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Objectives

- Categorize different abdominal clinical conditions in relation to the characteristics of the pain and the presence or absence of tenderness
- Describe other symptoms and signs leading to acute surgical intervention
- Describe the specifics of clinical diagnosis in the postoperative abdomen

2.1 Generalities

- Acute abdominal pain accounts for up to 50 % of emergency surgery consultations.
- All abdominal crises present with one or more of five main symptoms or signs:
 - Pain (often alone and inaugural)
 - Vomiting
 - Abdominal distension
 - Muscular rigidity
 - Shock
- The severity and the order of occurrence of the symptoms are important for diagnosis, together with the presence or absence of fever, diarrhea, constipation, and others.

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- The presence of tenderness on palpation is a hallmark of potential acute abdominal problem of surgical importance, and it generally implies inflammation of the visceral peritoneum.
 - May be accompanied or not by muscular rigidity (*defense guarding* or *guarding*).
 - Several grades (maximum: boardlike rigidity typical of perforated ulcer).
 - Usually implies inflammation of the parietal peritoneum.
 - Sometimes, it takes a great deal of clinical acuity and experience to differentiate between voluntary and involuntary guarding. In the past (pre-CT-scan era), errors with this distinction have led to numerous unnecessary abdominal explorations.
- Clinical expertise should not be replaced by easy availability of ultrasound (US) and CT scan; the latter is complementary and may sometimes be lacking.

2.2 Acute Generalized Abdominal Pain with Tenderness

- Generalized peritonitis consists of:
 - Diffuse severe abdominal pain
 - Patient:
 - Who looks sick and toxic
 - Typically lies motionless
 - Has a tender abdomen with “peritoneal signs” (rebound tenderness, defense guarding, or boardlike rigidity)
- The three most common causes of generalized peritonitis in adults are:
 - Perforated appendicitis
 - Colonic perforation
 - Perforated duodenal ulcer
- An occasional patient with acute pancreatitis may present with a clinical picture mimicking diffuse peritonitis.

2.2.1 Perforated Appendicitis

- Typical history: midabdominal visceral discomfort, shifting to the RLQ and becoming a

- somatic, localized pain, with rapid generalization and diffuse tenderness
 - Sometimes inaugural
 - Otherwise after a slow but rapid, progression

2.2.2 Colonic Perforation

- The most common causes:
 - Colonic malignancy
 - The tumor (usually rectosigmoid)
 - Distension upstream from malignant obstruction (usually cecum)
 - Often after several days of unrelieved complete obstruction in a patient with a competent ileocecal valve. Presenting symptoms include tenderness of the abdomen on the right side (sign of impending perforation) and history of previous abdominal distention associated with recent onset of constipation and lack of flatus.
 - Peritoneal irritation and tenderness are usually diffuse.
 - Acute sigmoid diverticulitis. Peritonitis is diffuse in large, non contained perforations, with free intraperitoneal gas on abdominal X-ray or CT.

2.2.3 Perforated Gastroduodenal Ulcer

- Incidence has decreased drastically, with some exceptions in socioeconomically disadvantaged populations worldwide.
 - In the Western world, perforated duodenal ulcers (DUs) are much more common than perforated gastric ulcers (GUs), presenting at times without a previous history of peptic ulcer disease.
- Signs and symptoms vary according to the time which has elapsed since perforation
 - Classically:
 - Abdominal pain
 - Intense.
 - Of sudden onset.
 - Located in upper abdomen.
 - Accompanied most often by signs of diffuse peritoneal irritation and tenderness.

- May mimic acute appendicitis if spillage of gastroduodenal contents along the right gutter.
- May be associated with pain on the top of the shoulder (*Kehr's sign*).
- The finding of “coffee ground” or fresh blood in the NG tube suggests the possibility of *kissing ulcers* – the anterior perforated, the posterior bleeding.
- Patients:
 - Restless
 - In great pain
 - Have boardlike abdomen
- Investigations:
 - Free gas under the diaphragm in about two-thirds of perforated patients, best seen on an upright chest X-ray
 - Differential diagnosis
 - Acute pancreatitis
 - In the absence of free air, marginal elevation of amylase (perforated ulcer can cause hyperamylasemia).
 - Abdominal CT scan is excellent at picking up minute amounts of free intraperitoneal gas and free peritoneal fluid.
 - Acute perforative appendicitis
 - Ruptured ectopic gestation
 - Acute intestinal obstruction
 - Diffuse peritonitis from other causes (perforated gallbladder with bile peritonitis among other more rare causes)

2.3 Localized Abdominal Pain with Tenderness (Epigastric, Umbilical, RUQ, LUQ, Hypogastric, RLQ, and LLQ)

- Pain and tenderness are not always over the site of disease.
 - Initial pain of appendicitis may be epigastric or umbilical.
 - Obstructive pain arising from the transverse colon may be hypogastric.
 - Golden rule: examine the patient again within 2 or 3 h.
 - In nearly every serious case, other symptoms (such as vomiting, fever, or local ten-

derness, pointing more definitely to the nature of the lesion) may then be found

2.3.1 Periumbilical and Epigastric Pain

- Uncommon in the absence of incarcerated umbilical hernia and omphalitis
- May be due to:
 - Simple intestinal or biliary colic
 - Initial stage of small bowel obstruction
 - Acute pancreatitis
 - Or even initial stages of acute cholecystitis

2.3.2 RUQ Pain

- If the chest is clear (no right basal pneumonia):
- Calculous acute cholecystitis (AC)
 - The most common cause.
 - RUQ pain and tenderness (*Murphy's sign*) are accompanied by systemic evidence of inflammation (fever, leukocytosis) and usually by a mild or moderate elevation of bilirubin or liver enzymes, sometimes also mild elevation of the serum amylase.
 - Diagnosis is usually confirmed with US.
 - Intramural gas, and gas within the gallbladder lumen (*acute emphysematous cholecystitis*), typical of AC in diabetic patients can also be seen on abdominal X-ray.
- Acute Cholangitis
 - Characterized by *Charcot's triad* (RUQ pain, fever, and jaundice).
 - Disproportionate pain may be due to coexisting AC.
 - Can progress to include confusion and septic shock (*Reynold's pentad*) in the elderly patient, or when medical intervention is delayed.
 - Typical biochemical panel shows mildly elevated transaminases, variably elevated total bilirubin with a direct preponderance, and a disproportionately elevated alkaline phosphatase and glutamyl transferase.
 - Diagnosis usually confirmed by US, which, besides gallstones in the gallbladder, usu-

- ally demonstrates mild intra- and extrahepatic ductal dilatation.
- If no gallstones are seen, malignant periampullary biliary obstruction must be suspected.
- *Pyogenic liver abscess, amoebic liver abscess* (in tropical climates), and *hydatid disease* (endemic regions) may give rise to similar signs and symptoms.
- *Acute Acalculous Cholecystitis*
 - Manifestation of the disturbed microcirculation in critically ill patients.
 - Fever, jaundice, leukocytosis, and disturbed liver function tests are commonly present but are entirely nonspecific.
 - Pain may be minimal or difficult to discern because of patient status.
 - Early diagnosis requires a high degree of suspicion in patient with otherwise unexplained septic state or SIRS.

2.3.3 LUQ Pain

- Rare
- LUQ contains tail of the pancreas, fundus of the stomach, spleen and its blood vessels, splenic flexure of the colon, and upper pole of the left kidney, each of which may on occasion cause acute abdominal symptoms.
- *Acute Pancreatitis*
 - One of the most common causes of pain in the LUQ.
 - Vomiting and retching are frequent.
- *Perforation* (uncommon) of fundic gastric ulcer localized by adhesions
 - Free air is rarely seen.
 - Often discovered intraoperatively.
- *Leakage or Rupture of an Aneurysm of the Splenic Artery* (Uncommon)
 - Tends to have a predilection for the pregnant patient
 - Pain
 - Is usually isolate unless rupture with severe intraperitoneal hemorrhage occurs
 - May be intense when the aneurysm ruptures into the lesser peritoneal sac
 - May closely simulate pain of peptic ulcer perforation or acute pancreatitis

- *Carcinoma or Stricture of the Splenic Flexure*
 - May rarely cause severe localized pain.
 - Constipation is common.
- *Left Perinephric Abscess*
 - Rare, pain may be lumbar
- *Spontaneous splenic rupture* of a normal spleen is very rare.
 - Splenic infarcts, common in sickle-cell crises, may cause pain aggravated by breathing.
- *Rupture of an Inflamed Jejunal Diverticulum*
 - Rarer cause among others

2.3.4 Pain in the Hypogastrium

- Associated with rigidity
 - In a young or middle-aged man is usually due to appendicitis
 - In an older man acute diverticulitis or, infrequently, a rectosigmoid cancer with localized perforation
 - In a young woman, appendicitis or gynecological condition
- *Acute Urinary Bladder Retention*
 - Should always be considered in an elderly patient with a history of advanced prostaticism, and a tumor-mass effect will be felt on palpation.
 - In the pre-US and CT-scan era, this condition has been known to lead to an occasional misdiagnosis and abdominal exploration.

2.3.5 RLQ Pain

- *Acute appendicitis (AA)*
 - Is the most common cause
 - Initial pain is epigastric or periumbilical; the localization in the RLQ usually takes place some hours afterward.
 - Associated signs and symptoms:
 - Anorexia is very frequent.
 - Diarrhea, especially in children, is occasionally misleading (can be caused by a pelvic appendix irritating the rectum by contiguity, or irritation by a pelvic abscess).
 - Fever and leukocytosis may be mildly above normal, almost never precede the onset of pain.

Moderate tachycardia is common.

– Abdominal examination

Palpation: *McBurney's* point of tenderness corresponds roughly to the position of the base of the appendix, just below a line joining the anterior superior iliac spine and the umbilicus.

Tenderness elicited by light percussion is a remarkably reliable indication of parietal peritoneal irritation.

No local muscular rigidity in a case of appendicitis without any peritonitis is common.

Rigidity of the psoas should be tested for by extending the right thigh with the patient on his or her left side.

Pressure over the LLQ will sometimes cause pain in the appendicular region (*Rovsing's sign*).

Occasionally, palpation of a mass over the RLQ, together with a clinical picture consistent with appendicitis of several-days duration, should prompt the diagnosis of an *appendiceal phlegmon*.

– Anatomic variations

- When an appendix situated in the true pelvic ruptures, the pain will more frequently be felt in both RLQ and LLQ; there is usually no rigidity of the lower abdominal muscles, even when a pelvic abscess has formed, and clinical diagnosis is frequently overlooked. Usually, a tender swelling can be felt on rectal exam. This location, with the pelvic appendix lying against the rectum, frequently causes diarrhea, leading to misdiagnosis of gastroenteritis.

Small bowel ileus can obscure the diagnosis of perforated iliac appendix lying behind the end of the ileum.

Ascending (retrocecal or paracecal) inflamed AA may mimic acute cholecystitis, and a variety of acute right kidney or ureteric conditions (renal colic, pyelitis, acute hydronephrosis, pyonephrosis, or perinephric abscess)

– Differential diagnosis

- Acute cholecystitis, renal colic, pyelitis, acute hydronephrosis, pyonephrosis, or perinephric abscess (see above)

Crohn's disease (inflamed iliac AA) (distinguished by the almost invariable history of previous attacks, together with bouts of diarrhea)

- Nevertheless, AA caused by Crohn's disease may be the initial manifestation of that chronic process.

Yersinia ileitis should also come into consideration.

Acute gastritis or gastroenteritis (where pain and diarrhea somewhat dominates the clinical picture).

Acute salpingitis is one of the most difficult conditions to distinguish from AA.

Salpingitic pain is frequently felt on both sides from the onset, and the presence of vaginal discharge should aid in the diagnosis.

Twisted ovarian cyst or hydrosalpinx or ruptured follicular cyst (*Mittelschmerz* or pain at mid-cycle), ruptured *corpus luteum* cyst (pain with the menses), ruptured pyosalpinx, and ruptured ovarian endometrioma can be misdiagnosed as AA on clinical grounds; imaging is essential.

Influenza, although backache, headache, and pain in the eyeballs are more likely to be felt in influenza, and vomiting may precede the abdominal pain.

Acute porphyria, but pain does not usually localize in the RLQ.

An acute crisis of *diabetic ketosis*.

Meckel's diverticulitis is infrequent.

Cecal ulcers are rare.

2.3.6 LLQ Pain

- *Acute diverticulitis* (AD) of the sigmoid colon is the most frequent cause.

– Signs and symptoms:

Sometimes rigidity of the overlying muscular abdominal wall.

Fever is often moderate.

Increased C-reactive protein and leukocytosis with left shift.

Vomiting is rare.

Previous attacks of diverticulitis are often reported but may occur many years apart.

Colonic obstruction may occur (usually after repeated acute attacks of diverticulitis with development of extreme narrowing and thickening of the inflamed sigmoid).

- *Inflammation* around cancer of the sigmoid colon: associated tenderness

2.4 Acute Abdominal Pain Without Tenderness

2.4.1 Acute Mesenteric Ischemia

2.4.1.1 Mesenteric Arterial Thrombosis or Embolism

- Clinical examination is remarkably nonspecific (in early mesenteric ischemia).
- Signs and symptoms:
 - Severe abdominal pain, with very little findings on physical examination.
 - Previous abdominal angina will be consistent with arterial thrombosis (mild central cramping abdominal pain is frequent).
 - Presence of an arrhythmia such as atrial fibrillation points to embolism. *Any patient with an arrhythmia such as auricular fibrillation who complains of severe abdominal pain of sudden onset should be highly suspected of having embolization to the superior mesenteric artery (SMA) until proved otherwise.*
- Most patients present late after the onset of symptoms (once intestinal gangrene has set in).
 - Associated signs and symptoms:
 - Abdominal distension
 - Generalized tenderness
 - Signs of intestinal hypoperfusion (frequent bowel movements are common and usually contain either grossly or microscopically detectable blood)
- Plain abdominal X-rays are obsolete.
 - Used to be normal in the early course of the illness
 - Later, used to show adynamic ileus, with visible loops of small bowel and fluid levels
- Laboratory studies:
 - Usually normal until the bowel loses viability, when leukocytosis, hyperamylasemia, and lactic acidosis develop

2.4.1.2 Nonocclusive Mesenteric Ischemia

- Due to a low-flow state, in the absence of documented arterial thrombosis or embolus
 - Often due to a combination of low cardiac output, reduced mesenteric flow, or mesenteric vasoconstriction, in the setting of a preexisting critical illness
 - May involve the entire small intestine and colon, often in a patchy distribution
- Clinical picture may be indistinguishable from that of organic occlusion of the mesenteric vessels. *Any patient who takes digitalis and diuretics and who complains of abdominal pain must be considered to have nonocclusive ischemia until proved otherwise.*
 - Chronic renal insufficiency patients on hemodialysis are prone to this condition.

2.4.1.3 Mesenteric Venous Thrombosis

- Much less common
 - Occurs in patients with underlying hypercoagulable state or sluggish portal flow due to hepatic cirrhosis.
 - Use of contraceptive pills has been implicated as a pathogenetic factor.
 - Has also been described after splenectomy.
- Clinical presentation is nonspecific: abdominal pain and varying gastrointestinal symptoms may last a few days until eventually the intestines are compromised, and peritoneal signs develop.

2.4.1.4 Differential Diagnosis

- Acute diaphragmatic myocardial infarction very often manifests as acute epigastric pain without tenderness.

2.4.2 Pain Radiating to the Back

2.4.2.1 Dissecting Aneurysm of the Aorta

- Pain is unbearable.
 - On questioning, the pain is found to start in the thorax, radiating through the back, extend-

ing down to the abdomen and, initially, without any tenderness or rigidity on palpation.

- Significant arterial hypertension of prolonged duration is usually a forerunner, and there will almost certainly be serious differences between an upper- and a lower-limb pulse according to the position of the lesion.
- Clinical misdiagnosis with a renal colic has not been uncommon in the pre-CT-scan era, with dire consequences for the patient.

2.4.2.2 Leakage or Rupture of an Abdominal Aneurysm

- Is by far the more common cause of abdominal pain radiating to the back
 - Any patient with a known aneurysm and recent abdominal pain should be regarded as being in imminent danger of rupture.
 - When present, the pain prior to rupture is of a throbbing (pulsatile) or aching nature, and it is located in the epigastrium or the back.
 - Pain becomes steady when rupture has occurred.
 - Collapse in a patient with a known aneurysm almost always indicates rupture.
- Abdominal and flank examination usually reveals a mass which may occupy almost any part of the abdomen.
 - Usually represents the extravasated hematoma, and the left flank is the most common site.

2.4.3 Other

- *Biliary colic*
 - Pain as well as epigastric and RUQ symptoms are self-limited, disappearing within a few hours.
 - No local tenderness.
 - No systemic evidence of inflammation.

2.5 Nonspecific Abdominal Pain (NSAP)

- Defined as:
 - Pain lasting a maximum of 7 days.

- No immediate cause can be found during the acute admission.
- Specifically does not require surgical intervention.
- Presenting symptom of a large number of minor and self-limiting conditions
 - Constitutes a diagnosis by exclusion.
 - Up to 10 % of patients with NSAP over the age of 50 years have subsequently been found to have an intra-abdominal malignancy.
 - Association between NSAP and irritable bowel syndrome or celiac disease has been described.
- Women account for about 75 % of admissions with NSAP.
- Compared with active clinical observation, early laparoscopy has not shown a clear benefit in women with NSAP.

2.6 Painful Abdominal Wall Swelling: Incarcerated and Strangulated Hernia and Other Conditions

- *Incarcerated hernia*
 - One of the commonest forms of intestinal obstruction
 - *Strangulated hernia*
 - Symptoms: those of intestinal obstruction, with the addition of a painful, tender, and often tense swelling in one of the hernia regions.
 - In certain cases there may be little local tenderness.
 - When omentum alone is strangulated or if a Richter's hernia is present, there will be pain, constipation, nausea, and sometimes vomiting, but the obstruction of the gut is never complete.
 - Diagnosis is usually easy as the patient will have usually been aware of the existence of the hernia for some time.
 - Torsion or inflammation of an undescended inguinal testis will be ruled out by the absence of the testicle from the scrotum on the affected side.
- Strangulated femoral hernia* gives rise to more mistakes in diagnosis than a strangulated inguinal hernia.

- Sometimes only a small knuckle of gut comprising a small portion of the circumference of the bowel may be caught in the femoral canal (*Richter's hernia*), and scarcely any projection may be felt in the thigh.
- Some of these patients, usually elderly ladies, will be worked-up with a presumed diagnosis of intestinal pseudoobstruction, and only a CT scan can provide an accurate preoperative diagnosis. Inflamed and enlarged inguinal glands produce a more diffuse and fixed swelling, and fever is not uncommon. Usually vomiting is absent. Ultrasound may be helpful but, ultimately, only surgical intervention will differentiate between both conditions in some patients.
- The swelling of a strangulated inguinal hernia comes out of the abdomen medially to the pubic spine and above the inguinal ligament, while strangulated femoral hernia is below.
- An inflamed appendix in a femoral hernia sac (*Littre's hernia*) cannot be distinguished definitely from a strangulated femoral hernia before operation.
- Differentiation between incarceration and strangulation:
 - Often difficult to make certain whether a hernia is merely incarcerated or whether it is strangulated (with advanced ischemia or necrosis of its content), for pain and constipation are usually present in both cases.
 - With simple incarceration of short duration, pain tends to be milder than with strangulation.
- *Umbilical or Paraumbilical Hernia*
 - More common in women and the obese
 - Usually contains omentum and sometimes large and small bowel
 - Can be overlooked if small and deeply embedded in fat, but a local tenderness on pressure can always be felt
 - Often difficult to say before opening the sac whether one is dealing with simple incarceration or strangulation
 - Particularly frequent in cirrhotic with ascites
- *Ventral or Incisional Hernia*
 - Small bowel is more commonly found in the sac, as compared to umbilical hernias.
 - Abdominal pain, vomiting, constipation, and local tenderness indicate the need for operation.
- *Obturator Hernia*
 - Uncommon.
 - Most frequently found in wasted, elderly women.
 - Symptoms of obstruction of unknown cause predominate.
 - The only local symptom may be some pain radiating down the inner side of the thigh along the distribution of the obturator nerve.
 - If the diagnosis is suspected on clinical grounds, something very unusual, rotation of the thigh (*Romberg's sign*) will elicit pain.
 - Rectal examination may reveal a tender, palpable mass in the region of the obturator canal.
- Of note, *uncomplicated inguinal or incisional hernia* may be locally painful when the patient has peritonitis of any other origin.
- *Rectus Sheath Hematoma*
 - Usually manifests itself as a painful abdominal swelling of moderate size and imprecise limits.
 - Can be confused with other acute abdominal conditions of surgical importance.
 - Diagnosis is more straightforward if skin discoloration is already present, together with the typical history of bouts of coughing in a patient on anticoagulation medication.

2.7 Leading Symptoms and Signs in the Postoperative Abdomen

- *Uncomplicated Postoperative Abdomen*
 - Pain
 - Usually present no longer than first 12–24 h
 - Gradually diminishes during the next several days
 - Ileus
 - Frequent watery stools are not uncommon at the completion of a long ileus, but may also mean antibiotic-induced colitis.
 - Beware that the passage of stool and gas (and also resumption of an oral diet) is not

always a guarantee that all is well within the peritoneal cavity.

In patients who are operated on for peritonitis, a persistent abdominal distention is common, and so is severe heartburn resulting from the increased intra-abdominal pressure which overcomes the resistance of a normal lower esophageal sphincter.

– Fever

Axillary temperature higher than 37 °C is common on the first postoperative night and gradually decreases thereafter.

No work-up is indicated for fever in the first 2–3 days, in an otherwise uncomplicated postoperative course.

Persistence or increase in body temperature (taken at the same time each day) after the first 2–3 days often portends the presence of an abscess in the wound or within the abdomen, if other common causes have been ruled out (postoperative atelectasis or pneumonia, UTIs, or phlebitis).

Conversely, the absence of fever in a postoperative abdominal complication is not unusual, since fever can be masked by antibiotics.

• *Complicated Postoperative Abdomen*

– Pain

Is frequent, and any new pain should be regarded with suspicion

– Ileus

Delayed or adynamic ileus is probably episodes of incomplete small bowel obstruction.

If accompanied by fever, deep organ-space surgical site infection should be ruled out.

– Tenderness and rigidity

Usually present

May be so mild as to be misleading

May be masked by other symptoms

– Fever

May be heralded by a rigor

– May be the only sign of deep organ-space surgical site infection (without pain or tenderness)

– Peritonitis

Almost always caused by an anastomotic disruption.

However, signs and symptoms can be subtle.

• Any unexplained signs or symptoms (oliguria and tachycardia, in the absence of fever, or tachypnea, in the absence of atelectasis or pneumonia) should raise the suspicion of anastomotic disruption.

• Superimposition of the recent abdominal incision, postoperative narcotics, and the common use of epidural analgesia all add to the difficulty of assessing the changes in symptoms and findings in the postoperative abdomen.

– Radiological signs are often indirect.

Pleural effusion

Ileus

• Early diagnosis and treatment are essential.

– The key to an early diagnosis of a serious abdominal complication that warrants an early reoperation is a frequent daily assessment.

– And for certain authors, early laparoscopic exploration, even when the initial operation was via laparotomy.

– Management

– Interventional radiology (percutaneous drainage)

Endoscopy (stents, clips, sponges)

Exploratory laparotomy or laparoscopy

Pitfalls

- Disregarding the value of a detailed history in the diagnosis of most conditions
- Overusing or underusing modern imaging techniques in the emergency ward
- Not taking into consideration the diverse anatomic positions of an inflamed appendix
- Not having a high index of suspicion in intestinal ischemia
- Not taking into account the differences pertaining to elderly patients

2.8 Summary

Acute abdominal pain accounts for up to 50 % of emergency surgery consultations. The presence

of tenderness on palpation is a hallmark of potential acute surgical abdominal problem(s). Surgeons must maintain the ability to diagnose acute abdominal conditions on clinical grounds in the emergency ward. Modern abdominal imaging has revolutionized emergency abdominal surgery, especially when the diagnosis is not clearly evident.

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