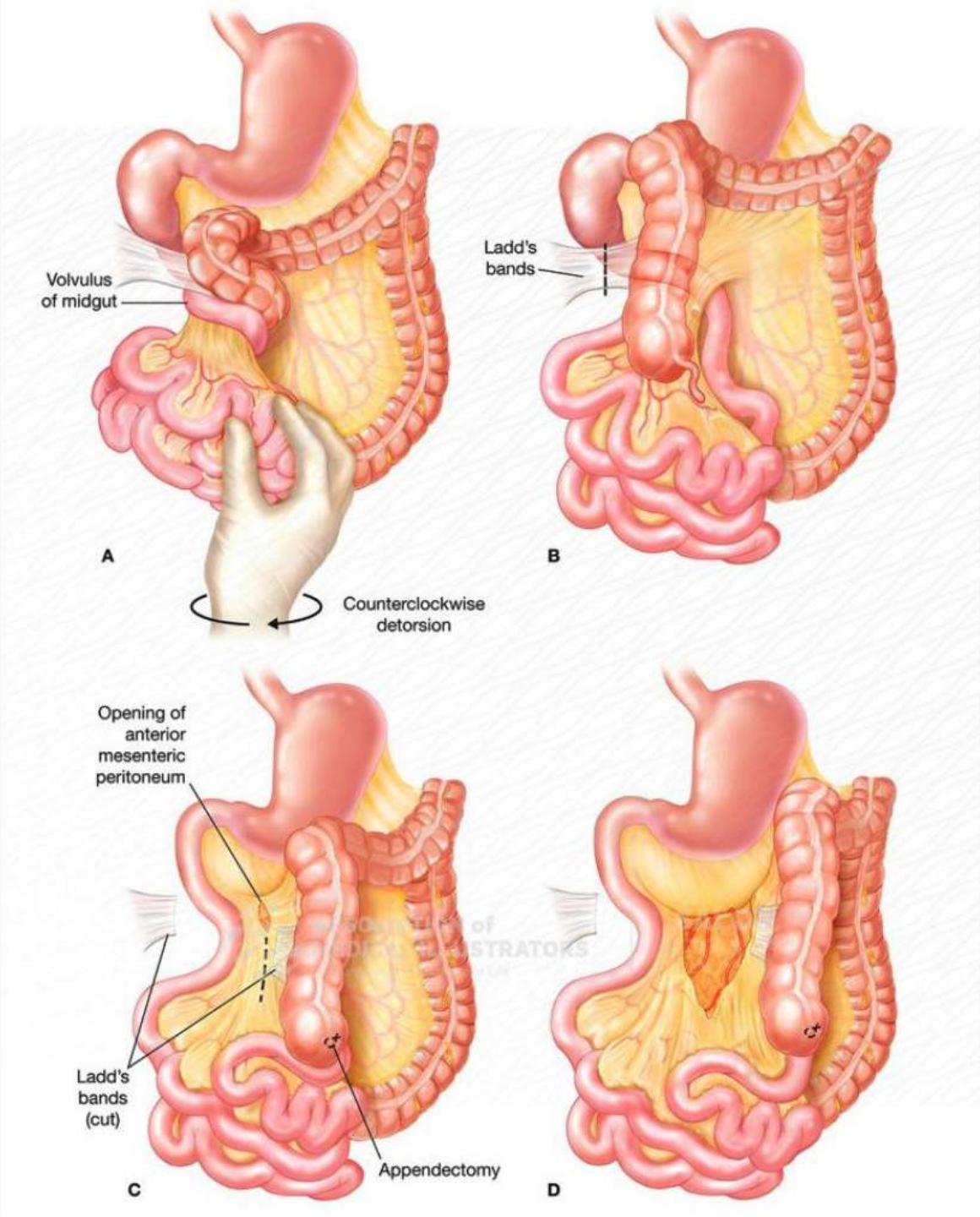


Figure 18.6 The narrow origin of the small bowel mesentery predisposes to midgut volvulus.

Ladd's procedures

The volvulus is reduced/untwisted and the Ladd bands removed.

The small intestine is folded into the right side of the abdomen
And the colon is placed on the left side.



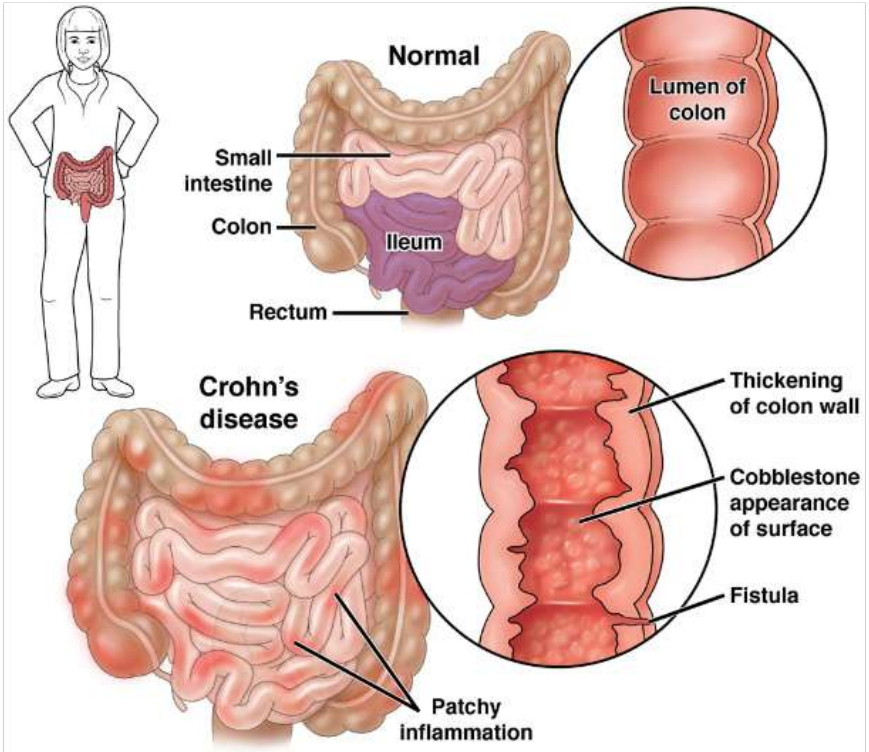
- **Obstruction from enteric strictures :**

Narrowing of part of the intestine because of scar tissue in its wall

Small bowel strictures usually occur secondary to **Crohn's disease .**

- **Management**

Standard surgical management consists of **resection and anastomosis.**



Intraluminal bowel obstruction :

The **obstructing agent lies within the gastrointestinal lumen.**

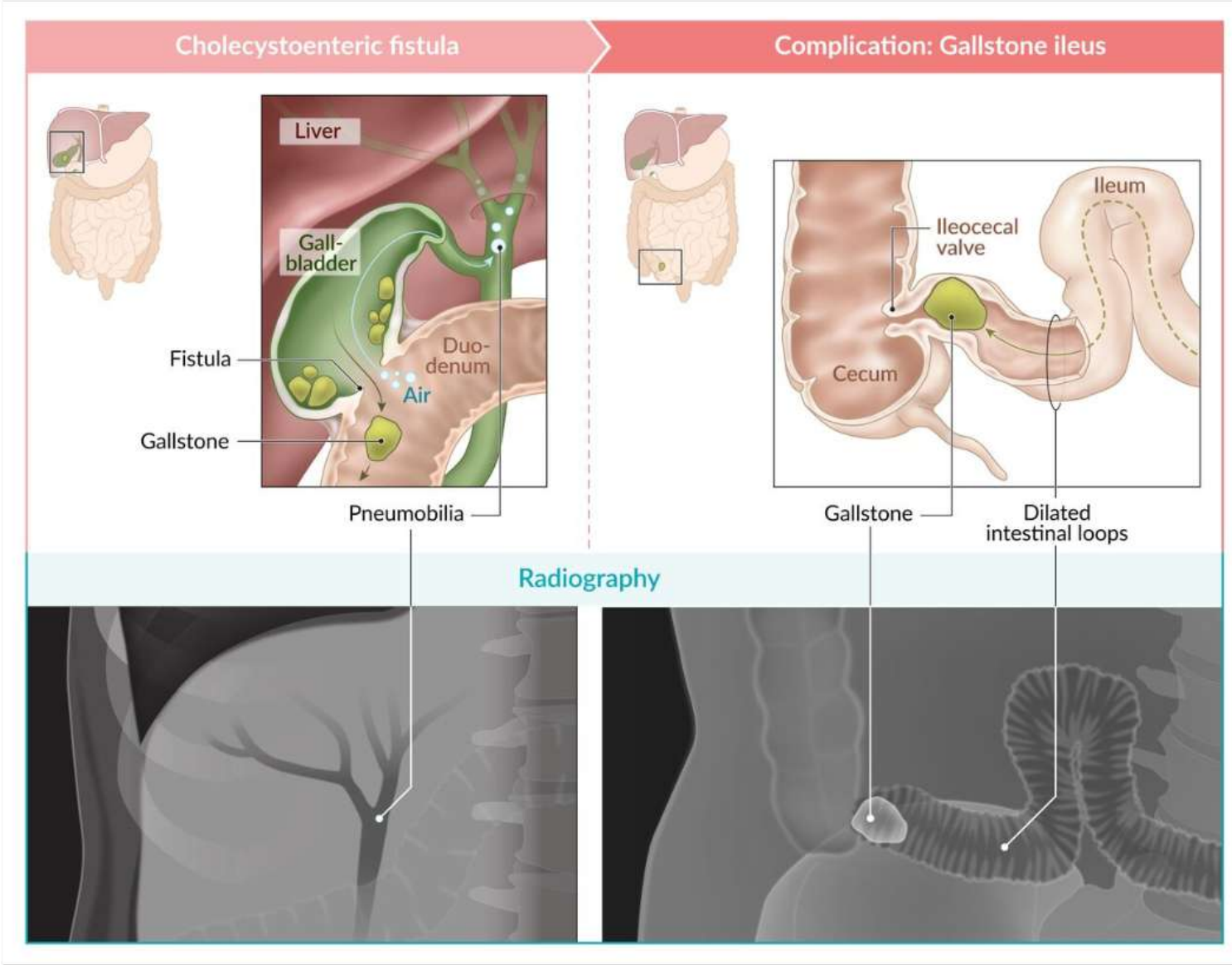
1. **Faecal impaction**
2. **Foreign bodies**
3. **Bolus obstruction**
   - *Worms*
   - *Food*
   - *Gallstones*

Gallbladder stones

Pathology

Erosion of infamed gallbladder , resulting in a cholecystointestinal fistula

Stones get impacted, usually in the terminal ileum or at the ileocecal valve (Narrow lumen)



Gallstone ileus

Is an infrequent complication of cholelithiasis, occurring as a result of impaction of one or more gallstones within the gastrointestinal tract.

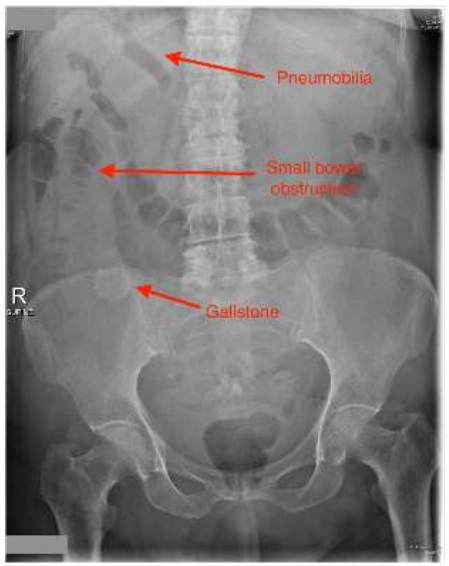
- Seen more frequently in the elderly and in women.
- Frequently an episode of acute cholecystitis leads to erosion of infamed tissues, resulting in a cholecystointestinal fstula

Investigations

- **Rigler's triad :**

1. Small bowel obstruction
2. Pneumobilia (accumulation of gas in biliary system)
3. Mineral shadow (Gallstones)

Imaging findings (radiological signs)



Treatment

- **Enterolithotomy:**

The stone should be milked proximally away from the site of impaction.

The intestine is opened at this point and the gallstone removed.

Worms : Ascaris infection

May cause low small bowel obstruction, particularly in children

- **Fecal impaction**

Is the **presence of hardened fecal material** that has **accumulated in the rectum and/or colon**, which results in the inability to have a bowel movement.

Paralytic ileus

also called functional bowel obstruction

state in which there is failure of transmission of peristaltic waves secondary to neuromuscular failure (i.e. in the myenteric (Auerbach's) and submucous (Meissner's) plexuses). The resultant stasis leads to accumulation of fluid and gas within the bowel, with associated distension, vomiting, absence of bowel sounds and absolute constipation.

It's often transient

Etiology

Surgery

Paralytic ileus may occur after any operation especially after major abdominal or pelvic surgery due to:

- **Pre-operative causes**: bad pre-operative preparation (full stomach).
- **Operative causes**: prolonged exposure of intestine and rough manipulation
- **Post-operative causes**: neglect suction, early oral feeding , leaking intestinal anastomosis and peritonitis . Most common cause

Trauma

Fracture spine, femur, pelvis, obstructed labour & retroperitoneal haemorrhage (may be sympathetic over stimulation) .

Toxic

Direct toxic effect on the intestinal nerve plexuses may be due to :

- General: Toxaemia, septicaemia, uraemia, typhoid
- Local: Septic peritonitis.

Metabolic causes:

Hypokalaemia
uraemia
DKA

Drugs

as anticholenergics and tricyclic antidepresents
vincristine

The 5 **P**s: **P**eritonitis, **P**ostoperative, low **P**otassium, o**P**ioids, and **P**elvic/spinal fractures are among the most common causes of paralytic ileus.

Pathophysiology :

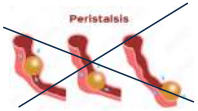
Irritation of the bowel

causing:

Sympathetic nervous system activation

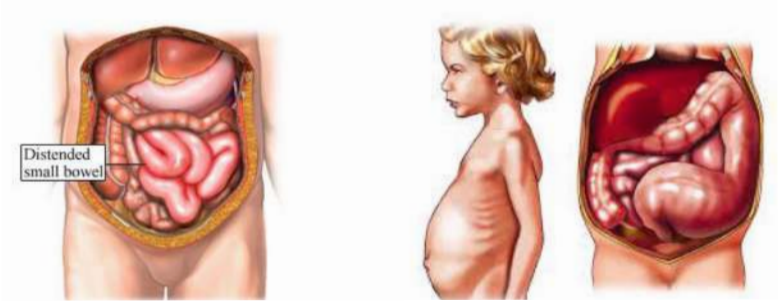
Local release of nitric oxide

relaxation of intestinal smooth muscles



decreased/arrested peristalsis

stasis of luminal contents and gas and bowel wall distention



Clinical picture:

Ileus is generally a clinical diagnosis.

I- History of the cause which is usually following abdominal surgery

II- Symptoms:

usually on the 2nd or 3rd post-operative day.

1. Marked adominal distension is essential feature
2. Absolute constipation: the patient can't pass faeces or flatus after the operation.
3. Continuous (noncolicky) abdominal pain severe abdominal discomfort.
4. Nausa &Vomiting: effortless & excessive vomitus.

.

III. Signs:

Examination findings

- Percussion: diffuse tympany
- Palpation: usually no tenderness unless peritonitis is present
- Auscultation: Bowel sounds are absent (silent abdomen) or decreased (early paralytic ileus).

Investigations:

Blood electrolytes &imaging

The characteristic imaging feature of paralytic ileus is diffuse dilatation of bowel loops with no transition point.

to rule out mechanical bowel obstruction and complications

Management

*Avoid all the predisposing factors .

Management is mainly supportive, involving IV fluid resuscitation, electrolyte repletion, and bowel rest

Surgical intervention is only indicated if necessary for the underlying cause (e.g., acute complicated appendicitis) or if complications arise. Complications such as intestinal ischemia and perforation are rare in paralytic ileus.

Imaging is not routinely required to confirm paralytic ileus, especially when the underlying cause is known (e.g., early postoperative ileus).

Abdominal ultrasound

- Fluid-filled, dilated bowel loops
- Loss of peristalsis
- Possibly signs of the underlying cause (e.g., cholecystitis)

X-ray abdomen

- Diffuse small and large bowel gaseous distention without transition or cutoff point
- The sentinel loop sign may be seen in localized paralytic ileus.
- Visible gas shadows in the rectum
- Free air if bowel is perforated (rare)

CT abdomen and pelvis with or without IV contrast

Gold standard for the evaluation of suspected bowel obstruction

- Similar to x-ray findings
- Uniformly distended loops without a cutoff point
- Possible signs of the underlying cause (e.g., appendicitis, pancreatitis, cholecystitis)

Pseudo-obstruction

This condition describes an obstruction, usually of the colon, that occurs in the absence of a mechanical cause or acute intra- abdominal disease. It is associated with a variety of syndromes in which there is an underlying neuropathy and/or myopathy and a range of other factors

Small intestinal pseudo-obstruction

This condition may be primary (i.e. idiopathic or associated with familial visceral myopathy) or secondary. The clinical picture consists of recurrent subacute obstruction. The diagnosis is made by the exclusion of a mechanical cause. Treatment consists of initial correction of any underlying disorder. Metoclopramide and erythromycin may be of use.

Summary box 71.16

Factors associated with pseudo-obstruction

- Metabolic
  - Diabetes
  - Hypokalaemia
  - Uraemia
  - Myxodoema
  - Intermittent porphyria
- Severe trauma (especially to the lumbar spine and pelvis)
- Shock
  - Burns
  - Myocardial infarction
  - Stroke
- Idiopathic
- Septicaemia
- Postoperative (for example fractured neck of femur)
- Retroperitoneal irritation
  - Blood
  - Urine
  - Enzymes (pancreatitis)
  - Tumour
- Drugs
  - Tricyclic antidepressants
  - Phenothiazines
  - Laxatives
- Secondary gastrointestinal involvement
  - Scleroderma
  - Chagas' disease

Malignant causes of SBO

- Twenty percent of all cases of SBO are attributed to malignant tumors of which ovarian and colorectal carcinomas are the most common ones.

- Bowel obstruction caused by cancer is referred to as malignant bowel

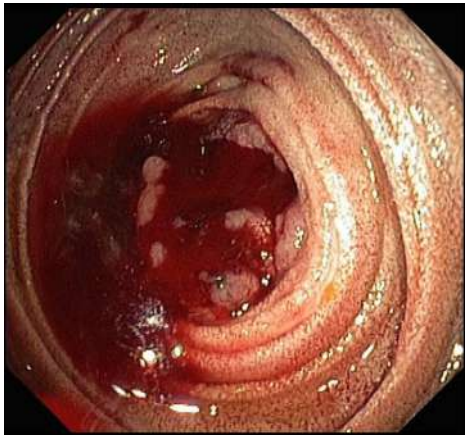
- Obstruction occurs because tumors and enlarged lymph nodes compress the bowels, typically the small intestine, causing digested food and waste to become stuck.

Malignant bowel obstruction (MBO) is one of the most severe complications in patients with advanced ovarian cancer, with an estimated incidence up to 50%

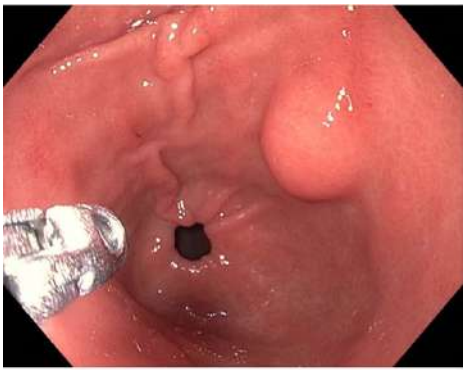
Malignant small bowel tumors

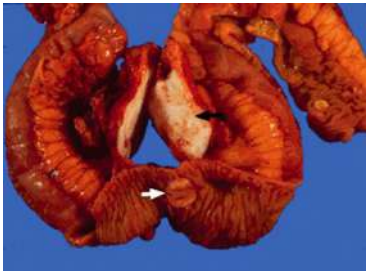
1.adenocarcinoma,
2.sarcoma including gastrointestinal strumal tumor
3.carcinoid tumors,
4.lymphoma.

Adenocarcinoma is the most common type of small bowel cancer..



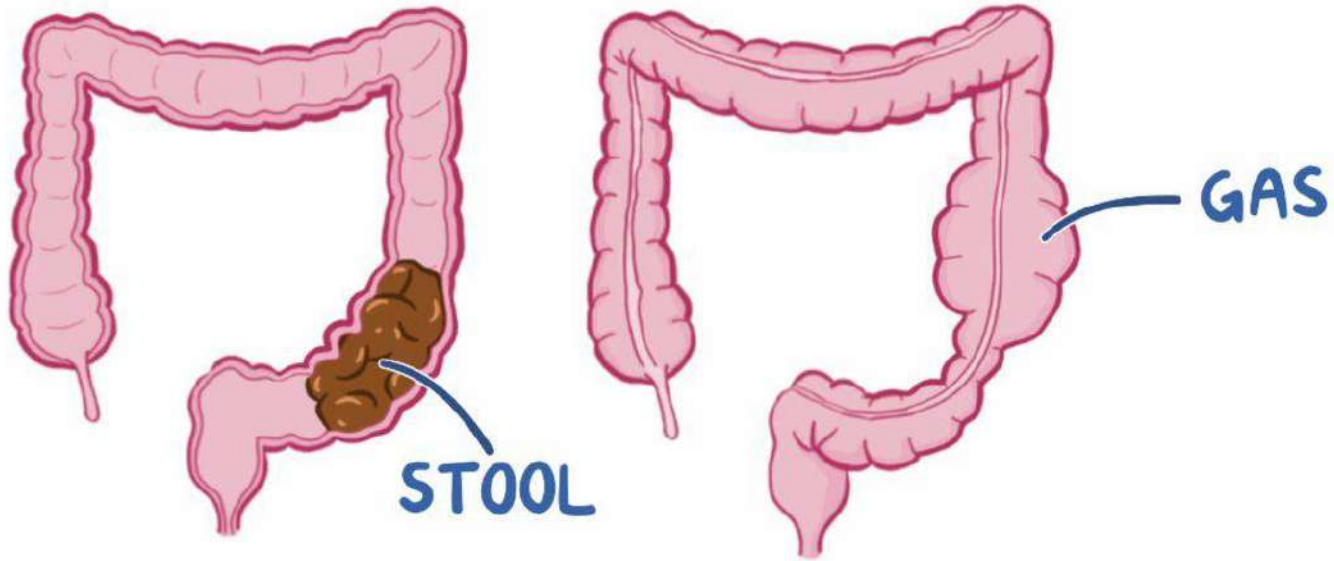
Symptoms of small bowel malignant tumour
- Abdominal pain/cramping
- Unexplained weight loss
- Nausea/vomiting
- Blood in the stool
- Watery diarrhea
- Skin flushing
- A lump in the abdomen,abdominal distension, peritoneal signs of complication,





LARGE BOWEL OBSTRUCTION

BLOCKAGE INTERFERES w/ INTRALUMINAL CONTENT



CONSTIPATION

* INFREQUENT or DIFFICULT PASSING STOOL or FLATUS

OBSTIPATION

* TOTAL INABILITY to PASSING STOOL or FLATUS

- Age dependent
- More common in elderly (due to the higher incidence of neoplasms)

- It result by:
  1. Mechanical *(mechanical interruption of the flow of intestinal contents)*
  2. Pseudo-Obstruction *(dilation of the colon in the absence of an anatomic lesion)*

- Mechanical LBO causes bowel dilatation above the obstruction, which in turn, causes mucosal edema and impaired venous and arterial blood flow to the bowel.

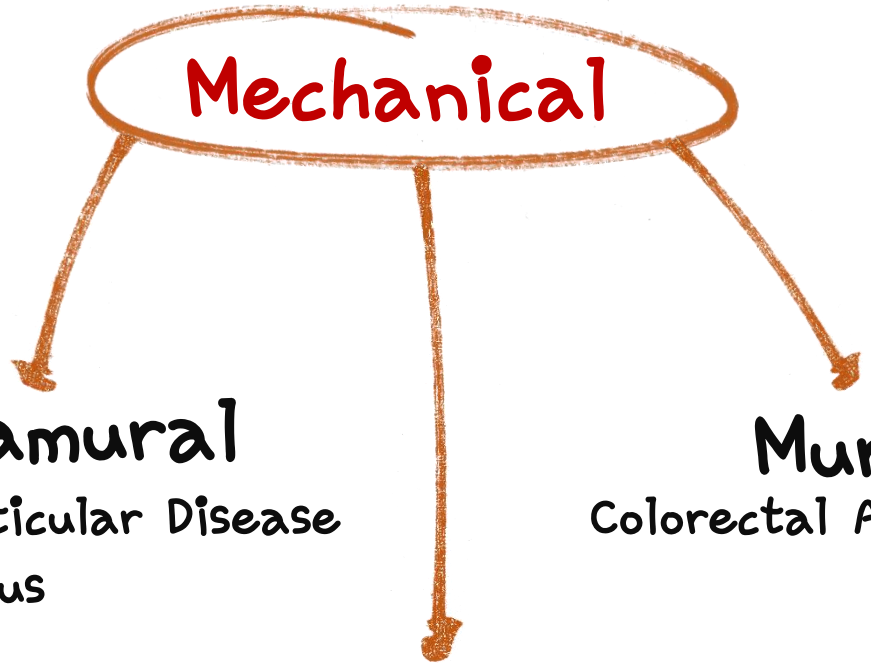
- Bowel edema & ischemia increase the mucosal permeability of the bowel, which leads to bacterial translocation, systemic toxicity, dehydration, and electrolyte abnormalities.

- Bowel ischemia can lead to:
  1. Perforation
  2. Fecal soilage of the peritoneal cavity
  3. Dead bowel.

- In cases of closed loop obstructions (colonic obstruction in the presence of a closed ileocecal valve or incarcerated hernia) this process may be accelerated.

Etiology

Large bowel obstruction make up around ~20% of Obstruction cases



Extramural

1. Diverticular Disease
2. Volvulus

Intraluminal

Fecal Impaction

Mural

Colorectal Adenocarcinoma

1. Colonic Pseudo Obstruction
2. Hirschsprung's disease

Because the content of the bowel is unable to pass => large bowel obstruction can lead to bowel dilatation, ischemia, perforation, and finally sepsis.

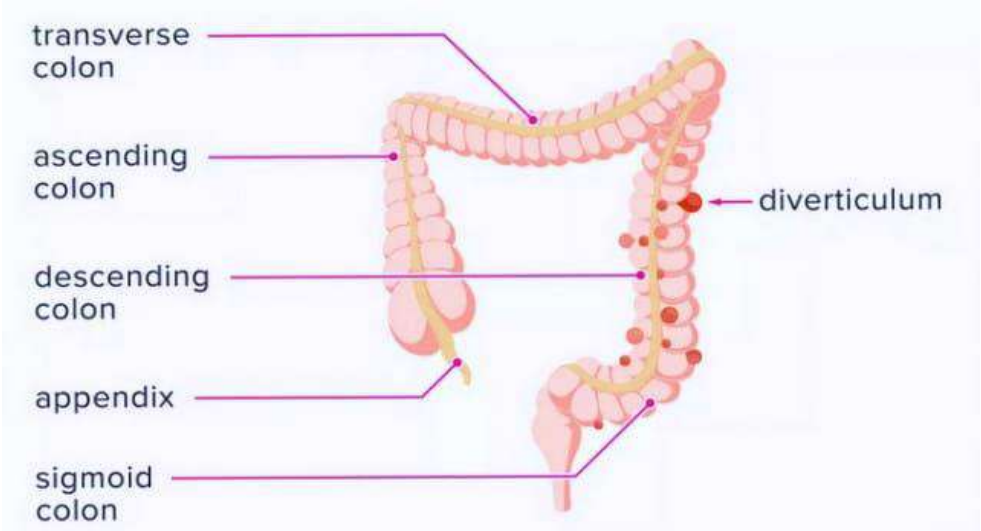
Extrinsic Bowel Obstruction (Extramural):

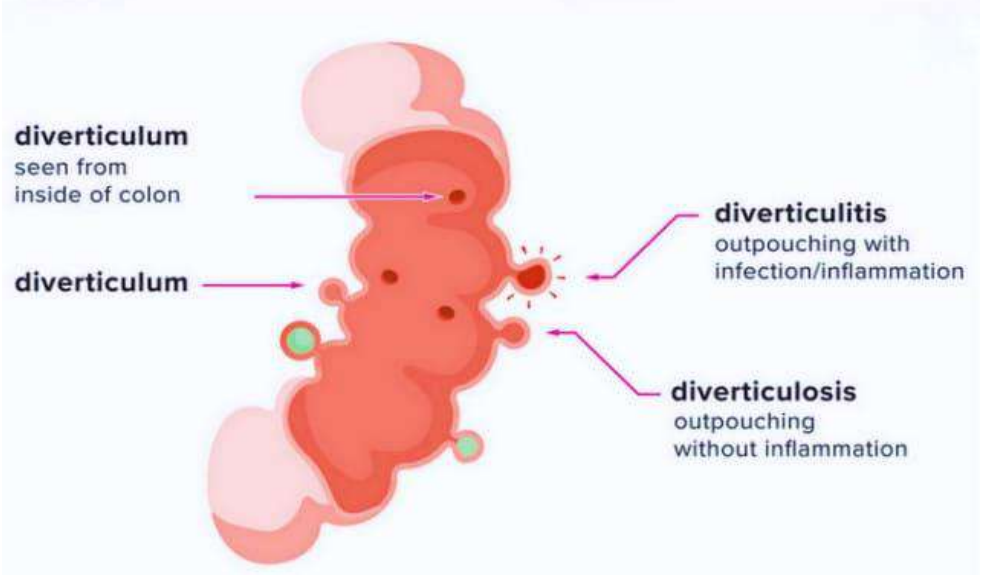
The underlying etiology arises outside the intestinal wall.

- Diverticular Disease
- Volvulus

Diverticular Disease

- Diverticula are small pouches or pockets form in the wall of the large bowel
- Diverticular disease describes the presence of symptomatic diverticula.
- Diverticulosis refers to the presence of diverticula without inflammation (no symptoms).
- Diverticulitis refers to inflammation and infection associated with diverticula.



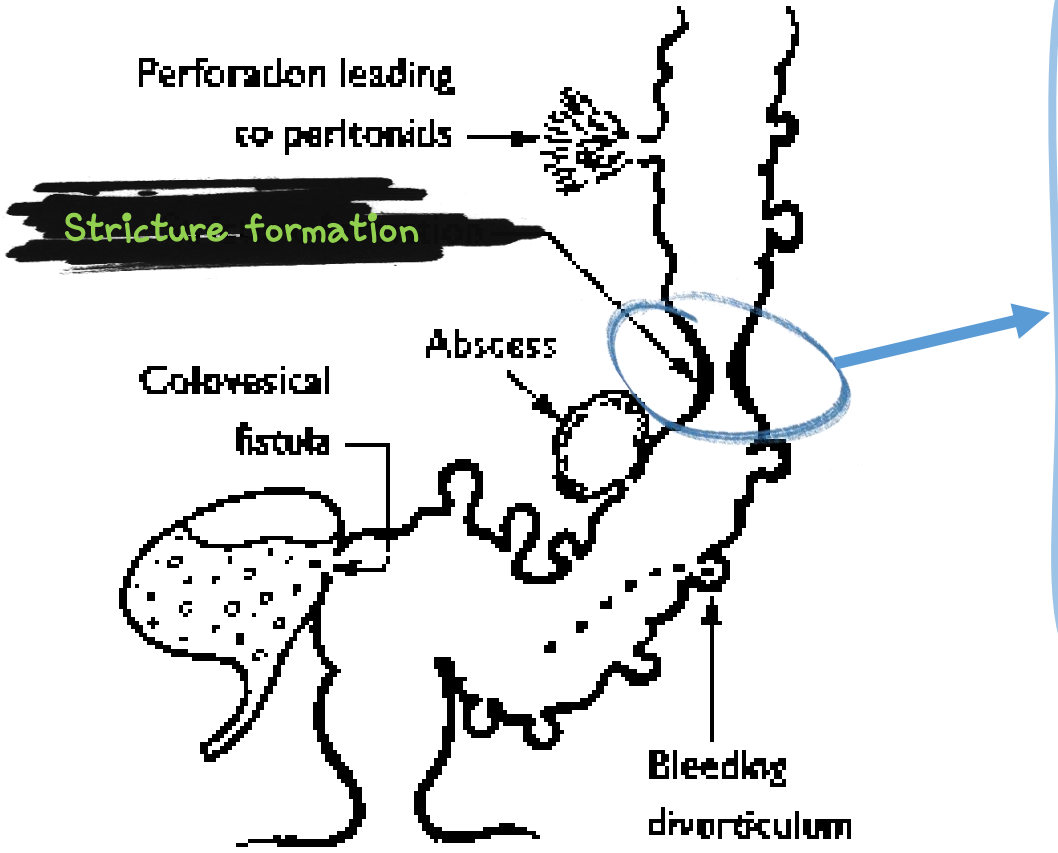


Pathology

- **Diverticula are found throughout the colon, but over 90% occur in the descending and sigmoid colon.**

- Majority are false diverticula in which the **mucosa & muscularis mucosa** have herniated through the colonic wall.
- Those occur between the teniae coli, where the main blood vessels penetrate the colonic wall creating an area of weakness in the colonic muscle.
- They are pulsion diverticula resulting from high intraluminal pressure.
- True diverticula are rare and are usually congenital in origin, which comprise all layers of the bowel wall.

Pathology



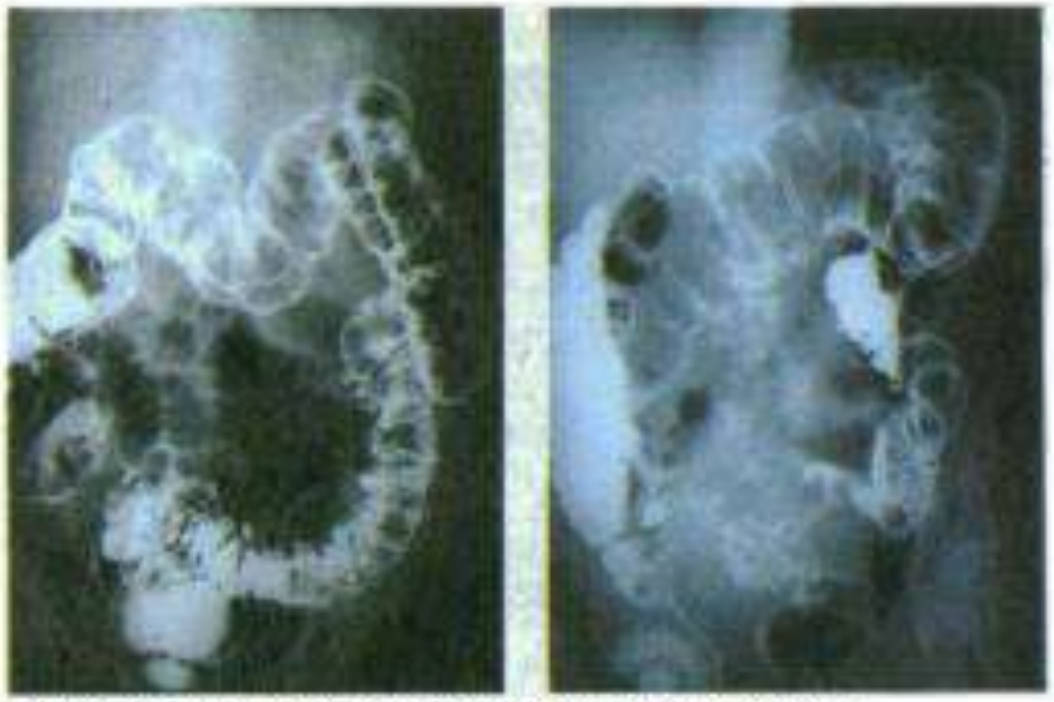
The inflammation of acute diverticulitis leads to scar formation and fibrosis which gradually narrows the lumen of the sigmoid colon resulting in an intrinsic compression of the lumen (stricture formation).

Diverticular Strictures

- **Second most common cause of LBO which occur 20% of cases.**
- Obstruction caused by diverticulitis is usually an **insidious** process. Patients with Diverticular stricture have a history of
  1. Multiple bouts of diverticulitis.
  2. Gradual onset of constipation
  3. Abdominal bloating
  4. Narrowed stools
  5. Diarrhea.
  6. Recurrent left lower quadrant abdominal pain over several years.
- **An endoscopic history of diverticulosis or subclinical narrowing is common.**

Investigation

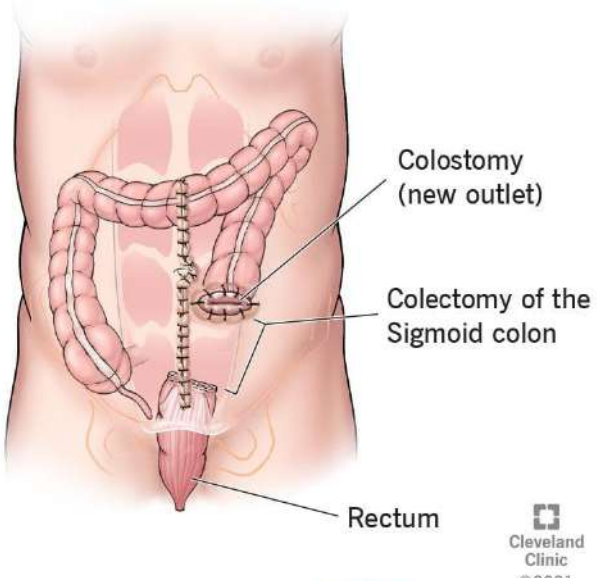
- **CT scan revealing a transition point in the sigmoid colon with upstream dilation of the proximal colon.**
- **Barium enema (both investigations may be required for full evaluation)**
- Obstruction due to diverticular stricture can be difficult to differentiate from strictures due to carcinoma. It's differentiated by:
  1. **Absence of diverticula** in the affected segment
  2. **Presence of shoulder phenomenon** (bulging, acute edge (90 degrees), or lack of tapering at the proximal or distal edge of the obstruction).



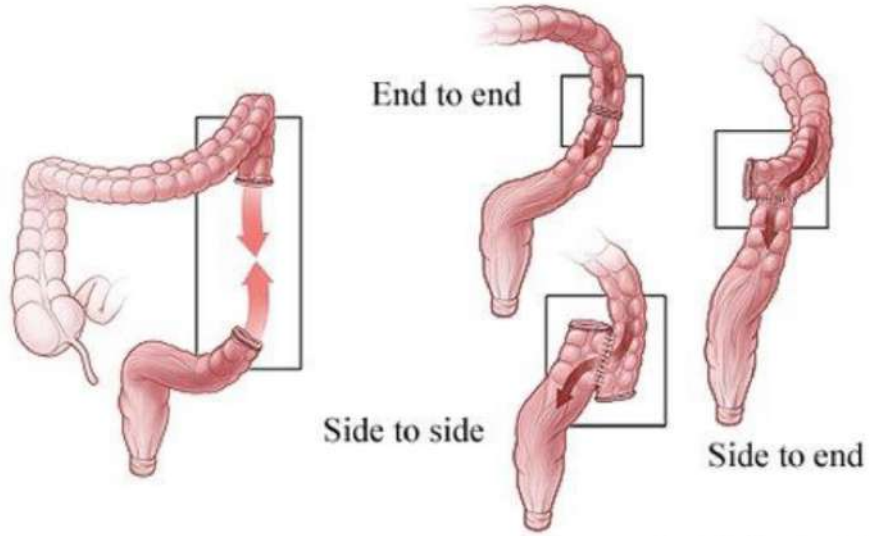
Barium enema radiographs (left) showing uncomplicated diverticular disease; (right) showing a diverticular stricture. This is difficult to distinguish from cancer; colonoscopy is essential.

Management

- Resection (Hartmann's procedure)
- Primary Anastomosis



*Stenting for diverticular strictures is not currently recommended.



Volvulus

- **Volvulus occurs when an air-filled segment of the colon twists about its mesentery, which impairs the venous drainage and arterial inflow.**
- The **sigmoid colon** is most commonly involved in **up to 90%** of cases which occur spontaneously in adults, still it can involve the cecum (<20%) or transverse colon.
- A volvulus may reduce spontaneously, but more commonly produces **bowel obstruction**, which can progress to strangulation → gangrene → perforation.
- Risk factors:
  1. Elderly
  2. Debilitated individuals
  3. History of chronic constipation.

Volvulus

Primary

- Occurs secondary to congenital malrotation of the gut
- Or abnormal mesenteric attachments
- Or congenital bands.

E.g:

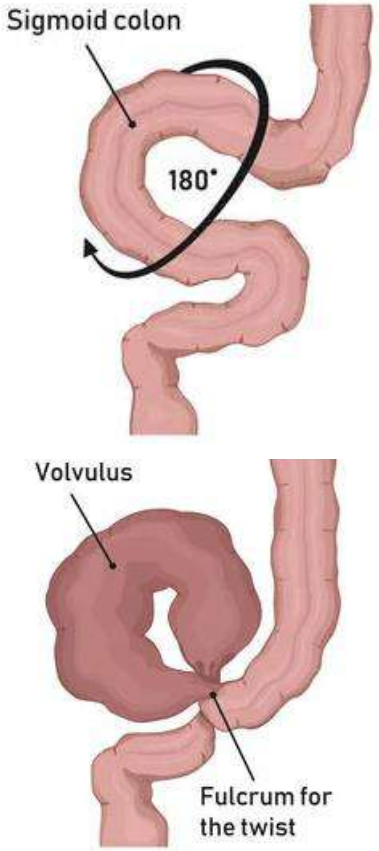
1. sigmoid volvulus.
2. caecal volvulus
3. volvulus neonatorum

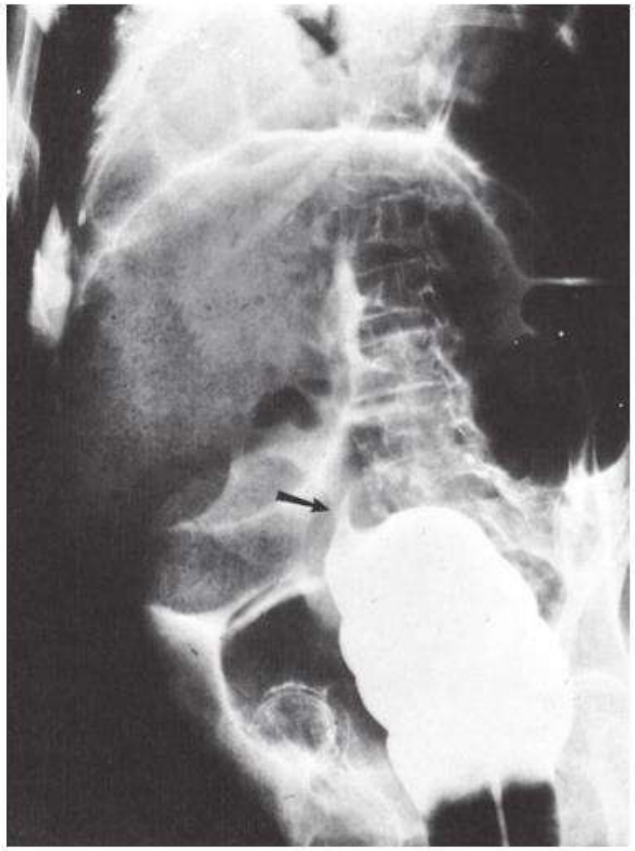
Secondary

- which is the more common variety
- it's due to rotation of a segment of bowel around an acquired adhesion or stoma.

1. Sigmoid Volvulus

- Sigmoid volvulus can be differentiated from cecal or transverse colon volvulus by the appearance of **Plain X-rays** of the abdomen.
- Sigmoid volvulus produces a characteristic **bent inner tube or coffee bean appearance**, with the convexity of the loop lying in the right upper quadrant (opposite the site of obstruction).
- **Gastrografin enema** shows a
  1. Narrowing at the site of the volvulus
  2. Pathognomonic bird's beak.

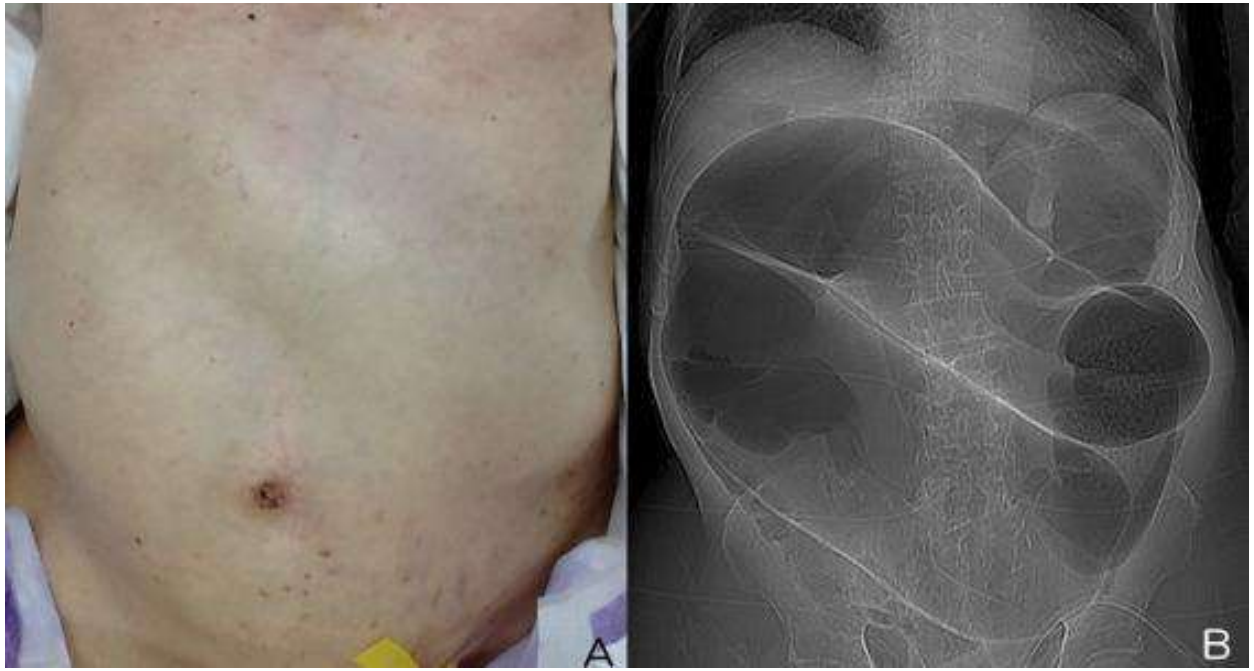


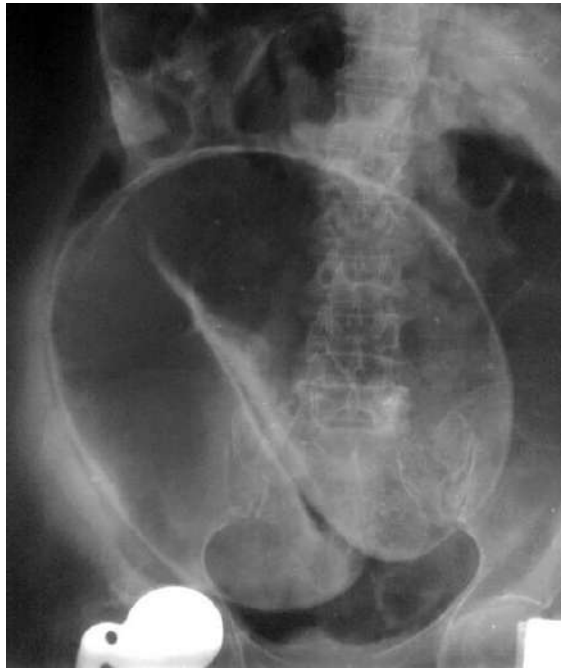


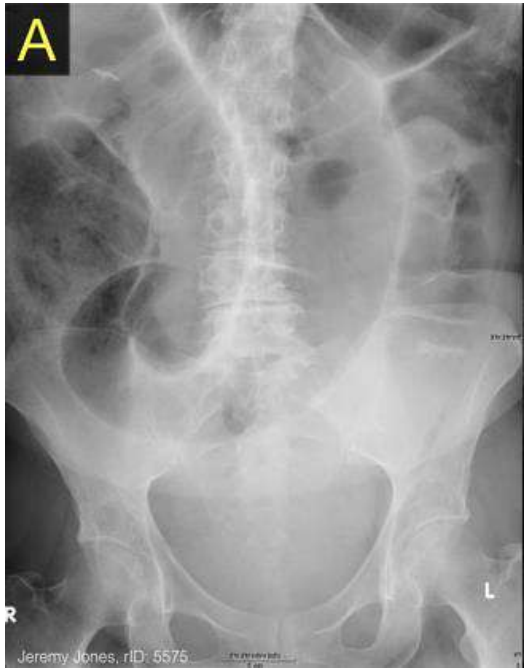
B

(B) Gastrografin enema showing "bird-beak" sign (*arrow*).

Plain X-ray coffee bean appearance







- arises in **the pelvis** (left lower quadrant) but extends towards the right upper quadrant
- **ahaustral** in appearance
- sigmoid volvulus causes obstruction at the distal part so the **ascending, transverse and descending colon** may be dilated
- **few air-fluid** levels may be seen

Management

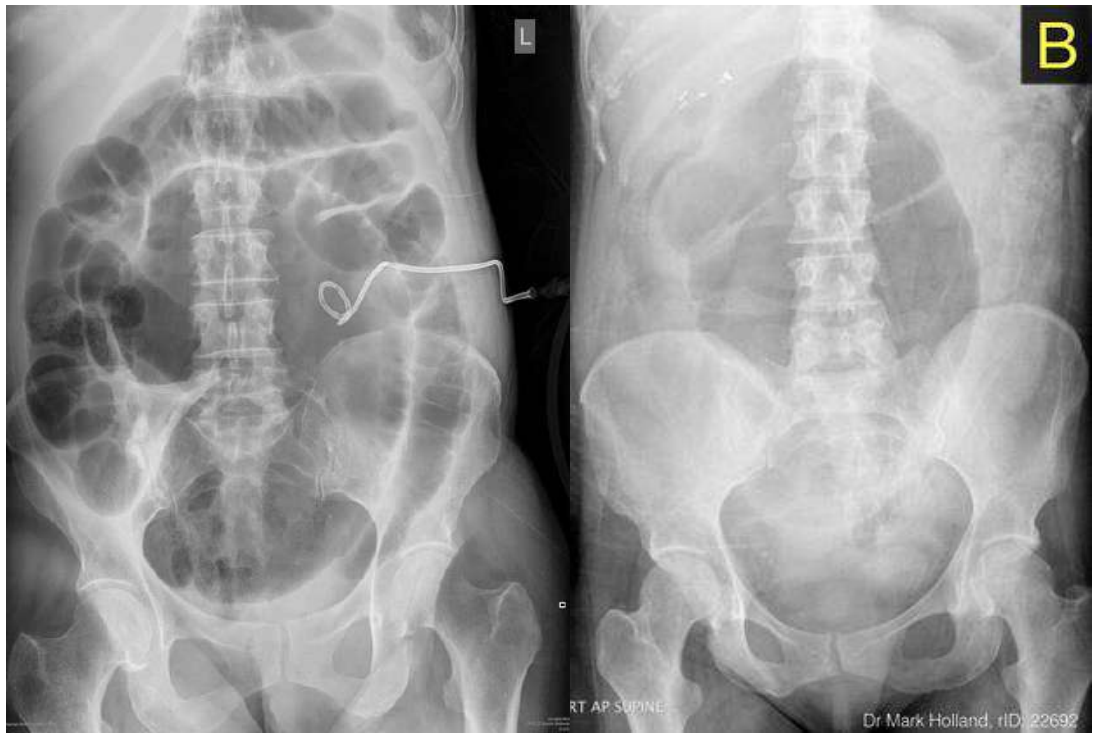
the initial management of sigmoid volvulus is:

1. **Resuscitation** followed by **endoscopic detorsion** by rigid proctoscope.
2. A **rectal tube** to maintain decompression.

- The risk of recurrence is high (up to 40%) => so an elective sigmoid colectomy should be done.
- Evidence of gangrene or perforation mandates immediate surgical exploration without an attempt at endoscopic decompression.
  Similarly, the presence of necrotic mucosa, ulceration, or dark blood noted on endoscopy examination suggests strangulation and is an indication for operation.
- If dead bowel is present at laparotomy, **Hartmann's procedure** may be the safest operation to perform.

2. Cecal Volvulus

- **It results from non fixation of the right colon by:**
  1. rotation occurs around the ileocolic blood vessels
  2. vascular impairment occurs early
  3. 10% to 30% of the cecum folds upon itself (cecal bascule).
- Plain X-rays of the abdomen show a characteristic kidney-shaped, air-filled structure in the left upper quadrant (opposite the site of obstruction).
- Gastrografin enema confirms obstruction at the level of the volvulus.

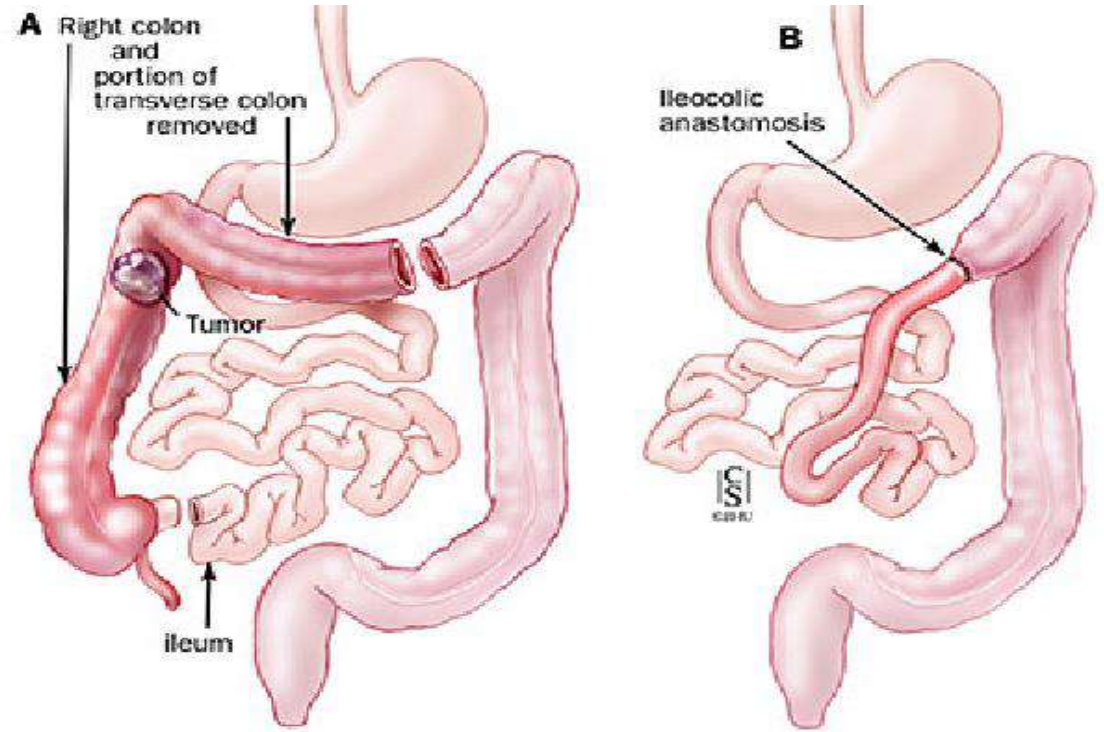


- **arises in the right lower quadrant but extends towards the epigastrium or left upper quadrant**
- **colonic haustral pattern is maintained**
- **distal colon is usually collapsed and the small bowel is distended**
- **one air-fluid level may be seen**

Management:

- **Cecal volvulus can almost never be detorsed endoscopically,** moreover, surgical exploration is necessary when the diagnosis is made.

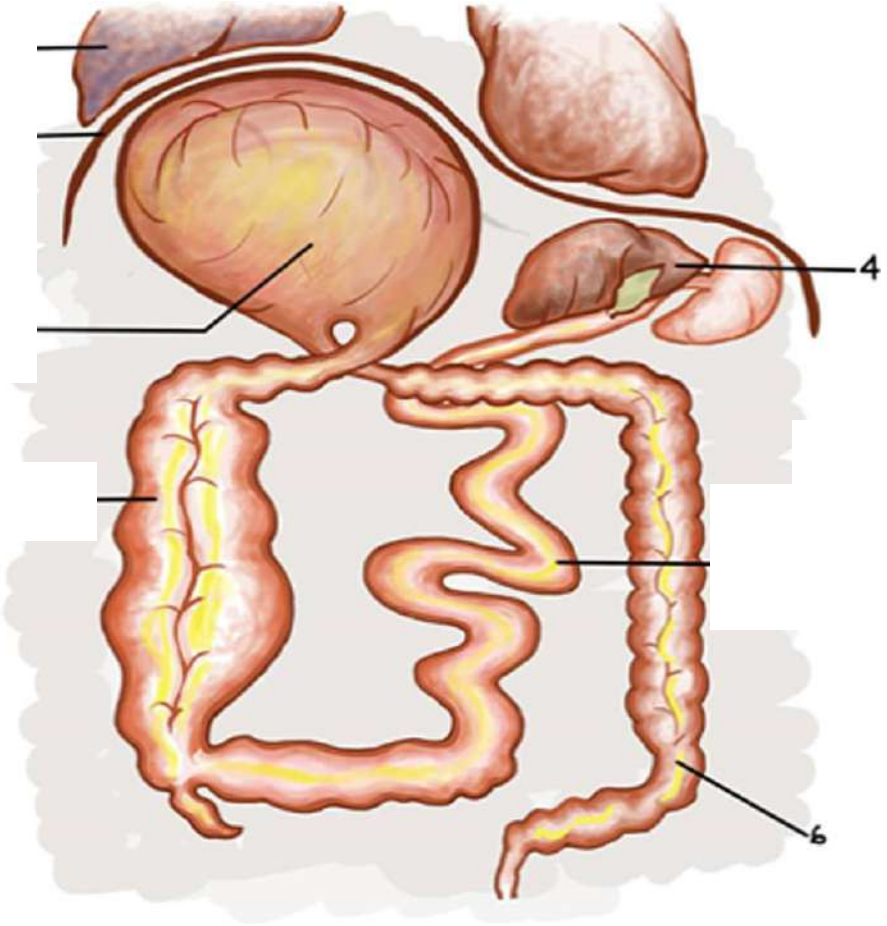
- Right hemicolectomy with a primary ileocolic anastomosis.



re 22. Extended right colectomy with ileocolic anastomosis.

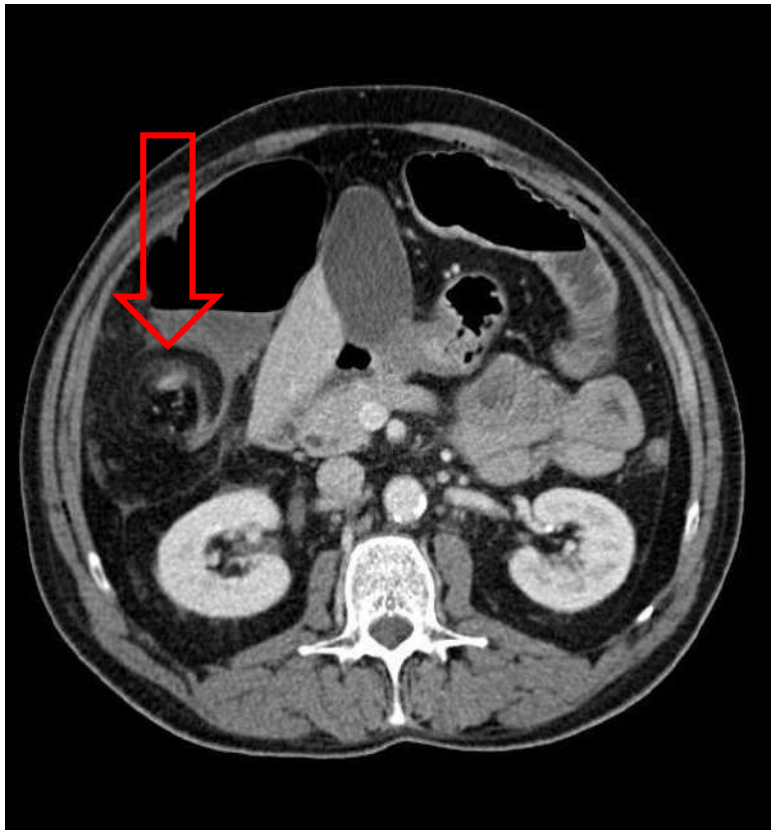
3. Transverse Colon Volvulus

- **Extremely rare but higher risk of mortality.**
- Nonfixation of the colon and chronic constipation with megacolon may predispose to transverse colon volvulus.
- The radiographic appearance of transverse colon volvulus resembles sigmoid volvulus.
- Gastrografin enema will reveal a more proximal obstruction.
- Colonoscopic detorsion is occasionally successful in this setting, most patients require emergent exploration and resection.



Volvulus

CT of the abdomen shows the classic "Whirl sign" which can be seen on all types of volvulus.



Mural Bowel Obstruction:

The underlying etiology arises in the intestinal wall itself.

- Colorectal cancer

Colorectal Cancer

- Most common cause of Large Bowel Obstruction which occur 60% of cases.
- Mostly Involve the Rectum and Sigmoid Colon then Cecum and Ascending colon.

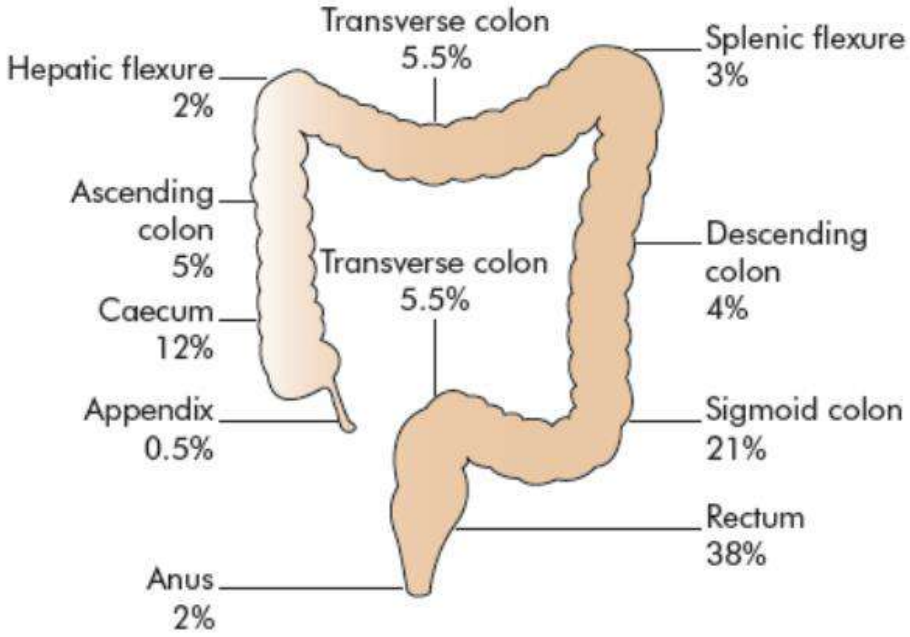


Figure 69.23 Distribution of colorectal cancer by site.

Risk Factors:

1. Age >50 (Dominant factor)
2. Hereditary (80% sporadic, 20% Familial)
3. Diet (High animal fat & low in fibers)
4. Inflammatory Bowel Disease
5. Smoking

Pathogenesis

Mutations of oncogenes:

- K-RAS

Inactivation of Tumor Suppressor genes:

- APC
- DCC
- p53

It's thought to develop from **adenomatous polyps by accumulation of these mutations** in what has come to be known as the adenoma carcinoma sequence

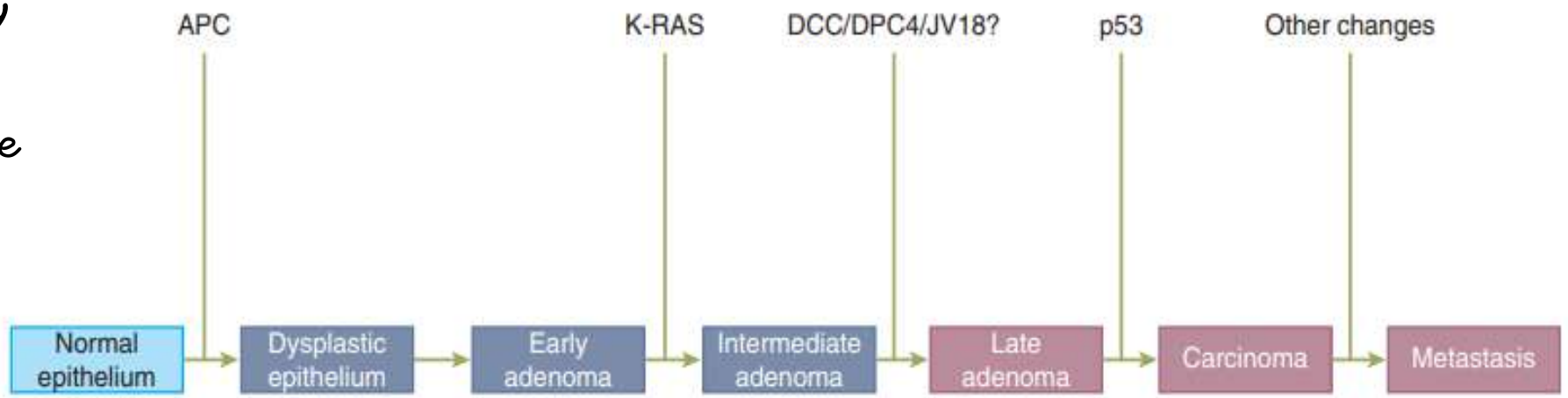


Figure 29-22. Schematic showing progression from normal colonic epithelium to carcinoma of the colon.

Macroscopically:

the tumor may take one of four forms:

- **The annular variety** give rise to obstructive symptoms
- whereas the others present more commonly with bleeding.

Left side of Colon has narrower caliber than right side, which gives earlier presentation and symptoms.

Accumulation of polyps in the distal part of colon, the polyps arise in circular pattern inside the lumen creating ring shape mass.

Annular or encircling lesions that produce an **Apple core or napkin ring** appearance.

Microscopically:

the neoplasm is a columnar cell adenocarcinoma. Origin from a benign polyp may be evident in early cases, before the benign architecture is destroyed by malignant infiltration.

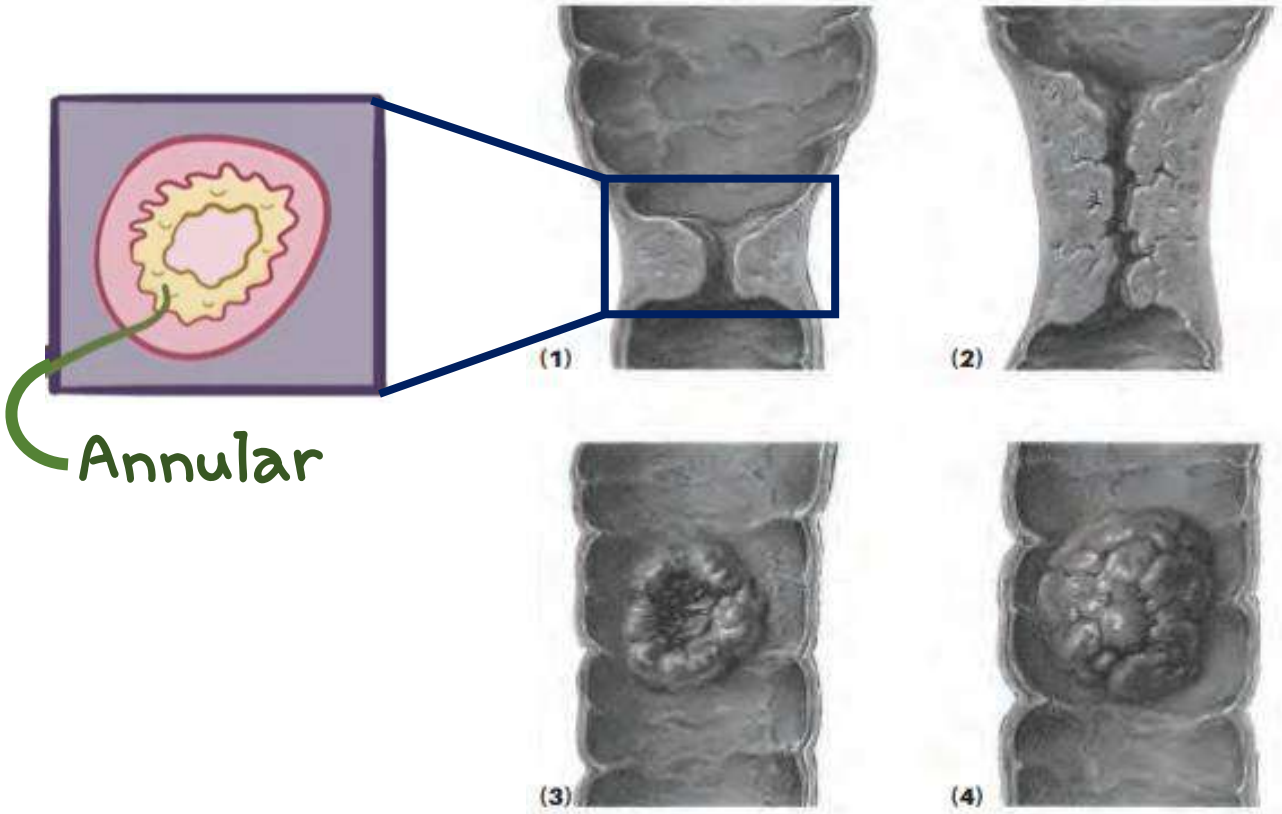
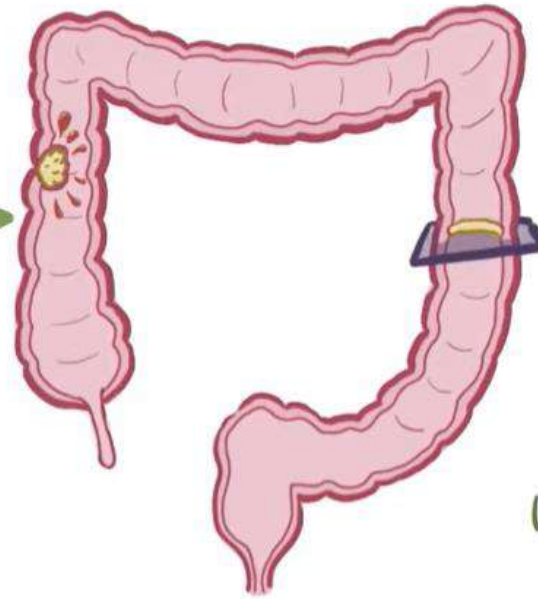


Figure 70.3 The four common macroscopic varieties of carcinoma of the colon: (1) annular; (2) tubular; (3) ulcer; (4) cauliflower.

Symptoms

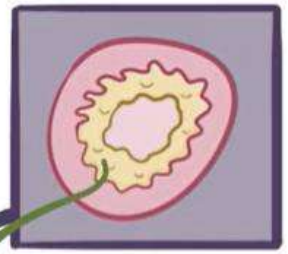
ASCENDING

* GROW BEYOND MUCOSA
  - ↳ PAIN & WEIGHT LOSS
* NO BOWEL OBSTRUCTION
  - ↳ GROWS LARGE
  - ↳ LATE DIAGNOSIS
* CAN ULCERATE & BLEED
  - ↳ ANEMIA



DESCENDING

* INFILTRATING MASSES
  - ↳ RING-SHAPED



* LUMEN NARROWING (NAPKIN-RING CONSTRICTION)
  - ↳ PAIN
  - ↳ HEMATOCHEZIA

Investigation

- Double-contrast Barium enema showing Apple-Core.

- CT Scan

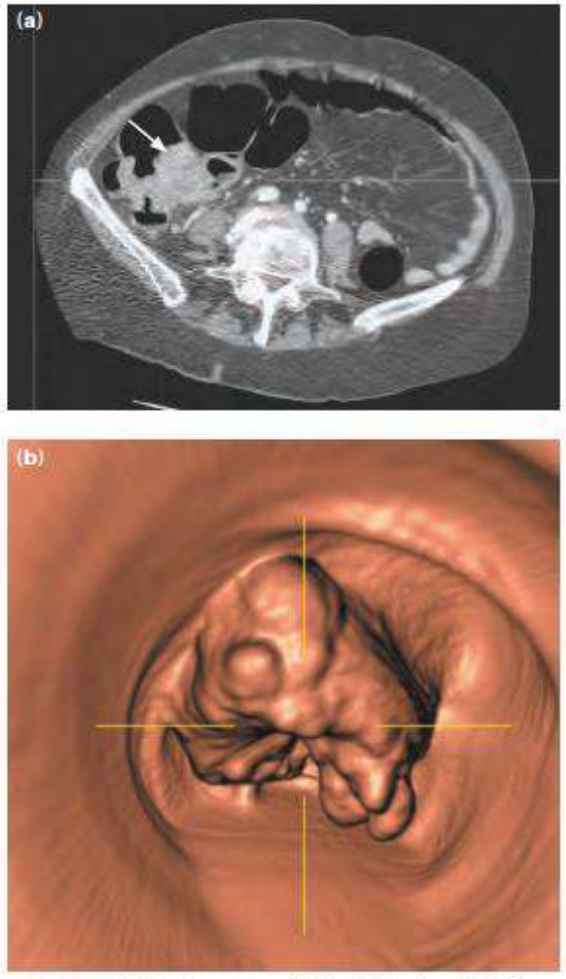


Figure 70.7 Virtual colonoscopy of the right colon. (a) Computed tomography scan of the abdomen showing a caecal tumour (arrow). (b) Formatted 'virtual' image of the same lesion as in (a) (courtesy of Dr A Slater, John Radcliffe Hospital, Oxford, UK).

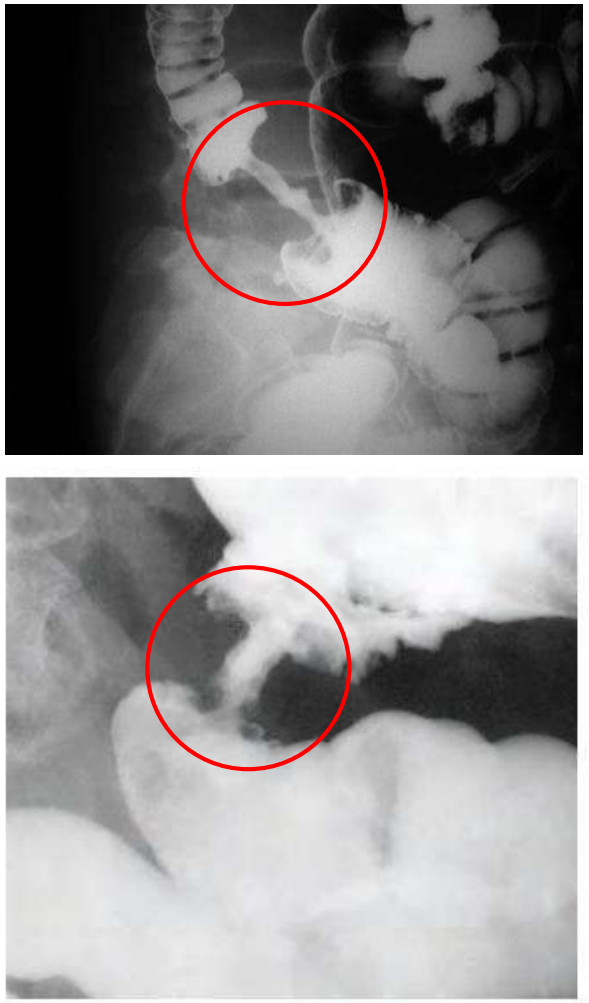


Figure 70.6 Barium enema showing a carcinoma of the sigmoid colon. It may have an 'apple core' appearance (i.e. a short, irregular stenosis with sharp shoulders at each end).

Pseudo Obstruction

Colonic Pseudo-obstruction (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 adynamic 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.

Hirschsprung's disease

- Congenital absence of intramural ganglion cells (aganglionosis) and the presence of hypertrophic nerves in the distal large bowel.
- Due to a failure of migration of vagal neural crest cells into the developing gut. The affected gut is in spasm, causing a functional bowel obstruction.
- The aganglionosis is restricted to
  - Rectum & sigmoid colon (75%) (short segment)
  - Proximal colon (15%) (long segment)
  - Entire Colon and a portion of Terminal ileum (10%) (total colonic aganglionosis).

Signs & Symptoms

Small Bowel Obstruction

Abdominal Pain
Central Cramping/Colicky pain

Minimal Abdominal Distention

Nausea & Vomiting
More proximal => Earlier Vomiting
Bilious/Undigested food

Constipation
Late finding

Rapid Dehydration
Electrolyte Imbalance

Large Bowel Obstruction

Abdominal Pain
Lower Abdominal Spasms (longer lasting)

Early Abdominal Distention

Nausea & Vomiting
Later sign
Feculent Vomiting

Constipation
Early finding

Late Dehydration
Electrolyte Imbalance

Investigations

- Lab studies
- Imaging

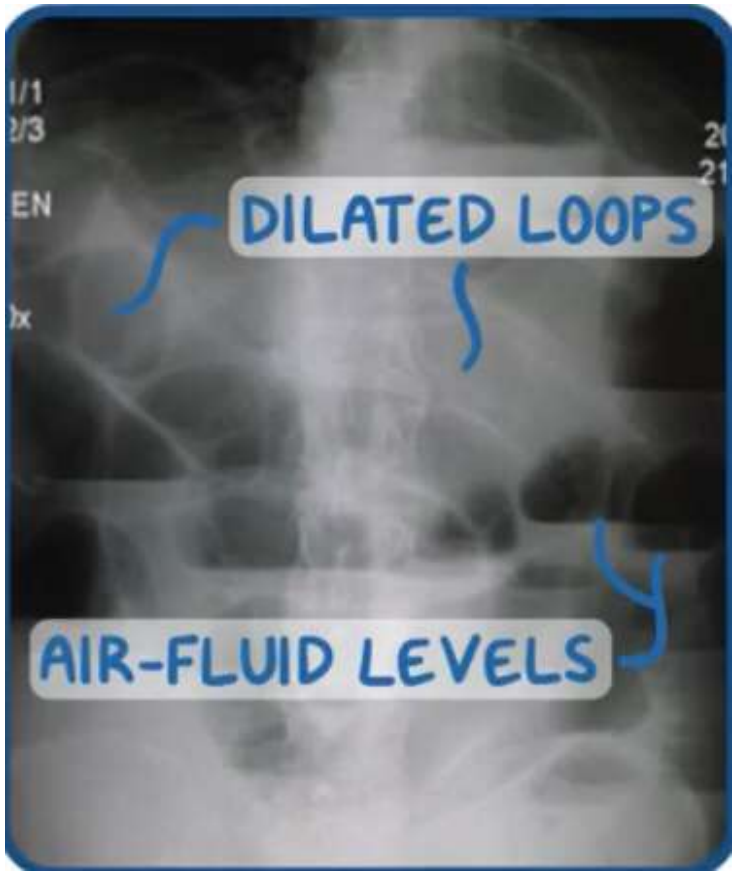
Lab studies

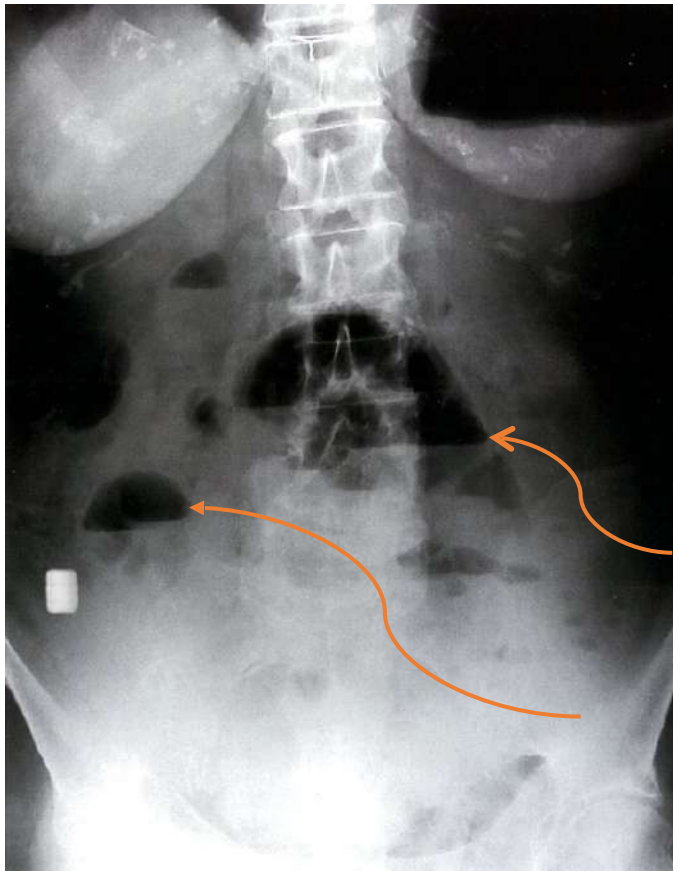
- **Routine studies**: CBC, BMP, serum lactate, and CRP
- In patients who are dehydrated
  - ↑ BUN and creatinine (prerenal acute kidney injury)
  - ↑ Hematocrit (due to hemoconcentration)
- In patients with recurrent vomiting
  - Hypochloremic hypokalemic metabolic alkalosis
  - Hyponatremia

- Suggestive of complicated bowel obstruction
  - Hyperkalemia , elevated serum lactate, and metabolic acidosis: suggestive of bowel ischemia
  - **Leukocytosis**(> 16,000 cells/mcL)
  - Elevated nonspecific inflammatory markers (↑ CRP and serum creatine kinase)
  - ↑ Amylase
  - Altered coagulation panel (e.g., elevated INR in sepsis)

Imaging

- Erect abdominal X-ray





to outline Air-fluid levels.

The air rises above the fluid and there is a flat surface at the "air-fluid" interface

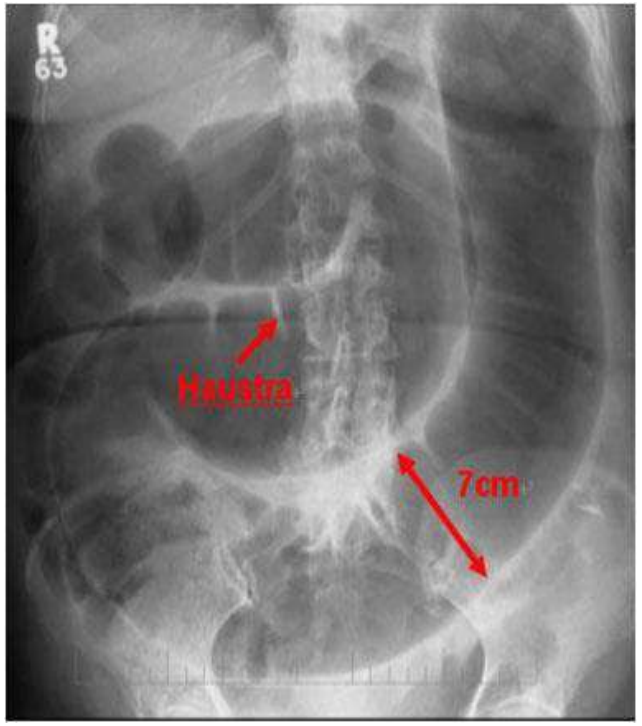
Common criteria for diagnosing SBO

- Supine abdominal X-ray (3,6,9 rule)

➢ **Small bowel >3 cm**

parallel soft- tissue shadows that extend the whole width of the involved segment

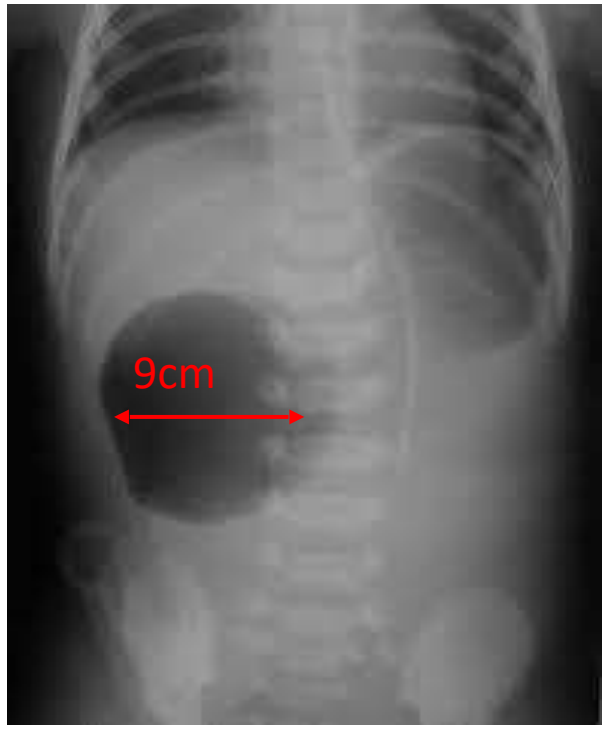
valvulae coniventes



➢ **Large bowel >6 cm**

crescentic soft-tissue shadows that do not traverse the entire width of the bowel

haustra

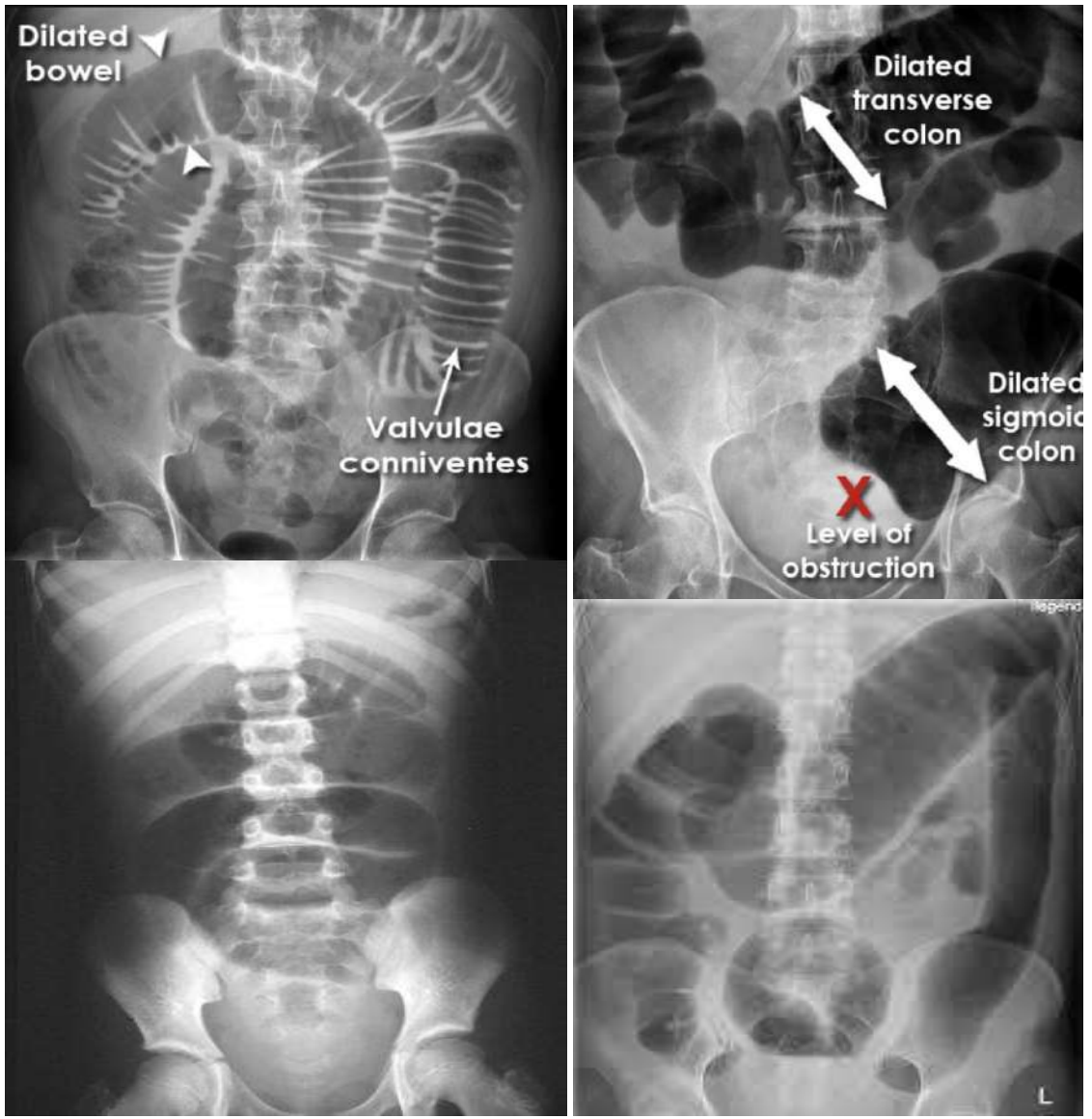


➢ **Cecum>9 cm**

Shown by rounded gas shadow in the right iliac fossa

SBO VS LBO

- Dilated loops are predominantly central.
- Diameter: 3cm , >5cm is sever
- Vulvulae coniventes
- Ladder sign



- Dilated loops are predominantly peripheral
- Diameter: 6 -10 cm
- Presence of haustra.
- 'Picture frame'.

CONTRAST MEDIA

1- Water-soluble contrast challenge:

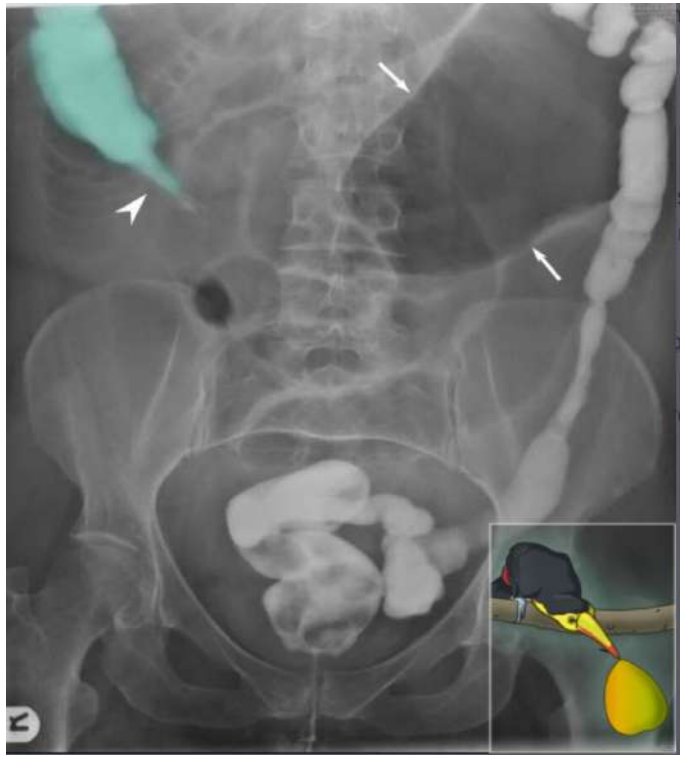
Administered orally or via enteric tube, followed by abdominal X-ray 8 and 24 hours after ingestion IF suspected SBO

- **2- Barium Enema:**
- **Through rectal tube we introduce Barium contrast (Barium Sulfate) under fluoroscopy guidance to large bowel only.**

**** Note : Barium Enema is contraindicated if bowel perforation is suspected, and we use Water-soluble contrast enema instead.**

SIGMOID VOLVULUS

Coffee bean sign



cecal volvulus

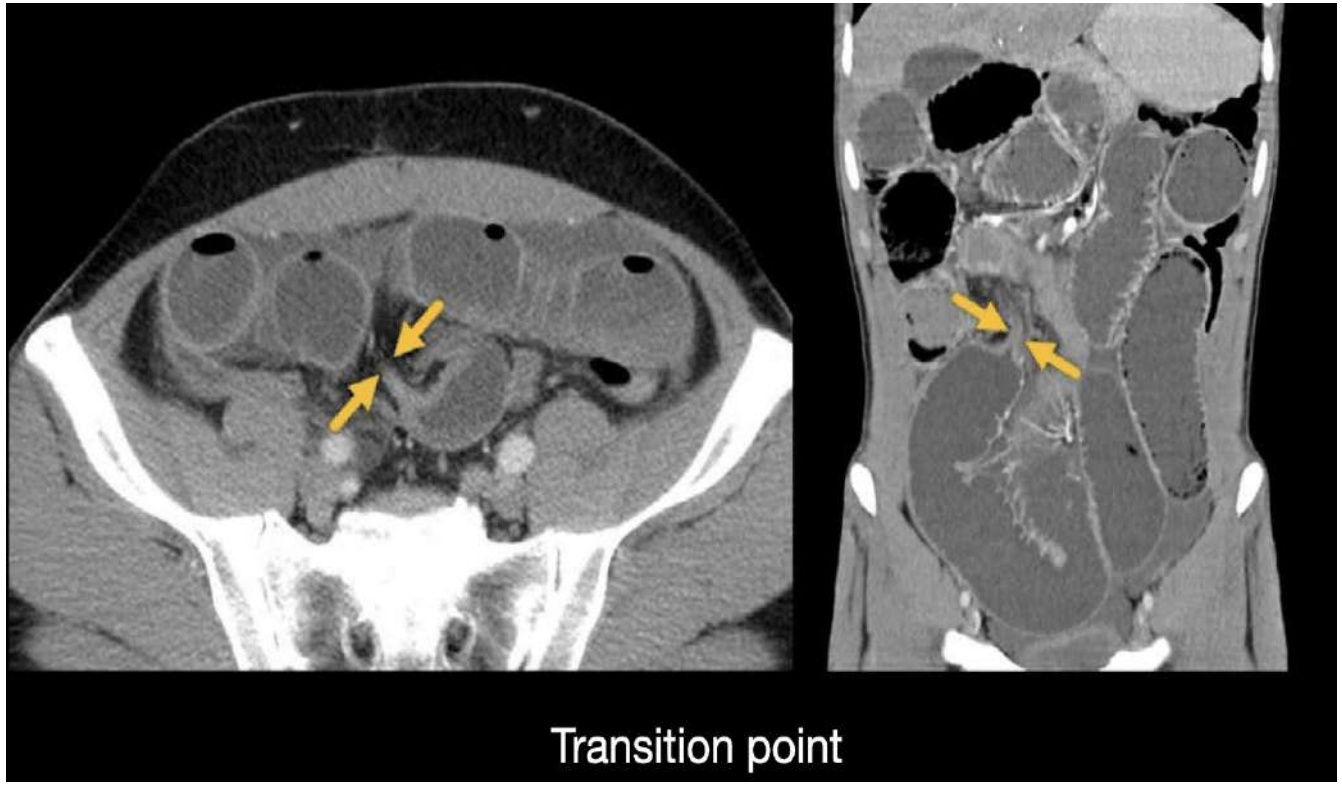
Bird beak sign

annular constriction by a colorectal carcinoma.

Apple core sign

CT scan

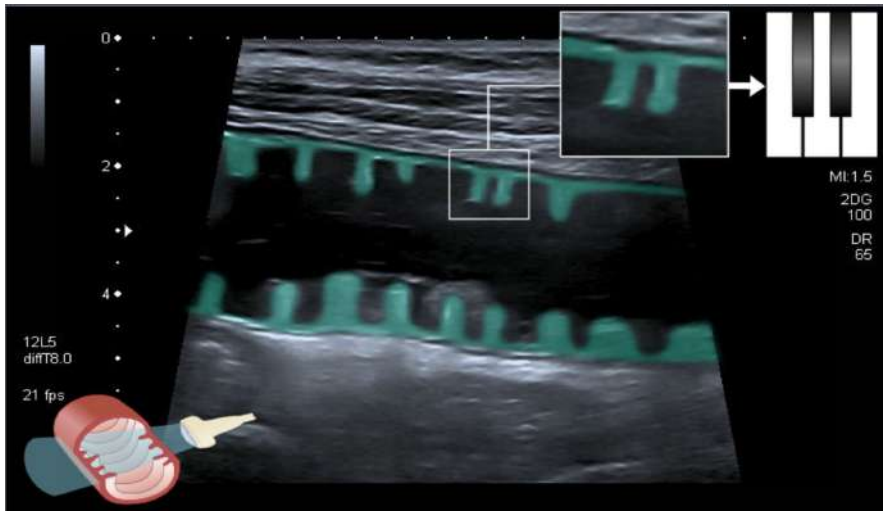
- CT is more sensitive than plain films of the abdomen and will demonstrate the cause in ~80% of cases



- **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**

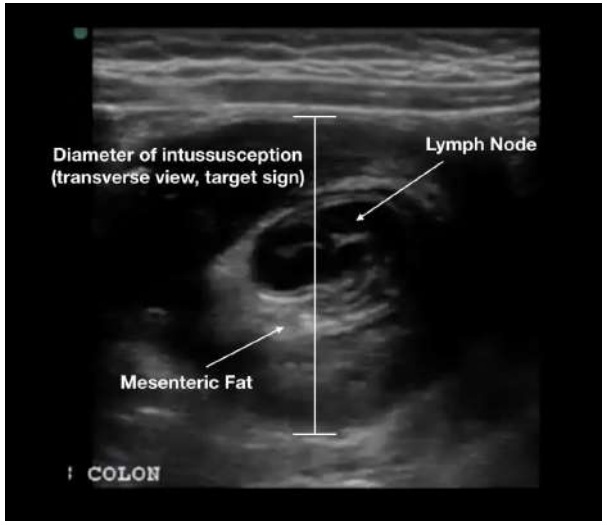
Ultrasound

- Can reveal distended bowel loops which have diameter over 2.5 cm and mass of intussusception can also be demonstrated.
- It’s useful for patients with contraindication to CT.



Keyboard sign

Prominent plicae circulares of dilated small bowel loops



Target sign

Intussusception mass

Treatment

Depends on the severity and etiology of the obstruction and clinical presentation of the patient :

- Conservative treatment .

- Interventional treatment:
  - Endoscopic intervention
  - Surgery

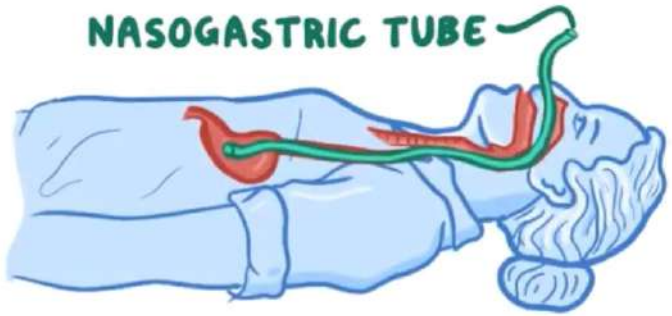
- Identify and.treat the underlying cause.

Conservative treatment

- Simple bowel obstruction / no complications (partial obstruction or postoperative ileus)

➢Bowel rest (NPO)

➢Supportive care (IV fluid/ correction of electrolyte abnormalities/ gastrointestinal decompression for individuals with persistent distension, nausea, or vomiting.)



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

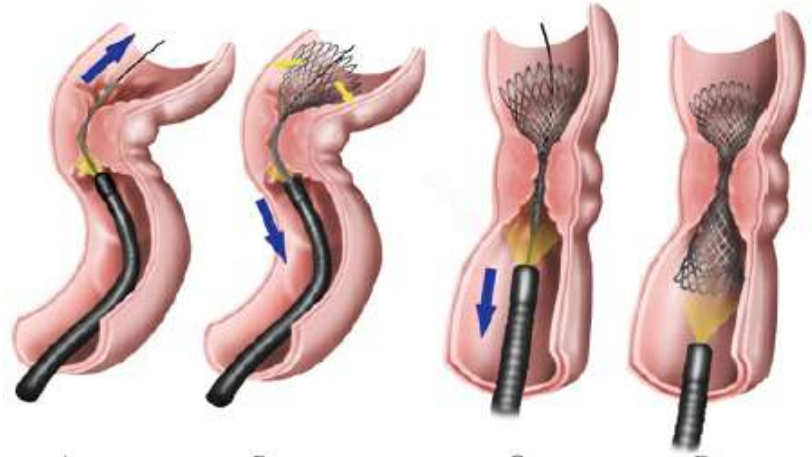
Inerventional treatment

➢Endoscopic intervention

for bowel obstruction
with **no** signs of strangulation

or perforation.

Consider placement
of stents and decompression
tubes.



- **Sigmoid volvulus**:
  Attempt endoscopic decompression, detorsion, and reduction.

- **Intraluminal bowel obstruction** that is within reach of an endoscope: fragmentation or removal

Inerventional treatment

➢Surgery

- Indications:

a) Complicated bowel obstruction

b) Closed –loop bowel obstruction

c) Failure of nonoperative management

d) Underlying etiology necessitates surgical intervention.

- Procedure: exploratory laparotomy.

a) Management of the obstruction (adhesiolysis, hernia reduction, tumor resection.)

b) Resection of gangrenous bowel with restoration of intestinal transit or creat a stoma

Complications

- Bowel ischemia
- Bowel perforation
- Peritonitis

Thank you