



Perforation and infarction of viscus

(etiology, clinical features and complications)

Objectives

- **Perforation:**
 - The student is expected to describe and explain the etiology, clinical features and complications of the following conditions:
 - Peptic ulceration, Boerhaave's syndrome, Gangrenous appendicitis, Perforated gallbladder, Acute diverticulitis. Small bowel (Crohn's, typhoid, strangulation, tumour and foreign body), Ulcerative colitis (toxic megacolon), Ischemia, Radiation necrosis, Carcinoma colon, Ruptured bladder
- **Infarction:**
 - The student is expected to describe and explain the etiology, clinical features and complications of each of the following conditions
 - Small and large bowel infarction: Strangulation, Volvulus, Arterial thrombosis, Arterial embolism, Venous thrombosis, Dissecting aneurysm
 - Stomach (volvulus)
 - Spleen, liver and kidney (arterial occlusion)
 - Ovary (torsion of pedicles)
 - Omentum/appendix epiploica (strangulation)

This tutorial is ONLY based on Dr.Mufti's slides and notes

The textbook content and extra information from 438 team were added only to cover the objectives

Good luck :)

Colour Index

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Introduction

- **Acute Abdomen:**

Is any abdominal condition (With main symptoms being the pain) that mandate emergent intervention (That intervention not necessary surgical, it may be medical). It can be life-threatening or trivial.



Medical Acute abdomen

- Cardiovascular (Referred MI)
- Gastrointestinal (Gastritis and hepatitis)
- Metabolic (Uremia)
- Hematological (Sickle cell)
- Gynaecological

Surgical Acute abdomen

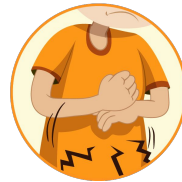
- Inflammatory (Acute pancreatitis, cholecystitis)
- Obstruction (Intestinal, biliary and ureteric)
- **Perforation**
- **Ischemia**
- Intra Abdominal bleeding (Ruptured aneurysm, ruptured ectopic pregnancy)

The highest mortality conditions of acute abdomen:

Laparotomy of unresectable cancer

Ruptured abdominal aortic aneurysm

Perforation of the viscus (Especially the colon)

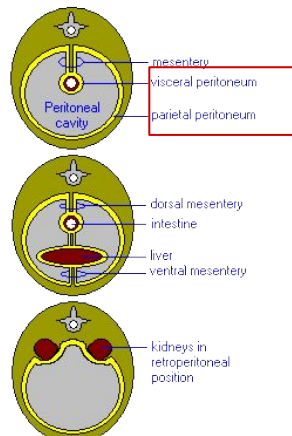


Types of pain

Parietal Peritoneum

- Parietal peritoneum covers all abdominal wall aspects (Anterior, Posterior, Superior and Inferior)
- It is supplied by **somatic** nerve endings (derived from underlying muscles and skin)
- Gives **somatic** pain
 - Sensitive to chemical, mechanical or thermal irritation
- The pain is **localized**. Patient presents with **guarding + rigidity**

Cross sections through the abdomen



Extra picture

Visceral Peritoneum

- The visceral peritoneum covers all organs (**Aside of spleen and lower esophagus**).
- It is supplied by **autonomic** nerve endings
- Sensitive to **ischemia, distension** and **temperature** only.
- **Not sensitive** to chemical, mechanical or thermal.
- **Poorly localized** pain (Vague), deep seated. Patient have **guarding only**

Perforation and Infarction



Etiology

1 Perforation:

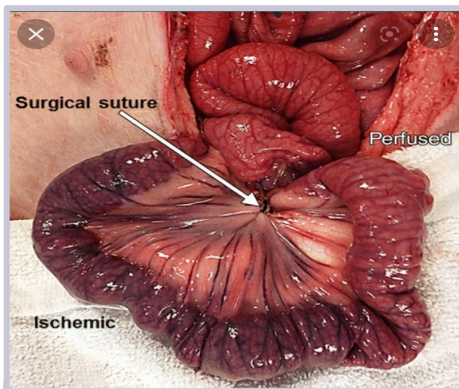
1. Inflammation of wall
2. Ulceration of wall
 - PUD
 - Duodenal ulcer
3. Ischemia
4. Infarction & Gangrene of wall
5. Luminal Obstruction
6. Benign or Malignant tumor of wall
7. Trauma (RTA)
8. Post operative leak
9. Instrumental trauma

2 Infarction:

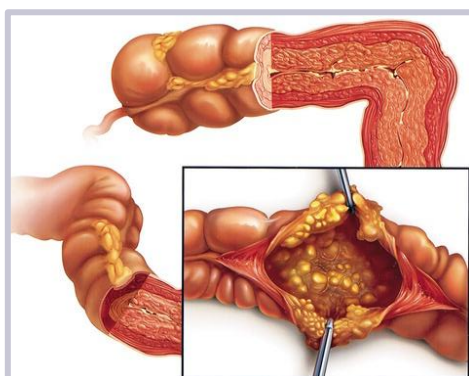
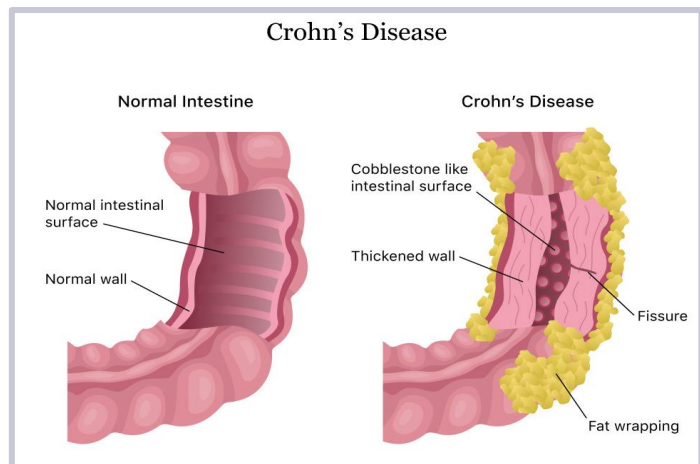
1. Arterial or Venous occlusion
2. Internal or external Strangulated Hernia
most common (paraumbilical)
3. Obstruction of lumen
4. Benign or Malignant tumor of wall
5. Postoperative
6. Prolonged hypotension
7. Aggressive Inotropic support
8. Chemotherapy
9. Medical Disease
10. Trauma (injury to the mesentery → Ischemia)

3 Clinical Causes:

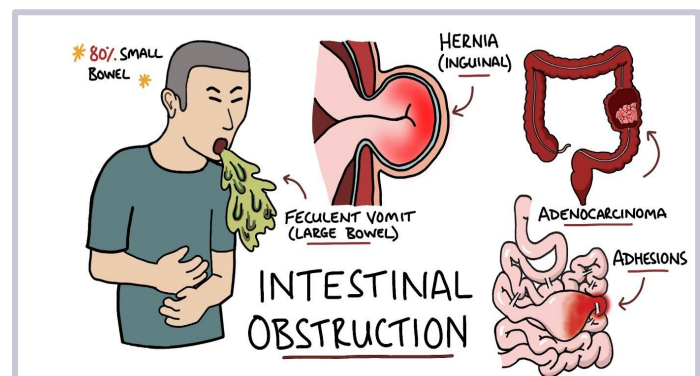
1. Perforated Appendix
Most common cause due to appendicitis
2. Strangulated hernia
3. Trauma
4. Anastomotic leak
post-surgical
5. Perforated Diverticulitis
6. Bowel Ischemia
7. **Primary Peritonitis** → Spontaneous bacterial peritonitis (SBP) may occur in patients with **nephrotic syndrome**, but is more frequently seen in those with liver cirrhosis or chronic renal failure (particularly in patients on peritoneal dialysis).



Vascular compromise



Wall infiltration



Luminal obstruction

Perforation and Infarction

Mechanism

Vascular Compromise

Decrease blood supply
(Arterial/venous) e.g. PUH

Luminal obstruction

- If the lumen is obstructed → obstructed hernia
- If the blood vessels are obstructed → strangulated hernia

Wall infiltration

- Growth or mass causes luminal obstruction e.g. colon cancer
- Inflammation in the wall e.g. colitis which will make it thick but weak leading to perforation (crohn's)

Perforation & Infarction

Severity depends upon:
Patient¹ and Etiology² factors | Underlying disease

Infarction: Depend on the size of the blood vessel

Short segment infarction, Segmental infarction and Massive infarction

Perforation:

Micro perforation

- Peritonitis → CT showing gas in the abdomen → no perforation found on surgery. We close the abdomen and watch the patient for improvement.

Sealed/concealed perforation

- Perforation sealed by the omentum. Initially fluid will go into the peritoneal cavity but later on it will stop.

Contained perforation

- Around the perforation, coils of the intestine separate the area (enclosed area).

Free perforation

- full blown peritonitis

Peritoneal Irritation

Normally: there is sterile peritoneal fluid in the peritoneum.

Irritation is caused by abnormal contents in the peritoneum, like:

- Blood, Bile, Pus and Urine
- **Stool³** contains highly virulent microorganisms e.g. clostridium spp and bacteroides causing severe infection and high grade peritonitis.
- **Gastric juice** (HCL → severe chemical burn of peritoneum → peritonitis). **MOST LETHAL**
- **Pancreatic Juice** pancreatic enzymes → digestion of any tissue in contact.
- **Chyme** partially digested food originating from the small intestine.

Peritonitis

Two Phase: Compensatory Mech
Symptoms & Signs

Function of the Peritoneal fluids? lubrication.

Normally it's sterile. When the intestines perforates, its content will leak into the peritoneal cavity.

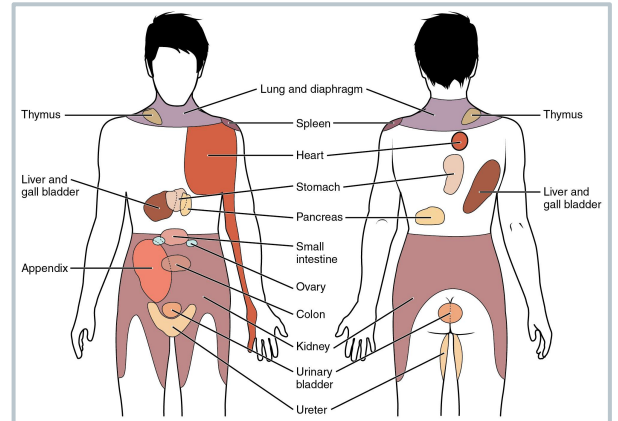
Collection of foreign material → peritoneal irritation → peritonitis.

1. Omentum has a defensive mechanism that prevents spread of inflammation by surrounding it, so when operating on appendicitis you'll see the omentum first. **Lack of OMENTUM puts you at higher risk of inflammation, e.g. infants and pregnant women shouldn't delay operating.**
2. Some diseases are more prone to; perforation (crohn's), infarction (atherosclerosis)
3. The patient will be admitted a day before the surgery and given a large amount of fluid → severe diarrhea → stool free colon.

Abdominal Pain

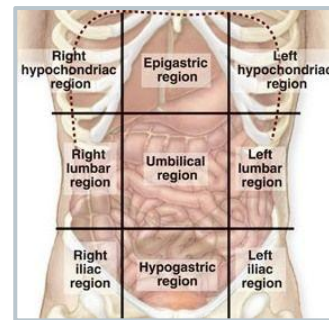
Referred Pain

- **Definition:**
 - Defined as pain perceived at a location away from the site of the painful stimulus
- **Examples:**
 - Biliary colic → Right shoulder pain
 - Ureteric colic → Upper thigh
 - Cardiac pain → Left jaw
 - Ice cream headaches
- **Cause:**
 - Multiple inputs from sensory fibers



How to Investigate Pain

- 1- Onset
- 2- Site
- 3- Duration
- 4- Progression
- 5- Character
- 6- Severity
- 7- Associated symptoms



Pain Types ★

Visceral pain:

- ❖ From Viscera
- ❖ Supplied by autonomic fibers

Somatic pain:

- ❖ From body surfaces e.g abdominal wall
- ❖ Supplied by somatic fibers

	Visceral (Autonomic)	Somatic
Cause	Stretch/distention → act as receptor of pain Ischemia → w/ forceful contraction the vessels get compressed	Cutting Burning
Nature	Colicky (fluctuates in relation to contraction and relaxation)	Continuous
Intensity	Mild to moderate	Severe
Localization	Generalized Poorly localized	Well localized
Radiation	Radiates and Refer	Does not refer
peritonitis phases	Phase 1 (tenderness ONLY)	Phase 2 (Rigidity & Rebound tenderness)

Abdominal Pain

> Pain Examples:

- **Appendicitis:**

- with time the pain pattern can change:

- **First 4-6 hours (phase 1) tenderness**

Nerve impulses will go from the appendix to T10 (which also receives impulses from paraumbilical area)

there will be REFERRED pain around the umbilicus initially.

- **After 4-6 hours (phase 2) rebound**

Abdominal wall inflammation → pain shift into the right iliac fossa (somatic overwrites autonomic, so it becomes more severe and localized)

- **Gallbladder :**

Pain in the right hypochondria. Can extend from the midline along the right side and radiate to the tip of the scapula or the right shoulder (referred biliary colic)

- **Pancreas:**

Start in the upper epigastrium radiates to the back, gradual and progressive.

Peritonitis

Phases of Peritonitis

- An intra abdominal inflammation develops in two phases

Phase 1

Visceral peritonitis → Inflammation limited to the organ

- **Tenderness ONLY (Autonomic) - Medical diseases**

Phase 2

Parietal peritonitis → Inflammation of parities of the abdominal wall

- **Rebound tenderness (somatic) - Surgical diseases**

- Peritonitis presents initially in Phase 1 with visceral symptoms and progresses to phase 2 gradually and both have different clinical picture.
- Time interval between these phases differs, for the appendix it's 4 hrs, for gallbladder 10-14 hrs. But that doesn't mean the first will stop and second will start, they happen simultaneously.
- You can only tell what is the inflammation in the second phase and where is it localized

Peritonitis

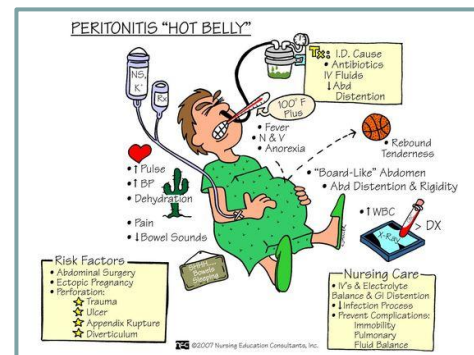
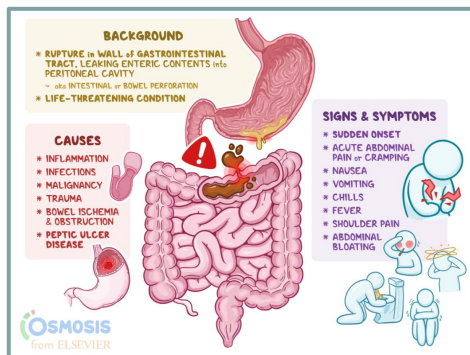
Compensatory Mechanism

Mechanism	Purpose	Clinical Manifestation
Inflammation	As part of the immune response	1- Fever 2- Activation of other mechanisms
Pylorospasm Contraction of pyloric sphincter → gastric content accumulate → stomach distention → feel full	NPO	1- Anorexia 2- Nausea 3- Vomiting ¹
Paralytic Ileus ² (Intestinal paralysis leading to losing intestinal tone)	Rest to abdominal organs	1- Abdominal distention 2- Decreased or absent bowel sounds 3- Constipation
CNS activation (Plasma volume decrease due to loss of fluid → blood shrinks) May not happen if mild	To support insult to cardiovascular system e.g. in severe perforated duodenum	1- Tachycardia ³ 2- Hypotension

Clinical Features

Depends on:

- Clinical picture of underlying disease and how severe it's
- Clinical features of Peritonitis

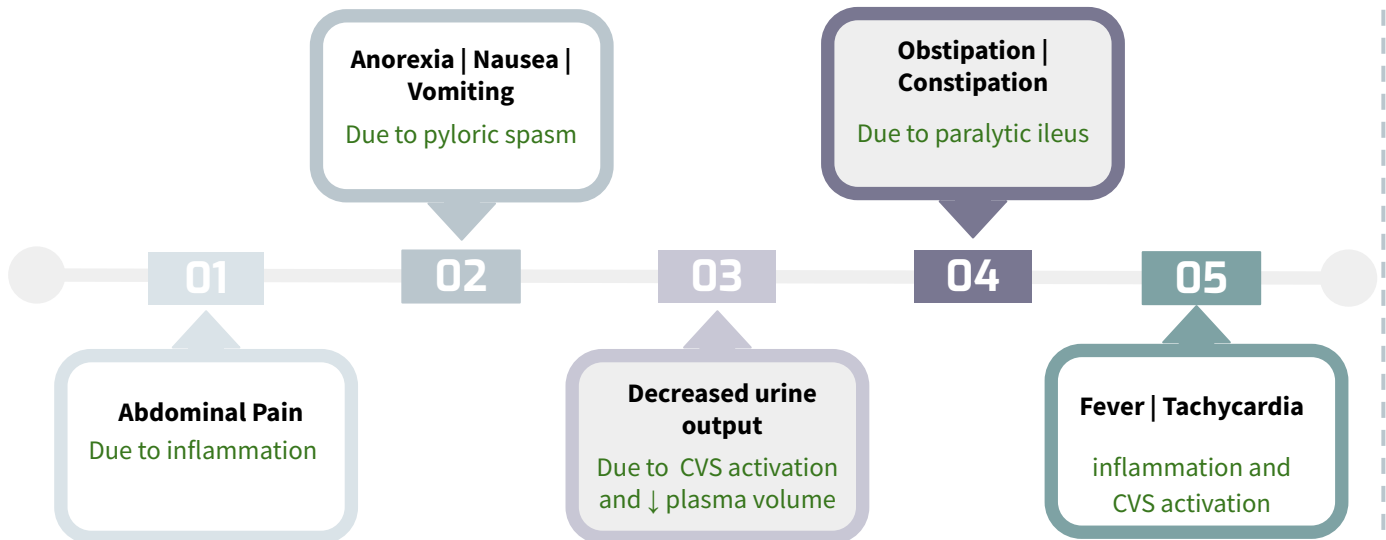


1. So a patient presenting with pain in right iliac fossa and repeated vomiting is NOT appendicitis, it would instead present with anorexia only NOT vomiting.
2. During laparotomy, to check for perforation you do a puncture test (inflate bowels then put it under water to check for bubbles indicating perforation). Here a physiological paralytic ileus occurs as a response to injury NOT peritonitis.
3. Help in assessing the extent of the inflammation

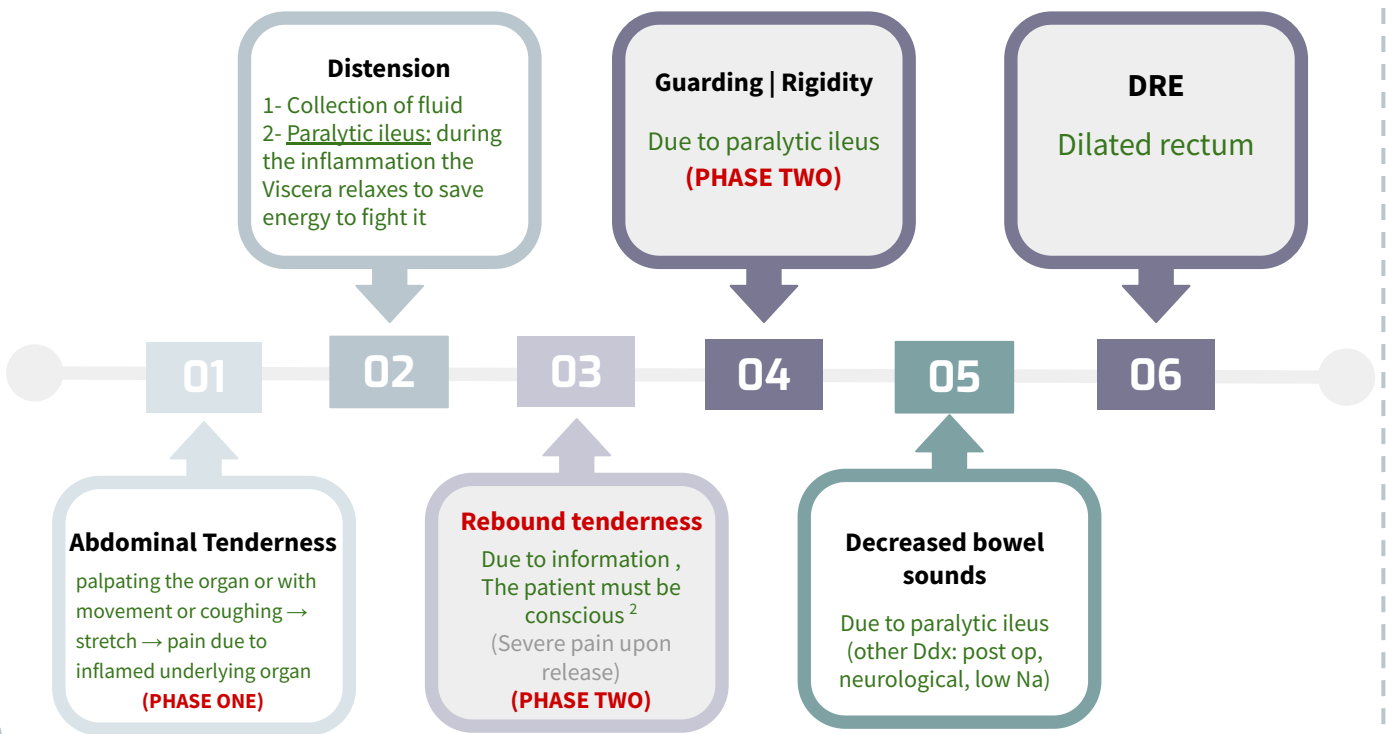
Peritonitis

Clinical Features ¹ ★ cont,

Symptoms



Signs

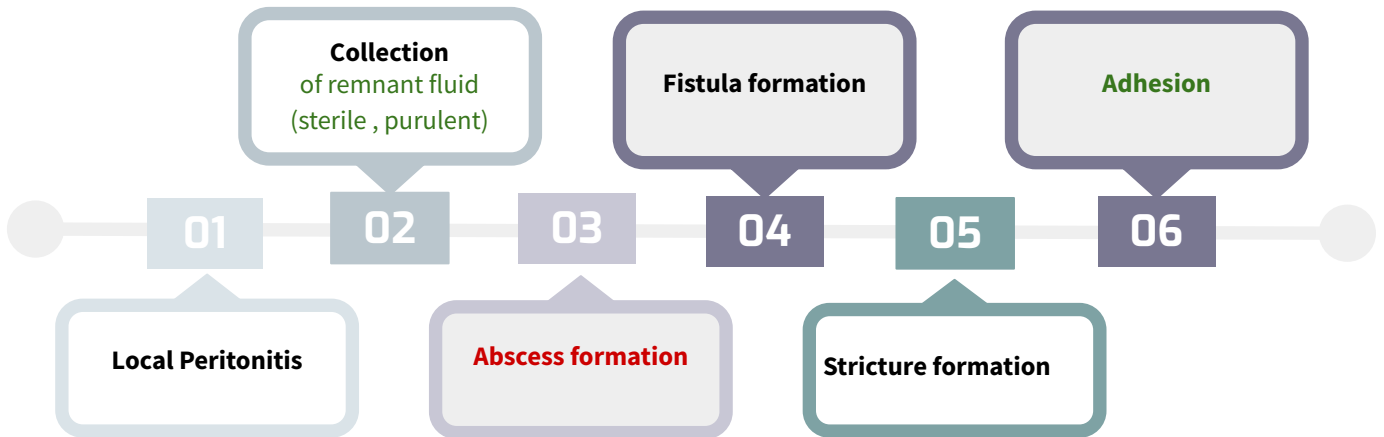


1. Any cause of peritonitis will cause this clinical picture, but the magnitude will be different (Ex. Appendix is a small structure so the symptoms will be less, on the other hand pancreatitis and diverticulitis are involving bigger structures so the symptoms will be augmented)
2. **MCQ!** Somatic nerves damage (paralytic – cerebral palsy) → loss of rebound tenderness
Under general anesthesia → no muscle tone → no rebound tenderness

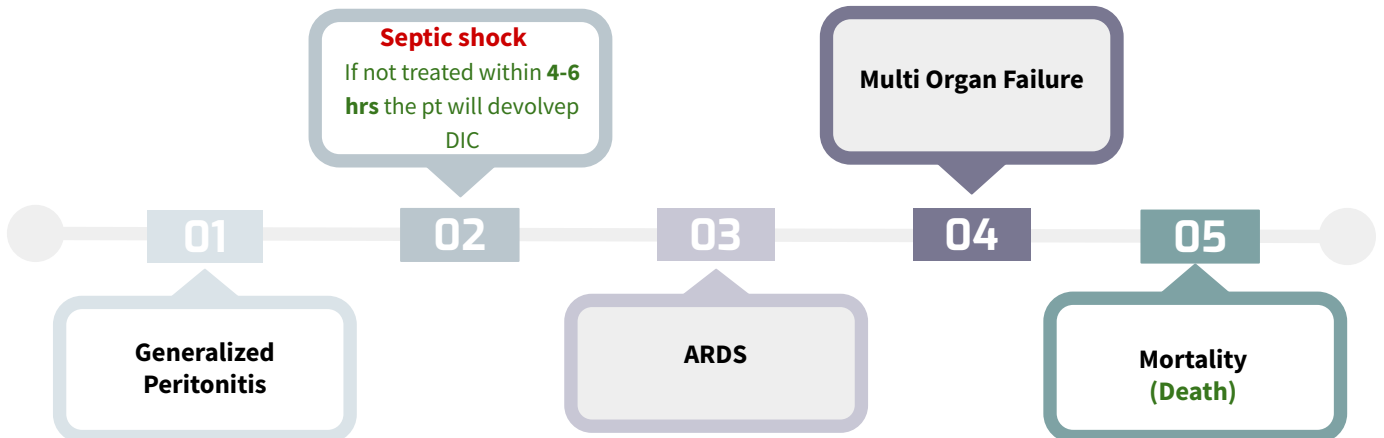
Peritonitis

Complication

Local



General



Introduction - Perforation

Clinical Feature

- Perforated hollow viscus is a **life-threatening** cause of abdominal pain and carries a high mortality rate.
 - Perforation → spillage → sepsis and high risk of mortality.
- These patient usually **very sick**. They have **progressing tachycardia** within first 2 hours.
 - **Pyrexia** usually indicates **highly infected peritoneum**.
- The pain is **constant**, and **progressing**, never **relieved** (Picture A)
 - Patient will have a history of localized pain (Underlying pathology; **Pictures B**). When that pathology perforate, it will causes severe pain at the same site
 - Once defense mechanism fails, and generalized peritonitis develop → there will be generalized pain.
- Usually, there is **abdominal distension**, By 2 mechanisms
 - Inflammation will cause **ileus** → Pseudo Obstruction then distension.
 - **Some breathed air** will go through esophagus to the abdomen, then through the perforation to the abdominal cavity (Such case can be complicated when the emergency department put the patient on O2 once he arrived)
- Peritonitis leads to difficulty moving, rebound tenderness. Don't forget to look for hernia in the physical exam.

A; reference picture

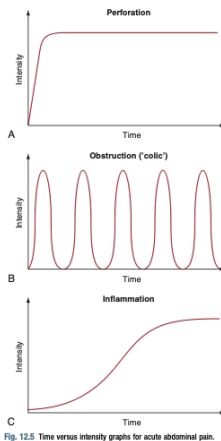
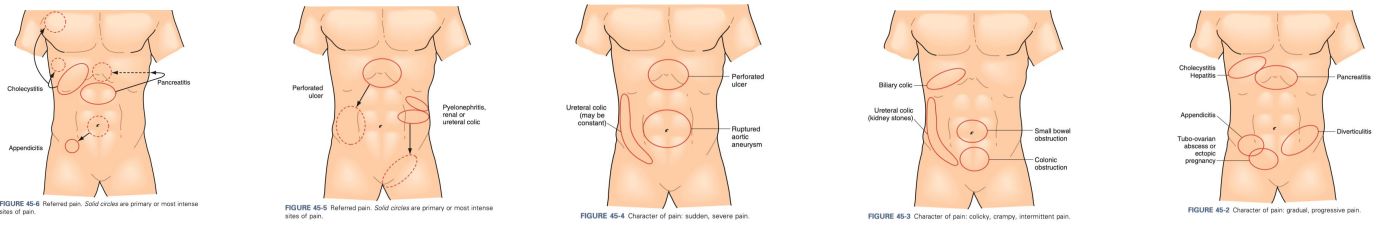


Fig. 12.5 Time versus intensity graphs for acute abdominal pain.

B



- (B) pictures **summarize** underlying abdominal pain, **click on the picture for higher resolution**
- From left picture to right:
 - First 2 pictures: Referred pain (solid circles are primary or the most intense pain)
 - Sudden and severe abdominal pain.
 - Colicky, crampy intermittent abdominal pain.
 - Colic is a form of visceral pain that rises from a hollow viscus with muscle in its wall (e.g., gut, gallbladder and ureter). The pain is due intense peristalsis that tries to push the obstruction in these structures
 - Gradual, progressive abdominal pain

Labs

- **CBC** Look at WBC count, which will be elevated
- **Urine analysis:**
 - Acute pyelonephritis present some times with typical acute abdomen symptoms
- **VBG** (Venous blood gases)
 - Ph, Lactate, Base deficit (**Elevated lactate indicates ischemic tissue in general**)
 - What is the difference between ischemic and gangrenous bowel? Gangrene (Bowel dead) = lactate is not raised
- We do amylase, lipase, LFT (to exclude Pancreatitis and Cholangitis)

Imaging

- **CXR/AXR** (**Best initial; shows pneumoperitoneum**)
 - Order **upright** X-ray
 - Can be done standing and laying down. (2 contradictory notes :/)
- **US** is helpful in biliary disease
- **CT-scan** (**Gold standard for any perforation**)
 - We can add IV contrast to detect ischemia
 - Oral contrast not required, but it gives more clear picture
 - The contrast must be water-soluble
- **MRI** (In pregnant women)

Treatment

- **Peptic Ulcer:** Omental (Graham) patches
- **Perforated diverticula:** Hartmann's procedure
 - Grade 1 and 2 can be managed conservatively (**IV. Antibiotics + Resuscitation w/o surgery**)
- **Contained** or controlled perforations of intestines can be managed **conservatively** with interventional radiology guided drainage of fluid collections.
- If **not contained**, **resection** of the perforated site and **diversion** usually done.

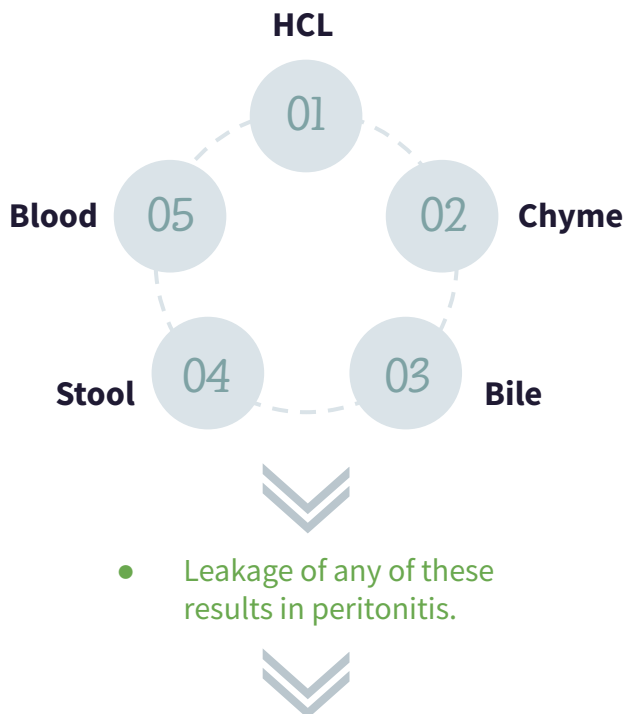


Ultimate complications:

Localized access (Peritonitis) → Generalized Peritonitis > may lead to sepsis (Gram -ve) → which may lead to shock → Shock leads to DIC → DIC leads to Multi-organ-failure



Etiology



- You must understand the physiology of peritonitis. If you do, there will be no need to memorize each subject separately.
- The easiest cause to recognize is trauma then inflammation then ischemia.

01 Perforated viscus

- Upper abdomen:
 - Boerhaave's syndrome
 - Peptic ulceration
 - perforated gallbladder
- Lower abdomen:
 - Gangrenous appendicitis
 - Acute diverticulitis
 - Ulcerative colitis (Toxic Megacolon)
 - Carcinoma colon
 - Ruptured Bladder
- General
 - Small bowel (Crohn's, Typhoid, Strangulation, Tumor and foreign body)
 - Ischemia, Radiation necrosis

- What happens when there is a leakage of these ? the peritoneum will act as an organ to minimize the inflammation, it will try to make it localized as possible as it can by 3 protective mechanisms.
- The aim of these mechanisms is to**
 - Give rest to intestine (Intestine shouldn't be contracted or pushed)
 - Protect organs
 - Prevent spread of inflammation

1 Pylorospasm (Contraction of Pyloric sphincter)

- Lead to enhance satiety to stop your feeding
- Due to:** Neural, Hormonal, Chemical Stimuli.
- Clinically manifested as:** Anorexia, Nausea, Vomiting .

2 Paralytic ileus

- Lead to loss of intestinal motility
- Due to:** Same as pylorospasm, but in terminal ileum.
- Clinically manifested as:** symptoms of obstruction (Distension and constipation)

3 Role of omentum

- It is the abdomen policeman!**
- It protects viscera and **prevent spread** of inflammation by **(Sticking /surrounding/ isolating) an organ.**

Remember, Peritonitis doesn't mean at all generalized pain. It can be generalized (If the protective mechanism failed), and it also can be localized depending on the layer of peritoneum and the localization response of the peritoneum and the presence of microbes or chemicals in the leaked fluid.



- AS example, if we have inflamed appendix, the omentum will cover the appendix; stick & surround it and prevent its inflammation from spreading
- This rule is **deficient** in (pregnancy & infants)

01

Perforated Peptic Ulcer

> Etiology

- The most common causes of peptic ulcers are infection with the bacterium *Helicobacter pylori* (**H.pylori**) and long-term use of nonsteroidal anti-inflammatory drugs (**NSAIDs**) & spicy food
- Stomach is **Intraperitoneal**, if perforated, gastric acids will leak into the visceral peritoneum which will lead to **peritonitis**
- Duodenum is **not fully** intraperitoneal, if the perforated ulcer was exposed to the visceral peritoneum (**Anterior perforation**) it will cause peritonitis. (MORE COMMON PRESENTATION)
 - Otherwise (**Retroperitoneal perforation**), acids will accumulate without symptoms in the retroperitoneal space until sepsis ensues.
- Salicylates, Acid/alkali ingestion can cause perforation also.

> Clinical Features

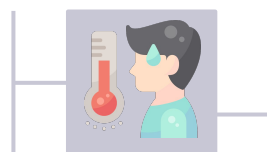
History	Physical Examination
<ul style="list-style-type: none"> • History of past Dyspepsia, Heartburn (The patient will tell you "I had a burning sensation which was relieved by drinking milk"), Chest discomfort or Early satiety • Hematemesis (If bleeding was severe) or melena (signs of risk of concurrent perforation) • When the ulcer gets perforated, it causes sudden severe and constant epigastric pain. • Begins at the epigastrium, then extend gradually to involve the whole of the abdomen (Peritonitis) 	<ul style="list-style-type: none"> • Patient looks ill, Any movement can exacerbate the pain (Even breathing) • Tachycardia, Low RR, normal temperature. • Palpation: <ul style="list-style-type: none"> ◦ Early: Epigastric tenderness ◦ Late: Board-like rigidity (While abdomen is very tender with intense rigidity = Whole Peritoneum contaminated) • Bowel sounds: Disappear once generalized peritonitis develop • Triad: Abdominal constant pain, rigidity and tachycardia



Alarming Symptoms:

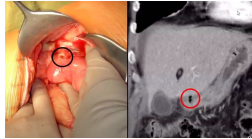
- Bleeding or anemia
- Early satiety
- Unexplained weight loss
- Progressive dysphagia or odynophagia
- Recurrent vomiting
- Family history of gastrointestinal cancer

Complications



- **After 4-6 hours**, Pain and guarding **decrease** (acids in the peritoneum dilute), Patients think they are **improving** but they are **in fact getting worse** (Peritonitis is progressing and tachycardia still present with **hypervolemia**)
- Any perforation can lead to **generalized peritonitis** → shock → DIC → Multiorgan failure

Investigation of Peptic ulcer perforations



CT shows perforated duodenum due to PUD, and leakage of bile.
Red circle: free air

- Endoscopy
- Urea Breath Test
- Imaging:
 - **Upright CXR: Pneumoperitoneum**
 - CT (rule out perforation- **CT is gold standard for perforation**)

Treatment

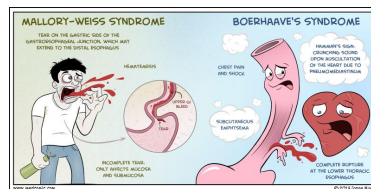


- Eradicate H.Pylori
- Lifestyle modifications
- If perforated:
 - ABC (Any peritonitis require emergent **resuscitation**),
 - Resuscitation
 - Surgery for perforated ulcers/ resistant disease
 - **Omental (Graham) patches**

02

Boerhaave's syndrome ★

Mallory-Weiss syndrome, a non transmural esophageal tear



Boerhaave syndrome, a transmural (**Full-thickness**) perforation of the esophagus, should be distinguished from Mallory-Weiss syndrome

Etiology

- Spontaneous rupture of the esophagus, which typically occurs after **forceful emesis**.
- Perhaps as a consequence of attempting to suppress a vomit.
- Any act that may increase the intra-abdominal pressure (**Ratcheting vomiting**, Weight-lifting, childbirth delivery, Seizures and iatrogenic)

Presentation

- **Triad:** Sudden pain onset, Vomiting, and **supraclavicular subcutaneous emphysema**.
 - With each time patient take a breath, some air will leak to the esophagus then through the tear, it will cause subcutaneous emphysema (You can feel bag of worms "Bubble wrap" when you gently palpate lower part of chest above mid abdomen)
- **Risk factors:** History of **alcohol** and food abuse. Past history of underlying PUD (peptic ulcer disease), EoE (Eosinophilic esophagitis), Esophagitis may be present.

Diagnosis & Complications

- Imaging: CT scan or Upright Chest X-ray (Pneumoperitoneum or hydrothorax)
- Patient will be at risk of sepsis **within 1-2 hours** (we must resuscitate & repair it)
- Perforation may leak either into abdominal cavity (Peritonitis) = midline abdominal pain
- or thoracic cavity (usual site for the tear is above diaphragm) = Pleural and neck pain

03

Gangrenous Appendicitis

01

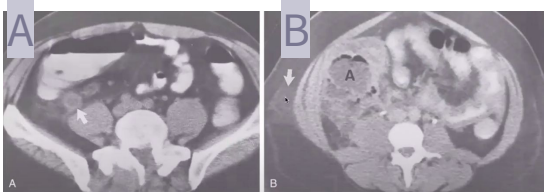
- Appendicitis starts by **unknown** etiology that causes Appendix's submucosal lymphoid tissue **hypertrophy**, → This hypertrophy **narrows** or decompress appendix lumen → Hinges **fecolith or any foreign body** which will later on cause the **obstruction**.

02

- This obstruction leads to **bacterial overgrowth**, inflammation, edema, lymphatic and vascular compromise and finally → **gangrene and perforation**.
- Within 12–24 hours, the appendix distal to the site of obstruction becomes inflamed and subsequently gangrenous.
- In the **nonobstructive** or catarrhal type (1/3 of cases), inflammation of the wall of the appendix causes venous congestion → compromise arterial inflow. especially in the **distal appendix** where the artery lies in a subperitoneal position

> Presentation

- The **typical history** is of periumbilical pain (visceral midgut pain), followed within several hours by right iliac fossa pain (somatic pain from parietal peritonitis). Tenderness and muscle guarding in the right iliac fossa are the **most reliable signs**
- Appendix Perforation will have similar symptoms to any perforation (Sudden, **Progressing & constant** "Never relieved").
 - Although, Appendix is an **exception** have a period of relieve. (Inflamed appendix cause dissension of the peritoneum, so when it gets perforated, the distention relieved, so the pain relieved with it)
 - Improvement **only for some time**, then the pain will exacerbate



- A: Acute appendicitis (Arrow)
- B: complicated perforated appendicitis (Arrow)

> Complications

- The overall mortality of appendicitis is less than 1%, rising to 5% if perforation occurs and increasing with age.
- As mentioned earlier, peritoneum is an organ, and has his own response to inflammation. Rarely, Perforated appendix complicate to generalized peritonitis, why?
 - This duo to the peritoneum response to appendix inflammation, which will make small bowel and omentum **adhere** to the appendix. So, when the appendix perforate, its content will remain (Localized) within the adhesion area. (If left untreated, it will complicate to appendix mass, or pelvic abscess)
 - If perforation occurs **early** in the clinical course, the inflamed area will not have had time to be walled off, and **generalised peritonitis** follows.

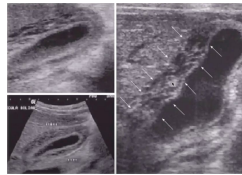
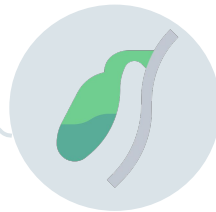
04

Perforated gallbladder

- Gallbladder perforation is a rare but life-threatening **complication of acute cholecystitis**
- Persistent obstruction of the gallbladder → Inflamed and edematous gallbladder → if the obstruction couldn't resolve → The transmural pressure in the wall of the gallbladder can result in **venous ischaemia** → **Impair arterial blood flow** → **gangrene and ischemia**
- Another cause of (Biliary peritonitis) is iatrogenic, due to a ligature or clip slipping off the cystic duct
- **Gangrene (Bowel died) = not elevated lactate. It get elevated only in ischemia**

Presentation & Complications

- Perforation may be contained by the liver or surrounding viscera leading to localised **abscess** → can be indistinguishable from uncomplicated acute cholecystitis.



- If that protective mechanism failed, there will be **biliary peritonitis** (Rigidity, progressive and constant pain)
- Bacteria from gallbladder (E. coli, Klebsiella, and Strep. faecalis) can be a source of **sepsis**.

Management

ABC, Resuscitation

Percutaneous drainage with **antibiotics** following resuscitation Surgery in special cases (delayed or initial)

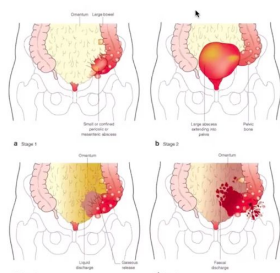
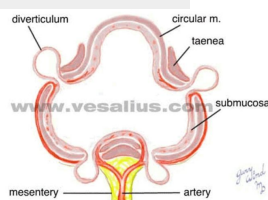
Diagnosis of perforation:

U/S shows a perforated Gallbladder
CT Scan is gold standard

05

Acute Diverticulitis ★

Extra Picture



- ★ **Sigmoid colon** is the most common site
- The colonic blood supply penetrates the muscular layers of the wall to ramify in the submucosal layer.
- This points of penetration create areas of weaknesses. Which can protrude as result to increased intracolonic pressure (In susceptible patients with unknown etiology)
- ★ **Hinchey Classification or grading: (A-D or 1-4)**
 - Grade 1- Contained **small** abscess
 - Grade 2- One **large** abscess extending in the abdomen
 - Grade 3- **Multiple abscess** with small air leak
 - Grade 4- **Fecal peritonitis**

05

Acute diverticulitis cont,

> Presentation

- Diverticula often cause no symptoms
- If obstructed → Inflammation – acute diverticulitis. → pericolic abscess then perforation
- Same pathophysiology as appendix perforation (Localized then shifts)
- Solitary diverticulum of the caecum inflamed, → signs are the same as Appendicitis.
- The first symptom is often a mild **intermittent lower abdominal** → shifts to the **left iliac fossa** (same as appendicitis mechanism). **Once perforation occurs** → symptoms of peritonitis

> Complications

- ★ Rupture of a pericolic abscess → purulent peritonitis,
- Free perforation of the bowel → faecal peritonitis.
- bleeding from erosion of the adjacent vessel by a fecalith (self-limited episodes)
- If the perforation contained, there will be risk of **fistula formation (To bladder)**

Treatment



- Grade 1 and 2 can be managed nonoperatively
- For Grade 3 and 4 require surgery. (if any grade is complicated then they require colonoscopy in the future to exclude malignancy)
- **Hartmann's surgery:** Diverticulosis pockets in the sigmoid require resection of the sigmoid portion of the colon. And then the descending colon is closed as close-end colostomy. And the rectum is then closed off. (stable=colectomy, unstable: Hartmann procedure)
- * Keep in mind that we don't anastomose the colon to rectum directly after resection, because there is a risk of re-perforation and leakage.

06

Small Intestine

01

- Any bowel obstruction can complicate to cause Bowel perforation
- Small bowel obstruction can be distinguished from large bowel by the signs of **early** vomiting & **Late** constipation
- CT-scan always is the gold standard
- Obstruction in the ascending colon can complicate to cause cecal perforation
- Management: Complete? surgery. Partial? there is a window for observation

02

Crohn's disease

- The symptom that helps distinguish acute Crohn's disease from appendicitis is the occurrence of **repeated episodes of diarrhoea**
- Perforation is associated commonly with IBD, especially UC (Will be discussed later). Crohn's rarely cause perforation
- Why perforation is rare? because inflamed bowel in crohn's usually adhere to any adjacent structure, and form **fistula rather than free perforation.**

03

Infections

- **Typhoid:** Ulcers caused by typhoid usually erode into artery and cause septicemia and diarrhea. If that erosion perforate, it will cause peritonitis
- **C.Diff colitis** → dilated due to toxins of bacteria (**Toxic megacolon**)

06 Small Intestine cont,

04

Strangulation

- Hernia is a huge category of perforation (strangulation and perforation)
- Umbilical & femoral hernia especially have high tendency to be strangulated and perforated (not in infants).

06

Foreign body

- **Bezoars** are: when you have patients eat their hair (**Or any indigestible material**), and it accumulates leading to obstruction with food and others.
- **Foreign body relates** (truma, endoscopy) eg:
 - Patient with achalasia came for **ballooning/endoscopy** that led to perforation
 - Pediatric patient ingesting batteries that led to a chemical reaction and perforation

05

Tumor

- Any abdominal mass (e.g left colon mass) can perforate if it was associated with inflammation and abscess (Pericolic abscess).
- Abdominal tumor may become tender in that case.
- Malignant tumors have higher tendency to perforate.
- Tumor lysis syndrome can make abdominal wall loss its integrity → perforate

07 Toxic megacolon

Etiology



- Toxic megacolon is a potentially lethal complication of **inflammatory bowel disease (IBD)** or **infectious colitis (C.difficile)** that is characterized by total or segmental nonobstructive **colonic dilatation** plus systemic toxicity.
- It is part of **Acute fulminating ulcerative colitis** (defined as >6 stools per day + evidence of toxicity "Fever, Anemia")
- During this Acute colitis dilatation the dilated colon may become **paper-thin**. Which makes the colon more susceptible to be perforated.
- **Presentation:** Varies Bloating, fever, pain, shock



Historical Diagnostic Criteria of toxic megacolon

- Radiographic evidence of colonic dilatation - The classic finding is **more than 6 cm** in the transverse colon



- **Any 3** of the following - Fever (>101.5°F), tachycardia (>120 beats/min), **Leukocytosis +/- Anemia**
- **Any 1** of the following - Dehydration, altered mental status, electrolyte abnormality, or hypotension

Complications	Ulcerative colitis	Crohn's diseases
Diarrhea	Severe, bloody	Less severe, blood rare
Fistula & Stricture	Uncommon	Common
Perforation	Free perforation (Spillage of bowel content)	Localized perforation (No spillage; fistula)
Cancer	Can cause sigmoid polyps or tumor → Obstruction>perforation	

- **Diagnosis of perforation**

- Labs, CT

- **Management**

ABC, Resus, Etiology specific Rx (Steroids for IBD, Abx for infections)
Surgery (If the person didn't respond to above Rx or is in shock)

Perforation due to ischemia

- Ischemia can happen if a thrombosis in an artery lead to ischemia OR hernia → strangulation then no blood supply leading to ischemia and perforation

Radiation necrosis

- **Etiology:** Radiation beams to treat pelvic malignancies (cancer of uterus, cervix and bladder.)
 - Affect both small and large intestines.
- **Presentation:**
 - Radiation fistula and perforation typically present **several years after** the primary treatment.
 - Late manifestation owing to the late development of **endarteritis** of small mesenteric vessels → **Necrosis** → **Perforation** or fistula formation
- Must be differentiated from recurrence of the primary tumor

Carcinoma colon

- **Carcinoma of right colon and cecum**
 - Must be suspected in any patient >40y who presents with acute appendicitis (Cecum carcinoma can cause 2ry appendicitis)
 - Symptoms usually are **anemia and weight loss**
 - **+ve Occult blood**
 - If peritonitis is present “Due to perforation” **bowel sounds will be absent** with generalized abdominal pain.
- **Carcinoma of left colon and cecum**
 - Eldery >50, or past history of UC or family history
 - Sigmoid colon is the most common site
 - If ignored, it may cause peritonitis (By ruptured distended cecum due to obstruction, **not** by perforation)

Ruptured bladder

- **Etiology:**
 - Blunt trauma (Car or motorcycle accident) = Intra-peritoneal “Pressure push urine towards weakest wall” (**Picture A**)
 - Pelvic fractures or penetrating trauma = Extraperitoneal (**Picture B**)
 - Iatrogenic: Colorectal or urologic procedures and foley catheter
 - Rarely rupture spontaneously due to vaginal delivery, malignancy and radiation
- **Clinical presentation:**
 - Intra-peritoneal rupture= peritonitis (Ileus and abdominal distension) & inability to pass urine
 - Extraperitoneal rupture= suprapubic and lower abdominal pain
- **Diagnosis:** X-ray (Cystogram)
- **Management:**
 - Intra-peritoneal: laparotomy and repair
 - Extraperitoneal: Conservative.

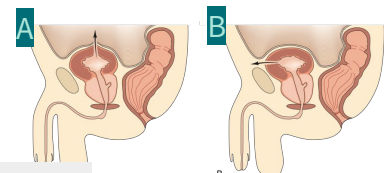


Fig. 23.14 Rupture of the bladder. (A) Intra-peritoneal. (B) Extra-peritoneal.

Reference picture

Reference pictures

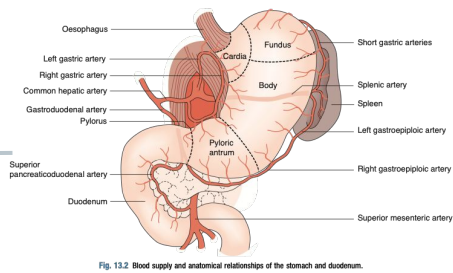


Fig. 13.2 Blood supply and anatomical relationships of the stomach and duodenum.

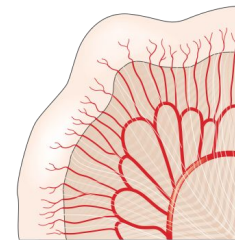


Fig. 16.1 Arterial arcades supplying the small intestine from the superior mesenteric artery.

1. Celiac Trunk

- **Celiac trunk:** Gives left gastric, splenic and common hepatic arteries.
 - **Left gastric:** Supply stomach lesser curvature & Lower esophagus
 - **Splenic artery:** Supply stomach greater curvature, Body of pancreas and spleen
 - **Common hepatic artery:** Give 2 branches
 - Proper hepatic: Supply pylorus, corresponding liver and gallbladder
 - Gastroduodenal: supply & anastomose with splenic artery at the greater curvature of the stomach, and supply the head of pancreas

2. Superior mesenteric artery (MSA)

- **Superior mesenteric artery:** Arise at level L1
 - Supply Small intestine, cecum, ascending colon (**right colon artery**), and 1st $\frac{2}{3}$ of transverse colon (**Middle colon artery**)
 - Give inferior **pancreaticoduodenal** artery which supplies uncinate head of pancreas and lower duodenum
 - The arteries pass between the layers of the mesentery and form anastomotic arcades – from which smaller, straight arteries (known as the “vasa recta”) arise to supply the organs
 - Jejunum= smaller number of arcade, but larger vasa recta
 - Ileum= Opposite
- Blood arterial supply comes to the small bowel through the mesentery via Superior mesenteric artery and then colon to the $\frac{2}{3}$ of the transverse colon is shared between superior mesenteric artery and inferior mesenteric artery (?) So what happens in a clot appears in s the *sup. mesenteric artery*? Ischemia of the small intestine.

3. Inferior mesenteric artery (ISA)

Reference picture

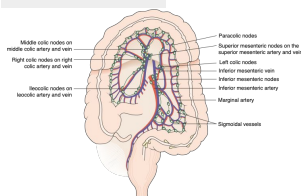


Fig. 15.2 Blood supply of the large intestine from the branches of the superior and inferior mesenteric arteries, with the lymphatic drainage of the colon and rectum.

- It is retroperitoneal structure
- Gives branches
 - **Left colic** = Splenic flexure, descending colon and rectum
 - Marginal artery (of Drummond): forms a continuous arterial circle along the inner border of the colon. It is formed by the union of several branches; the ileocolic, right colic and middle colic of the **SMA** and left colic and sigmoid branches of the **IMA**. = anastomosis
 - **Superior rectal** = Supply upper part of rectum

Introduction

01

- Small bowel, large bowel, Ovary, omentum, stomach, spleen and kidney. All can be infarcted.
- Infarction is one of acute abdomen causes, and hardest to diagnose.
- Histological pattern: coagulative necrosis

02

- Severe, sudden pain. Constant and aggravated by movement, and relieved only by strong analgesic.
- Poorly localized and quickly develops all hallmarks of peritonitis.
- **Suspect** bowel ischemia in any patient have **severe pain with minimal signs**
- Vomiting can accompany the pain as a result of the ileus (Intestine paralysis) caused by inflammation.

01

Occlusive

- **Arterial:**
 - Embolism, Thrombosis
- **Venous**
 - Thrombosis
- **External:**
 - Hernia strangulation, Volvulus (Vessel torsion)

02

Non-occlusive

- **Shock:**
 - Hypovolemia, Cardiogenic, sepsis.
- **Vasoconstrictor drugs**



- Emboli can come from **cardiac** origin. Thrombi can be an aneurysm, dissection, arthritis, MI, CHF or severe dehydration.
- Vasopressors (like Epi/NE can lead to vasoconstriction and eventual ischemia).
- Hypercoagulability: Factor V deficiency, Pregnancy, Long standing travel.

03

- **Signs:** Nothing specific. Patient is pale (Hypovolemic), sweating and have tachycardia.
 - Guarding and rigidity are late signs denoting gangrene and perforation
 - In general, non-occlusive are **more gradual** than occlusive. Embolism is **more acute** than thrombosis.
- **Complications:**
 - inflammation due to ischemia can cause ileus.
 - Ischemia can develop into gangrenous tissue, which is susceptible to be perforated.
 - As a result of perforation, sepsis may ensue, which leads to death.

04

- Labs: Patient will have metabolic acidosis (**Lactate is raised**)
- **Gold standard** imaging is CT with IV contrast

Small and large intestines infarction

1 Etiologies from Dr.Hussam slides (438)

Occlusive mesenteric ischemia (OMAI)

- acute mesenteric **embolism** (AMAE)
 - Cardiac emboli
 - emboli from fragments of proximal aortic thrombus due to a ruptured atheromatous plaque
 - Atheromatous plaque dislodged by arterial catheterization or surgery
- acute mesenteric arterial **thrombosis** (AMAT)
 - Atherosclerotic vascular disease (most common)
 - Aortic aneurysm
 - Aortic dissection
 - Arteritis
 - Decreased cardiac output from MI Or CHF (thrombotic AMI may cause acute decompensation)
 - Dehydration from any cause
- Mesenteric **Venous Thrombosis** (MVT):
 - Hypercoagulability
 - Tumor causing venous compression
 - Infection, usually intra-abdominal (eg, appendicitis, diverticulitis, or abscess)
 - venous congestion from cirrhosis (portal hypertension)
 - Pancreatitis.
- Systemic lupus erythematosus (Or any vasculitis), Polycythemia and Sickle cell disease.

Nonocclusive mesenteric ischemia (NOMI)

- Hypotension from CHF, MI, sepsis, aortic insufficiency, severe liver or renal disease. or recent major cardiac or abdominal surgery, Vasopressors, Cocaine

Reference pictures

2 Clinical Features Click on the picture for higher resolution

01

Strangulation:

- You must examine the patient for any hernia. **Femoral and umbilical** hernias are at higher risk of strangulation.
- Patient may have classical colic pain (Intestine smooth muscle try to push the food from the strangulated loop)



A strangulated hernia
The blood supply of the contents of the hernia is cut off. When a loop of gut is strangulated there will also be intestinal obstruction.

02

Volvulus:

- It is an example of “closed loop obstruction”.
- **Acquired** condition, affects adults in countries with high fibre diet
- It is due to a **twist** around a narrow origin in the sigmoid mesentery.
- Most common site is **sigmoid colon (75%)**, then **cecum(25%)** (Around SMA origin).
- Clinical presentation “**Typical obstruction symptoms**”:
 - Lower abdominal pain, distension, nausea, vomiting and absolute obstruction.
- **Plain X-ray:**
 - Characteristic Y-shaped shadow with grossly distended colon
 - Giver contrast to confirm obstruction (CT or X-ray)
- **Sigmoidoscopy** is both therapeutic and diagnostic in sigmoid volvulus
- Cecal volvulus usually require emergent laparotomy.

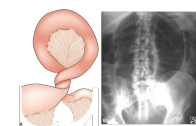


Fig. 16.20 Operative view of gross distension in sigmoid volvulus.



Fig. 16.21 Sigmoid volvulus. Plain abdominal radiograph showing characteristic “coffee bean” sign.

2 Clinical Features Click on the picture for higher resolution

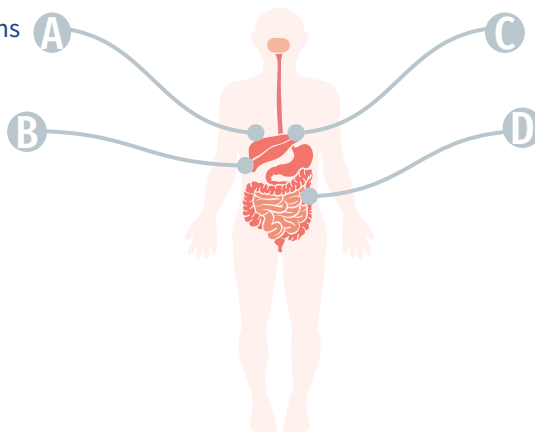
03

- **Small intestine arterial thrombosis and embolism**

- Mesenteric thrombosis: past history of DVT, CAD, strokes or intermittent claudications.
- Mesenteric embolus: likelihood increase if there is A.fib
- May have acute (Embolus) or chronic (Thrombosis) onset.
- Celiac artery & Superior mesenteric artery (SMA) supply small intestine
 - Chronic atherosclerotic lesion in these arteries' branches gives (**Intestinal angina**) feature
 - Abdominal pain that develops 30-60 minutes after eating - **causing fear of eating** and weight loss

Early diagnosis is difficult, due to the nonspecific signs

Intestinal angina can precedes the acute pain in history



Diarrhea (Watery or bloody) can present in 1/3 of patients

Abdominal pain is a predominant symptom and may be associated with **vomiting**. The pain is poorly localized, vague and constant.

04

- **Large intestine Arterial thrombosis and embolism**

- Similar etiology to that of small intestine
- Atheroma at the origin of (**IMA**) results in relative insufficiency of marginal artery supply.
- Rarely, IMA ligation can occur as **complication of aortic aneurysm surgery**.

- 80% of cases are **transient**.
- **Lower left abdominal pain**
- **Sigmoid colon is the most affected site**.

- Radiography: **thickened (A)** segment of colon and **Thumb printing (B)** (Both due to submucosal edema)
- Barium enema is for confirmation.
- VBG is necessary to measure **lactic acid** and exclude gangrene.

- **Tx:** Conservative unless abdominal signs reveal peritonitis.
- Further assessment by colonoscopy is indicated once the acute episode has settled, to exclude diverticular disease and colorectal cancer.

- Picture(C): shows smooth tapered appearance in a patient with typical symptoms of bowel ischemia.
- This patient have ischemic stricture of the bowel.
- It is benign because it lacks the (shouldering) appearance of malignancy.

Reference pictures



Fig. 16.21 Coronal CT scan showing gross mucosal thickening typically affecting the left side of the colon and sigmoid colon (arrows).



Fig. 16.20 Typical features of ischemic colitis. Barium enema showing mucosal edema and 'thumb printing' (arrows).

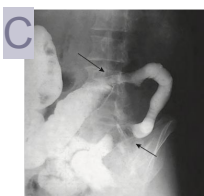
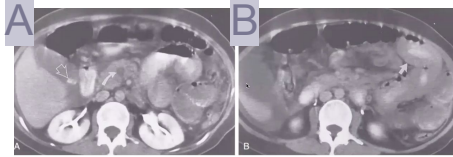


Fig. 16.22 Barium enema showing the smooth tapered appearance of a chronic benign stricture (between arrows).

2 Clinical Features Click on the picture for higher resolution

05

• Venous thrombosis



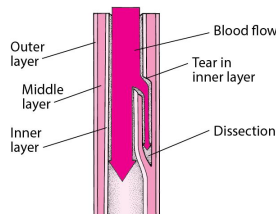
A: you can see the thrombosis at the arrow

B: Small bowel ischemia

- When the venous thrombosis blocks almost all the main outflow veins, arterial inflow will get congested, which will lead ultimately to blood insufficiency in that area.
- Mesenteric venous thrombosis can complicate abdominal trauma, **portal vein thrombosis**, splenectomy and other causes of a hypercoagulable state.
- **Portal vein thrombosis (OVT)**: develop in patients with liver cirrhosis, is severe, it can obstruct portal vein drainage and impair the outflow of the whole intestines.
- Predisposing factors: Reduced mobility, BMI >30, OCC, hypercoagulability, and **Surgical patients**.

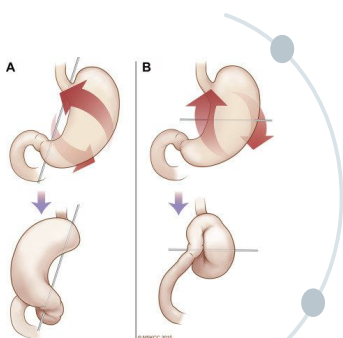
06

• Dissecting aneurysm

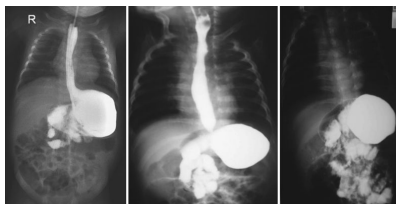


- Due to the separation of the layers of the aortic wall. A tear in the intimal layer results in the progression of the dissection
- This dissection can narrow the artery lumen.
- Major risk factors are atherosclerosis and hypertension (70% of cases)
- Aneurysm can occur in the aorta, or in the branches of the corresponding artery (SMA, IMA, Celiac)
- Carries high mortality rates.
- CTA is gold standard

➤ Stomach Volvulus



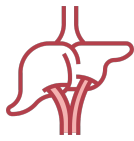
Extra Pictures



- A gastric volvulus occurs when the stomach rotates on itself at least 180 degrees along its transverse or longitudinal axis.
- Patients can simply present with mild abdominal pain associated with nausea, **vomiting** (Due to obstruction) and dysphagia.
- For the majority of cases, gastric volvulus is caused by a gastric, splenic, or diaphragmatic anatomic disorder, the most common being a **diaphragmatic hernia** or **Hiatal hernia**.
- **Organoaxial rotation (Singleton)**: The most common. occurs when the stomach rotates around the pylorus and the gastroesophageal (GE) junction Picture (A).
- **Mesenteroaxial rotation**: occurs when the stomach rotates longitudinal line parallel to the gastrohepatic omentum Picture (B).
- Barium meal studies showing chronic gastric volvulus. Note the associated gastroesophageal reflux in the first two films

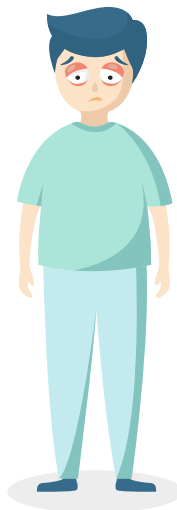
Spleen, Liver and Kidney (Arterial occlusion)

These OBJs were not found in davidson nor norman browse



Liver

- **Extremely rare** situation because the liver has a dual blood supply from the hepatic artery (25%) and portal vein (75%). Also, there are many collaterals between these circulations, which makes it triple blood supply.
- Most commonly occurs in liver transplant patients.
- It can also occur as result of hepatic artery ligation as a complication of cholecystectomy
- May cause RUQ pain, with elevated aminotransferases



Spleen



- It may be the result of arterial or venous occlusion.
- Splenic artery is the most common visceral artery that may develop aneurysm.
- The infarction may be **global** or involve a **small segmental** area of the spleen depending on which vessel is occluded.
- Typical presentation includes **left sided abdominal pain** in a person with an underlying
 - **hematologic disorder,**
 - hypercoagulable state,
 - **blood-borne malignancy,**
 - blunt abdominal trauma
 - embolic illness.

Extra

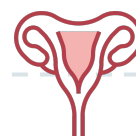
Therapeutic splenic infarction via splenic embolization has been used to treat hemorrhage from traumatic splenic injuries. Splenic embolization has also been used in the treatment of severe portal hypertension and in the preoperative phase of splenectomy to reduce intraoperative blood loss.

Kidney



- Renal infarction is the major complication that may result from an untreated renal artery thrombosis.
- The pain is typically persistent and can mimic the symptoms seen with nephrolithiasis and pyelonephritis.
- A strong correlation with hematuria, proteinuria, elevated aspartate aminotransferase (AST), and **elevated LDH** has been noted once the thrombosis **has progressed to renal infarction.**

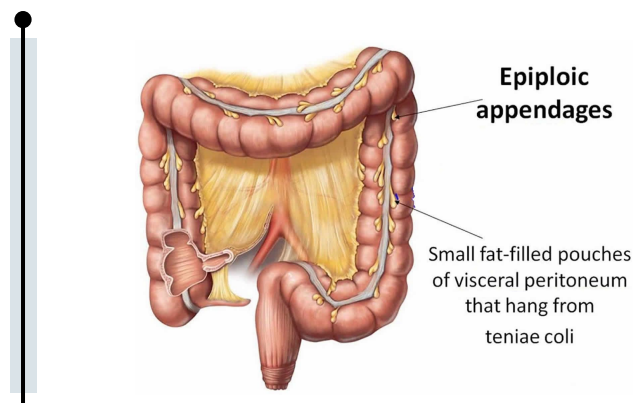
Ovary torsion (Torsion of pedicles)



- Ovaries have **dual supply (Ovarian and uterine arteries)**. Twisting of the ligaments that support the adnexa, can lead to venous congestion, **compression of arteries**, and, eventually, loss of blood supply to the ovary.
- The main risk factor is an ovarian **mass (or cyst)** that is 5 cm in diameter or larger (Increase in weight in one pole and increase the chance of ovarian rotation)
- Patient presents with **severe pelvic pain** (Exclude hernia first), pain may be dull or stabbing.
- Pain may radiate to the abdomen, back, or **flank.**
- **This is a true surgical emergency that can lead to necrosis, loss of ovary, and infertility if not identified promptly.**

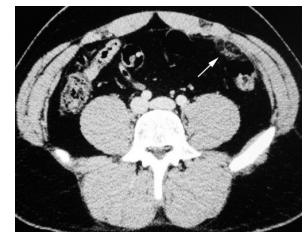
Omentum/appendix epiploica (strangulation)

These OBJs were not found in davidson nor norman browse



- Acute epiploic appendagitis is an uncommon cause of abdominal pain (most often mistaken for acute diverticulitis.).
- It is caused by torsion of an epiploic appendage or spontaneous venous thrombosis of a draining appendageal vein.
- The diagnosis of this condition primarily relies on CT-scan
- Patients is afebrile, LLQ pain, labs show leukocytosis

Extra Picture



Case from the Dr (438)

Case: A 72-year-old male, known for chronic knee pain on NSAIDs, had one months hx of epigastric pain, presented to ER with acute onset of severe abdominal pain, mainly epigastric.

HR120, BP80/52, Temp 39.5 (Pyrexia)

Physical Examination: Rigid Abdomen

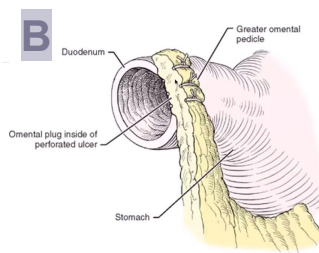
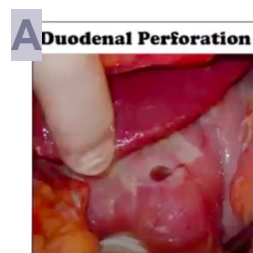
Labs: WBC elevated, Amylase elevated

On Imaging showed: free air under diaphragm (no need for endoscopy)

Answer: In this case, the patient have peptic ulcer perforation Picture (A).

We manage him by Omental (Graham) patches Picture (B) - Takes a piece of omentum and adhere it to the perforation.

Generally, we will start with AirwayBreathingCirculation (stabilize), surgery (Perform omental graham patch) then conservative PPI & ABX.



Dr. Omar gave these notes which are not related to our objectives:
Acute pancreatitis is caused by (Gallstones), while chronic by (Alcohol)
Abdominal Aortic Aneurysm symptoms starts only if (>4-5cm)

Summary

Recall

Q1: What is the treatment of appendicitis?

Answer **Nonperforated**—prompt appendectomy and cefoxitin to avoid perforation

Perforated—triple antibiotics, fluid resuscitation, and prompt appendectomy; all pus is drained and cultures obtained, with postoperative antibiotics continued for 5 to 7 days, ±drain

Q2: What is the approximate risk of perforation of inflamed appendix ?

Answer: ≈25% after 24 hours from onset of symptoms

≈50% by 36 hours

≈75% by 48 hours

Q3: What is Boerhaave's syndrome?

Answer: Esophageal perforation

Q4: Why is the esophagus susceptible to perforation and more likely to break down an anastomosis?

Answer: No serosa

Q5: What is the treatment of Boerhaave's syndrome?

Answer: Surgery within 24 hours to drain the mediastinum and surgically close the perforation and placement of pleural patch; broad-spectrum antibiotics

Q6: Overall, what is the most common cause of esophageal perforation?

Answer: Iatrogenic (most commonly cervical esophagus)

Q7: What are graham patches

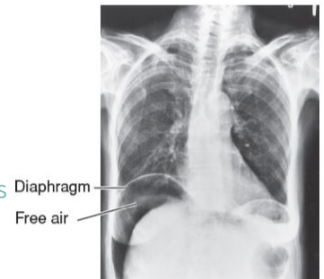
Answer Placement of omentum with stitches over a gastric or duodenal perforation (i.e., omentum is used to plug the hole)

Q8: What is Free air ?

Answer: Air free within the peritoneal cavity (air or gas should be seen only within the bowel or stomach); results from bowel or stomach perforation

Q9: What is the seatbelt sign?

Answer: Ecchymosis on lower abdomen from wearing a seatbelt (≈10% of patients with this sign have a small bowel perforation!)



Q10: What is **diverticulitis**?

Answer: Infection or perforation of a diverticulum

Q11: What is the pathophysiology?

Answer: Obstruction of diverticulum by a fecalith leading to inflammation and microperforation

Q12: What are the associated radiographic findings?

Answer: On x-ray: ileus, partially obstructed colon, air-fluid levels, free air if perforated On abdominal/pelvic CT scan: swollen, edematous bowel wall; particularly helpful in diagnosing an abscess

Q13: What are the associated barium enema findings?

Answer: Barium enema should be avoided in acute cases

Q14: Is colonoscopy safe in an acute setting?

Answer: No, there is increased risk of perforation

Q15: What is the best test for diverticulitis?

Answer: CT scan

Q16: What is the initial therapy?

Answer: IV fluids, NPO, broad-spectrum antibiotics with anaerobic coverage, NG suction (as needed for emesis/ileus)

Summary

Recall

Q17: What type of surgery is usually performed for an acute case of diverticulitis with a complication?

Answer

1. Hartmann's procedure: resection of involved segment with an end colostomy and stapled rectal stump
2. Resection, primary anastomosis loop ileostomy

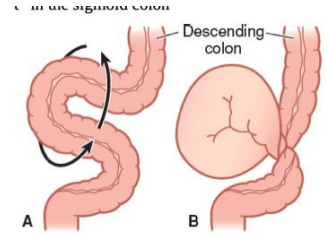
Q18: How common is massive lower GI bleeding with diverticulitis?

Answer: Very rare! Massive lower GI bleeding is seen with diverticulosis, not diverticulitis

Q19: What is **Colonic volvulus**? What is the most common type of it?

Answer: Twisting of colon on itself about its mesentery, resulting in obstruction and, if complete, vascular compromise with potential necrosis, perforation, or both

Most common type: Sigmoid volvulus (~75%)



Q20: What are the etiologic factors

Answer: High-residue diet resulting in bulky stools and tortuous, elongated colon; chronic constipation; laxative abuse; pregnancy; seen most commonly in bedridden elderly or institutionalized patients, many of whom have history of prior abdominal surgery or distal colonic obstruction

Q21: What findings are evident on abdominal plain film?

Answer: Distended loop of sigmoid colon, often in the classic “bent inner tube” or “omega” sign with the loop aiming toward the RUQ

Q22: How is the diagnosis made?

Answer: CT scan, sigmoidoscopy, or radiographic exam with Gastrografin® enema

Q23: What are the signs of strangulation?

Answer Discolored or hemorrhagic mucosa on sigmoidoscopy, bloody fluid in the rectum, frank ulceration or necrosis at the point of the twist, peritoneal signs, fever, hypotension, ↑ WBCs

Q24: What is the initial treatment?

Answer: **Nonoperative**: If there is no strangulation, sigmoidoscopic reduction is successful in ≈85% of cases; enema study will occasionally reduce (5%)

Q25: Most common complications of crohn's disease?

Answer: Fistula (Anal or others), obstruction (Stricture) and abscesse.

Q26: Most common complications of Ulcerative colitis?

Answer Cancer, toxic megacolon, colonic perforation, hemorrhage,

Questions /cases from the doctors

1 A young female came to the ER with Paraumbilical pain, a skin wound on the right iliac fossa , have vomited once and she is anorexic.

Q: What is the type of pain? which phase it is in? And is it because of the wound or appendicitis?

A: The patient came with only paraumbilical pain you either wait for phase 2 to start or investigate with the CT scan because it can be peritonitis due to appendicitis but still in phase 1 or gastroenteritis and it will resolve eventually

2 A 25-year-old female came with a perforated appendix. She underwent a laparoscopic operation and was discharged. 2 weeks later she presented to the emergency with severe lower abdominal pain, leukocytosis, and high temperature.

Q: What is the etiology?

A: Abscess formation as a complication due to improper cleaning of the abdomen.

3 A 60-year-old male patient came to the ER with long history of abdominal pain, distention ,constipation ,indigestion and decreased bowel movement

Q: where is the problem?

A: most likely the colon

the patient is prone to develop diverticulitis or hemorrhage due to a diverticular disease as a complication , the patient developed diverticulitis which perforated and the doctor missed eliciting rebound tenderness, CT confirmed perforated sigmoid colon the patient was taken to the OR and now under anesthesia,

★ Q: Can the surgeon elicit rebound tenderness now?

A: NO , other conditions include cerebral palsy (quadriplegic or paraplegic)

4 A patient of appendicitis and perforated appendix came to the ER and underwent surgery to clean pus and perform appendectomy and they should recover within two or three days but they did not , on the 5th day they were examined and there was no bowel sounds the patient still have paralytic ileus.

Q: What are the other causes for paralytic ileus?

A: Handling intestines , sodium deficiency, hypokalemia, neurological diseases and peritonitis

Questions /cases from the doctors

5

A 60 year-old-patient was operated for a perforated ileum but now he is septic with hypotension , severe tachycardia and no urine output

Q: Does the patient have severe mild or moderate peritonitis?

A: Severe

Then he was admitted to the ICU but the patient didn't improve , after a few days they noticed spots around the nasogastric tube, skin, and around the wound

Q: what complication did the patient develop?

A: disseminated intravascular coagulation (DIC)

439's Quiz

Q1: What is true regarding appendicitis pain?

- A) Start in umbilical region, move to RLQ
- B) Start in RLQ, stays there
- C) Start in rectal region, move to RLQ

Q2: **(MCQ! from the doctor)** A 25-year-old female came to the ER with paraumbilical pain and cramps and she has nausea, vomited once, passed 1-2 loose motions and she ate bad food the previous day, What is the best method to confirm the diagnosis of gastroenteritis or appendicitis?

- A) Elicit Tenderness
- B) Elicit Rebound tenderness
- C) DRE

Q3: **(MCQ! from the doctor)** A 50-year-old male came to the ER having severe abdominal colicky pain that started at seven in the morning and now has spread to the whole abdomen with repeated Vomiting and Tachycardia and Hypotension the patient also has joint pain and can't walk, what question could have been missed in the history?

- A) Pain Onset
- B) Hx of IBD
- C) Medication like NSAIDs or Steroids

Q4: Q58: A 55-year-old male found on the street unconscious with a tinge of bloody vomits come out his mouth, no family or medical information were found with him.

Vital sign initially: BP: 70/40, HR: 103/min, Temp: 37.9 C. He was intubated at the scene and transferred to hospital. His lab showed: WBC 12, K 5.3, Glucose 2. A family member eventually was contacted and further history was taken and revealed that this patient was just discharged from the hospital after a recent surgery. What is the likely surgery he had?

- A) Laparotomy for perforated viscus
- B) Cholecystectomy for acute cholecystitis
- C) Adrenalectomy for cortisol producing tumor
- D) Partial nephrectomy for complicated cyst

Q5) A 46-year-old male presented to the ER with a signs of peritonitis, which of the following is the most serious peritoneal irritant you should worry about?

- A) Urine
- B) Stool
- C) Gastric juice
- D) Pus

Answers

Q1	A	Q4	A
Q2	B	Q5	C
Q3	C		

439's Quiz

Explanations

Q1 Explanation: Autonomic nerves supply visceral peritoneum while the parietal peritoneum has somatic innervation. Often in the early hours, only the visceral peritoneum is affected. The visceral peritoneum senses pain when stretched or distended and results in dull, poorly localized pain, as the inflammation progresses, the parietal peritoneum becomes affected and results in a sharp, severe type of localized pain. An important element used in hx to distinguish acute appendicitis from mesenteric adenitis is the location of pain initially which in mesenteric adenitis is always in RLQ in contrast to acute appendicitis which starts centrally then moves to the RLQ.

Q2 Explanation: -

Q3 Explanation: The patient is prone to be a case of peptic ulcer perforation

Q4 Explanation: Anastomotic leakage > haemodynamic instability.

Q5 Explanation: HCL leads to severe chemical burn

Q6 Explanation: -

438's Quiz

Q1: What are the most appropriate surgical procedures in 2 patients, the first with bleeding diverticulosis, and the other with perforated diverticulitis, respectively ?

- A) 1-Sigmoid resection with end colostomy and rectal pouch (Hartmann procedure). 2-Sigmoid resection with primary anastomosis
- B) 1-Sigmoid resection with primary anastomosis 2-Sigmoid resection with end colostomy and rectal pouch (Hartmann procedure).
- C) 1- Long-term suppressive antibiotic therapy. 2- Hartmann procedure
- D) 1. Hartmann procedure 2. Long-term suppressive antibiotic therapy

Q2: 34 y/o patient presented with Suprapubic pain and tenderness, Difficulty or inability in passing urine and Hematuria. Which of the following is suggestive of bladder perforation ?

- A) Past History of pyelonephritis
- B) Being a female
- C) Pain is relieved after passing urine.
- D) Past history of prostatic cancer that excised surgically

Q3: A 45-year-old woman with history of heavy nonsteroidal anti-inflammatory drug ingestion presents with acute abdominal pain. She undergoes exploratory laparotomy 30 hours after onset of symptoms and is found to have a perforated duodenal ulcer. Which of the following is the procedure of choice to treat her perforation?

- A) Truncal vagotomy and pyloroplasty
- B) Truncal vagotomy and antrectomy
- C) Simple closure with omental patch
- D) Highly selective vagotomy with omental patch

Q4: A 76-year-old woman presents with acute onset of persistent back pain and hypotension. A CT scan is obtained (shown below), and the patient is taken emergently to the operating room. Three days after surgery she complains of abdominal pain and bloody mucus per rectum. Which of the following is the most likely diagnosis?

- A) Diverticulitis
- B) Ischemia of left colon
- C) Enterocolitis



Q5: IN the previous scenario, which artery is most likely to be occluded ?

- A) IMA
- B) SMA
- C) Celiac artery

Answers

[Click here for explanation](#)

Q1	B	Q4	B
Q2	D	Q5	A
Q3	C	Q6	

[Extra Questions](#)

Good Luck!



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