❖ Anorectal conditions

➔ Hemorrhoids[1]:

- Normal fibrovascular structures like cushions, help in continence. When it gets symptomatic it becomes diseased hemorrhoid .
- Types:
  - Internal hemorrhoids: Above dentate line, Painless, with bleeding, grades:
    1. Grade I: **Bleeding** W/O prolapse.
    2. Grade II: Prolapse W/ **spontaneous** reduction.
    3. Grade III: Prolapse with **manual** reduction.
    4. Grade IV: Incarcerated, **irreducible** prolapse. This may cause pain.
  - External Hemorrhoids Originating below the dentate line. Thrombosis → painful, mostly without bleeding. Due to straining it will become engorged .
- Sx: **Prolapse** (first to appear usually), per rectal **bleeding** (painless fresh bright bleeding).
- Dx:
  - Hx and PEx (lateral decubitus).
  - Inspection: Prolapsed piles, anal skin tags.
  - DRE: To assess sphincter tone and to exclude other anal conditions.
  - Anoscopy/Proctoscopy[2]: Bulging haemorrhoids visible at right anterior, right posterior and left lateral positions (3, 7, 11 clockwise).
- **Colonoscopy Indications (OSCE):**
  - **FHx** of cancer, Previous **Hx** of cancer, Hx not suggestive of hemorrhoids, Age above **40**, **Diarrhea** (bleeding+recent change in bowel habit→ suspect IBD, cancer), Constitutional Sx.

Treatment	
Dietary & Lifestyle modification (For all pts): ■ Increasing **fluid** and **fiber** intake, recommending **exercise**. ■ Minimize straining at stool, mostly due to constipation (**laxatives**) & minimize time spent in toilet.[3]	
Fixation (fibrosis & shrinkage→ left up to normal position): for grade 1.	**Removal**: for grade 2, 3, 4.
1. Injecting sclerosing agent. 2. Electrical cauterization.	1. Rubber band **ligation** (for grade 2 & some of 3, not suitable for external hemorrhoids). 2. **Hemorrhoidectomy**/stapled hemorrhoidectomy. ■ Complications: stricture, incontinence, pelvic infection.

[1] Anything that increases the intra-abdominal or intrapelvic pressure (Chronic straining secondary to constipation or occasionally diarrhea) can cause engorgement of the normal fibrovascular cushions → Fibrovascular cushions lose their attachment to the underlying rectal wall, which will cause: 1/Prolapse 2/rectal bleeding (the overlying mucosa becomes more friable and the vascularity increases).
[2] unless high risk for cancer then do full work up (colonoscopy). Evaluation of per-rectal bleeding depends on whether pt is low risk for cancer (anoscopy & sigmoidoscopy) or high risk (colonoscopy).
[3] Some patients will say they don't have constipation and when you ask about their bowel movements they will say: one bowel every 3 days OR sitting in the bathroom for a long time 45 mins to one hour → this is constipation

➔ **Anal fissure[4]:**

- Vertical tear in the lower half of the anal canal in the **posterior[5]** (mostly) midline.
- Successive bowel motions provoke further trauma, pain and anal spasm resulting in a vicious cycle.[6]

- Clinical Features[7]: **Painful defecation**, no bleeding (if present it is minimal, a drop).
- Dx:
  - Hx: **Anal pain**. Exclude previous perianal surgery, perianal abscess, and trauma during childbirth or symptoms consistent with Crohn's disease).
  - PEx: On inspection u can see lower end of the **fissure** (if u find it in lateral wall suspect crohn's and anal cancer), you cannot do palpation (severe pain).
- Chronic anal fissure is defined as an ulcer that has been present for at least 6 weeks.
- Features of chronicity (>6 weeks) 4 signs (not necessarily all present):
  - Distal sentinel/skin tag.
  - A proximal hypertrophied anal papilla.
  - Fibrotic and raised edges.
  - Exposed internal sphincter fibres appears white (while in acute they are red).

Treatment

- The main goal is to relieve pressure and increase the blood supply to the tissue to allow healing, acute can be managed medically while chronic with failed medical management needs surgery.

Acute fissures (this is general Rx, we instruct nearly all anorectal conditions pts to do it)**:**

- **Diet** (fibers) and **water** and a good **hygiene**.
- **laxatives**.
- **Local anesthetics**.[8]
- **SitZ bath**[9] (warm water with 3-4 tablespoons of salts) and sit in it for 15 minutes 3 times a day.

Chronic fissures:

- **Topical** creams (vasodilators): nitroglycerin[10] (diltiazem 2% q12h), CCB (nifedipine).
- **Botox** injection[11].
- **Surgery**: Lateral Internal Sphentorotomy[12] (LIS) - cut of the internal sphincter to increase diameter of the anal canal.

[4] Repeated straining → hypertrophy of muscle → decreased blood supply → ischemia → the least area of blood supply is the posterior midline → so a wound occurs.
[5] **Because:** It has the least blood supply (which further decreases when pushing to defecate) result of arterial anatomy and internal anal sphincter hypertonicity, Lack of tissue support, Maximal stretching at this site.
[6] Patients are reluctant to go to the bathroom because of the pain, so they hold it in. Then the longer the feces stays in the bowel, the more fluid is reabsorbed and the harder stool gets. Then this stool will cause more injury during defecation.
[7] Recurrent multiple or unusually extensive fissures affecting areas other than the midline should raise the suspicion of Crohn's disease, which can occasionally present with anal fissure as the sole initial complaint.
[8] Instruct pt that when there is desire to pass stool, apply ointment 10 -15 min before so when you pass stool there will be no pain.
[9] This hypertonic solution will suck the edema and reduce inflammation .
[10] Will relax the muscle and it will cause vasodilatation and improve blood supply so both factors will favor healing .
[11] You can inject something in the anal canal to paralyze the nerve temporarily, so the muscle will be paralyzed for a period 3 month and during that time the fissure will heal, after that the anal canal return to its normal function.
[12] You cut only the internal sphincter this will lead to relaxation of the anal canal and help to heal the fissure. Most common operation for anal fissure and involve controlled division of the of lower half of the internal sphincter at lateral position (3 O'clock or 9 O'clock with patient in the lithotomy position. There is a small but appreciable risk of late incontinence, which is usually to gas only.

➔ Abscess[13] & Fistula:

- The abscess is an acute manifestation, and the fistula is a chronic condition.
- Abscess: Infection at the glands in crypts[14] of dentate line → swollen → close lumen → collection and accumulation of debris → dirty area with bacteria → abscess.
- Other causes for anal abscess (10%): Crohn's (inflammation → abscess), Ulcerative colitis (rarely), immunosuppression (hematological disease, DM, chemotherapy and HIV).
- This collection of pus once it becomes big enough, there are 4 routes (abscess types) this pus can go:
  1. Down: **perianal** abscess, most common.
  2. ischiorectal fossa[15]: **ischiorectal** abscess, rare but serious (pyrexia w/ large, painful, fluctuant swelling in both buttocks w/ difficulty in sitting).
  3. Up: above the levator muscle: **supra-levator** abscess.
  4. Into anal canal: **sinus** formation.
  - Or abscess can remain localized (intersphincteric).

- Dx:
  - Hx: Acute anal **pain.** +/- systemic manifestations (fever) if it becomes infected.
  - PEx:
    - **Tenderness** (prevents digital examination requires general anaesthetic, confirmed by demonstration of a localized pea-sized lump in the intersphincteric space).
    - There is usually no evidence of suppuration on inspection of the perianal region.
  - US.

- Tx:
  - **Incision and drainage**[16].
  - Parenteral antibiotic (metronidazole,cephalosporins) only for some patient (Immunocompromised, patients with valvular disease, Diabetics, cancer patients, extensive diseases with local manifestation (such as cellulitis) or Systemic manifestation (tachycardia, fever).

[13] Most abscesses (90%) are due to cryptoglandular hypothesis, initiated by blockage of the anal gland ducts followed by secondary infection with colonic organisms such as Bacteroides, streptococcus faecalis and coliforms.
[14] At the level of dentate line between these 2 muscles internal and external sphincters there are glands, these called intermuscular glands, the duct of these glands open in the anal canal at the level o
[15] As the ischiorectal space is horseshoe-shaped and there are no fascial barriers within it, infection can track extensively and affect the contralateral space.
[16] When we drain the abscess, we produce a small channel between the end of the bowel and the skin near the anus, this is called fistula. 60% percent of the fistulas after drainage will close spontaneously while the rest will remain.

- Fistula is a communication between 2 epithelialized structures.
- Dx:
  - Hx: Chronic perianal **discharge**, **pruritus**, perianal discomfort, perirectal abscess and recurrent perirectal abscess.
  - PEx[17] (Protoscope):
    - Discharging opening.
    - Touch around the external opening to feel a cord-like structure.
    - Five essential points of a physical examination of an anal fistula:
      1. location of the internal opening.
      2. location of the external opening.
      3. location of the primary tract (the duct between the openings).
      4. location of any secondary tract.
      5. determination of the presence or absence of underlying disease.
- If you think it's a complicated fistula (deep or branching) do MRI or examination under anaesthetic (EUA) inject a liquid or gas bubbles (hydrogen peroxide) into the external opening then follow it until it comes out from the internal opening.
- Tx: (treatment of the fistula depends on the depth)
  - You have two ways, either filling the fistula or cutting:
    1. Filling:
    A. by fibrin (not effective).
    B. Anal fistula plug (AFP) expensive, undesired by pts (pig tissue).
    2. Cutting: Acute or slow
    A. Fistulotomy[18] (Acute/operative).
    B. Seton[19] (slow cutting): It allows for gradual healing with fibrosis (cell by cell cutting).

★ PR contraindications:
  - Fissure.
  - Thrombosed pile.
  - Perianal abscess.

★ Patient presented with severe pain, no lump, pain more with bowel motion→ most likely fissure..

★ Patient has painful lump → most likely abscess or external hemorrhoid.

★ If patient only presents with blood, no pain → most likely internal hemorrhoid.

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[17] An accurate preoperative assessment of the anatomy of an anal fistula is very important to know how much muscle is involved and choose correct management.

[18] you take patient to the OR, you insert a probe through the external opening to the internal opening and whatever tissue is there between the 2 opening you cut it

[19] Cutting Seton: It allows for gradual healing with fibrosis (cell by cell cutting).
Draining Seton: A length of suture material looped through the fistula which keeps it open and allows pus to drain out. It only relieves symptoms and can be used in patient with crohn's disease.

❖ **Inflammatory bowel disease** (IBD):

- IBD is a term generally used to denote two diseases of unknown etiology with similar general characteristics: Ulcerative Colitis (UC), Crohn's Disease (CD).

- The distinction between the two entities can usually be established based on clinical history, examination and pathologic criteria:[20] [21] [22]
  - History and physical examination (you can see signs of anemia and clubbing).
  - Radiologic and Endoscopic studies.
  - Gross appearance.
  - Histology.
- Smoking is protective in UC, and a risk factor in crohn's. FHx is a risk factor for IBD.
- IBD patients need special programs for screening: the screening is biopsy taking – endoscopy is not enough.

[20] About 10% to 15% of patients with inflammatory disease confined to the colon, a clear distinction cannot be made, and the disease is labeled **indeterminate colitis**.
[21] The medical and surgical management of ulcerative colitis and Crohn's disease often differ significantly. In some cases, grossly it looks like UC while microscopic features say it is CD. Also, sometimes the biopsy looks like UC but the clinical features suggests CD.
[22] In medicine it's not very important to distinguish the two diseases because they have the same treatment. However, in surgery we have to distinguish the two diseases because ulcerative colitis could be treated completely with surgery. But if crohns is treated with surgery, it is very likely that the patient will relapse.

➔ **Ulcerative colitis:** **Focus on Tx!!**

- A chronic disease that affects the mucosa and submucosa, with sparing of the muscularis of the rectum and colon (mainly the large intestine).
- Characteristics: **continuous**, uninterrupted inflammation of the colonic mucosa beginning in the distal rectum and extending proximally to a variable distance.
- Dx:
  - Hx: Bloody diarrhea & mucus, urgency, tenesmus, hematochezia, crampy abdominal pain. PEx normal.
  - Colonoscopy with biopsy.
  - AXR: Thumbprint sign (due to edema).
  - Barium enema (may show lead pipe colon "loss of segmentation").
  - UGI with small bowel follow-through. stool cultures.

- Macroscopic: Hyperemic mucosa, has a granular surface, looks like sand paper. (typical appearance). Diagnosis should be seriously questioned if the rectal mucosa is not affected.
- Microscopic: Inflammation restricted to the mucosa and submucosa of the large bowel. Crypt abscesses with goblet cell depletion.
- Extraintestinal manifestations[23]: Arthritis, ankylosing spondylitis , erythema nodosum, pyoderma gangrenosum, and primary sclerosing cholangitis.
- Complications: Hemorrhage, Toxic megacolon, Perforation, Stricture (due to fibrosis), Cancer.

Treatment

- Surgical indications in IBD:
  1. Elective: (same as Crohn's, check Crohn's notes).
  2. Emergency: If complications occur (Stricture "most common", Perforation, Abscess, Fistula)

  ★ **Surgery**: Total proctorcolectomy, ileal pouch and ileoanal anastomosis.[24]

- Contraindications to J-pouch:
  1. Crohn's disease, indeterminate colitis.
  2. Emergency surgery:
     a. Proctectomy and J pouch cannot be done in an emergency situation, needs planning and patient optimization.
     b. In emergency cases we do total colectomy with stoma followed by proctectomy and J-pouch when patient's condition is optimized.
  3. Rectal cancer.
  4. Fecal incontinence.

★ Surgical treatment of UC will result in resolution of both colonic and extracolonic symptoms.
★ Sclerosing Cholengitis mainly and ankylosing spondylitis won't get better after surgery.

[23] Colectomy has no effect on the course of (Ankylosing spondylitis and Primary sclerosing cholangitis).
[24] The principle of the surgery is removing of the whole colon including the rectum → anastomose the terminal ileum with the upper end of the anal canal → as the stool reservoir is removed (rectum) → all fluid will pass from the terminal ileum to the anal canal and the patient will go to the bathroom 20- 30 times/day, which considered the main problem in this operation. So we create an artificial rectum to avoid this, by duplicating 10 c.m of the terminal ileum and connect them to make a bigger pouch, which is called ileal pouch, then we anastomose it with the anal canal.

➔ **Crohn's disease: Focus on Tx!!**

- A **chronic**, **transmural inflammatory** disease of the GI tract of unknown cause. Can involve any part from the mouth to the anus.[25]
- RFs: Smoking, FHx.

- Major presentation:
  1. **Insidious**, slow and protracted course (symptomatic periods followed by asymptomatic periods that gets worse and sever with time=relapse and remission).
  2. **Intermittent colicky abdominal pain** mostly in RLQ (Most common).
  3. **Watery Diarrhea with mucus** (next most common Sx).[26]

- Diagnostic tests:
  - **Colonoscopy** with biopsy.
  - CT enterography, **MRI enterography**. barium enema, UGI with small bowel follow-through.Stool culture.

- Gross appearance:
  - Aphthous ulcers, cobblestone appearance[27], skip areas and extensive fat wrapping.[28]
  - Discontinuous and segmental process.
  - Rectal sparing (characteristic of Crohn's).
  - Any pt with multiple or complex, chronic perianal fistulas with weight loss or abdominal pain (Crohn's should be suspected).[29]
  - Acute inflammation (boggy hyperemic wall), chronic (fibrotic scarred thick leathery wall).

- Microscopic appearance:
  - **Non-caseating Granuloma** with Langerhans' giant cells. Mucosal and submucosal **edema** (may be noted before gross changes). Transmural chronic inflammatory infiltrate
- Systemic nonspecific symptoms: Low grade fever, malabsorption, weight loss, loss of strength and malaise.
- Complications: Obstruction, perforation, fistulas, localized abscesses, toxic megacolon[30] (common w/ UC), cancer.
- Extraintestinal manifestations: In 30% of patients. The most common symptoms are skin lesions, which include erythema nodosum and pyoderma gangrenosum. Others[31]

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[25] Most commonly affects the small intestine "terminal ileum", colon, rectum & anus). Small & large intestine r the commonest sites of recurrence.
[26] In contrast to ulcerative colitis, patients with Crohn's disease typically have fewer bowel movements, and the stools rarely contain mucus, pus, or blood. non-bloody diarrhea (watery) and they don't have tenesmus (rectal sparing).
[27] Earliest gross manifestation of Crohn's is the development of small mucosal ulcerations "aphthous ulcers" (red spots or focal mucosal depressions), as the inflammation progresses, aphthous ulcers enlarge and become stellate, Ulcers may coalesce giving cobblestone appearance. Mucosal ulcerations may penetrate through the submucosa to form intramural channels that can bore deeply into the bowel wall and create sinuses, abscesses, or fistulas.
[28](circumferential growth of the mesenteric fat around the bowel wall). If you suspect acute appendicitis in a patient and take him to the OR, if the diagnostic laparoscopy shows fat wrapping. what is the most likely diagnosis? Crohn's.
[29] Perirectal and perianal involvement occurs in about 1/3 of patients with Crohn's disease, particularly those with colonic involvement. Perianal disease (fissure, fistula stricture, or abscess) is common and may be the sole presenting feature in 5% of patients and may precede the onset of intestinal disease by months or even years.
[30] Toxic: sepsis febrile, abdominal pain. Megacolon: acutely and massively distended colon
[31] Arthritis and arthralgias, Uveitis and iritis, Hepatitis and Pericholangitis, Aphthous stomatitis, Amyloidosis, Pancreatitis, Nephrotic syndrome, These symptoms may precede, accompany, or appear independent of the underlying bowel disease.

Treatment[32]

★ Indications for surgery in Crohn's Disease:

A. Elective

1. Failure of medical treatment despite maximum medical therapy.
2. Complications or concerns[33] of medical therapy (steroids "osteoporosis", or Imuran).
3. Non-compliance.
4. Steroid dependency.[34]
5. Colon CA or dysplasia (IBD patients are at high risk for cancer).
6. Rarely, control of debilitating extracolonic manifestations such as iritis and sacroiliitis.

B. **Emergency** - Development of Complications, like :

1. Stricture leading to small bowel obstruction (most common complication in Crohn's disease) ! Perforation, patient may present with peritonitis.
2. Abscess.
3. Fistulas (entero-cutaneous, entero-vaginal, entero-vesical).
4. Toxic megacolon and perianal diseases.
5. Massive bleeding.

★ What is the surgical principle in Crohn's disease? **Limited resection with disease-free margins**.[35]

★ What is the most common site? **Terminal ileum**

★ What is the most common operation done? **Ileocecal resection** (resection of the diseased part of terminal ileum and cecum + anastomosis of ascending colon to terminal ileum).

★ How to make sure that you have resected adequately?

- Grossly, by seeing negative margins.
- Send frozen section for negative margin confirmation.

- Other surgical options:
  1. Stricturoplasty
     a. For extensive disease with many strictures lying apart.
     b. For patients who have already underwent small bowel resection (Because extensive resection means the patient will develop short bowel syndrome).
  2. Total colectomy with ileorectal anastomosis: in 20% of crohn's disease cases the colon is involved.

★ Note: the rectum is ALWAYS spared in Crohn's, which is why we do total colectomy only not total proctocolectomy as in ulcerative colitis.

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[32] Both medical and surgical treatments are palliative not curative (surgery is curative in UC).
[33] long term immunosuppression, risk of malignancy and viral/atypical infections.
[34] Normally patients take a short course of steroids during flare ups to reduce remission, once they are in remission steroids are tapered and stopped. Some patients develop dependency in that they fall right back into relapse upon stopping steroids.
[35] Why? Because surgery is not curative and once you remove the disease at one point of GIT, it will later on develop at another point of the tract.

❖ CRC:

- Cancer and sarcoma are both malignant, however cancer arises from epithelium (mucosa) while sarcomas are from subcutaneous tissue.
- Colon cancer: malignancy arising from the mucosa of the colon mainly adenocarcinoma.
- No difference in the incidence of colon Ca, regarding gender or age, in rectal ca female are more likely to have it. most common side is the left colon and sigmoid[36] (but can occur anywhere).
- Patterns:
  - Sporadic: " no family history. " No previous history.
  - Hereditary: Has some genetic transformation that can result in the future to cancer.
    - Hereditary Polypotic: Familial adenomatous polyposis (FAP) precancerous, ca incidence 100%.
    - Hereditary non polypotic: (HNPCC) seen in patients with proximal colon cancer at a young age, or patients with a family history of cancer but no polyps.

- Other Risk factors: Inflammatory bowel disorders, mainly Ulcerative colitis (long duration and pancolitis increases risk).
- Clinical presentation: Melena (dark, tarry, sticky), Hematochezia: (bright blood with defecation), bright blood found on examination. The presentation differs depending on the site of the tumor.

- Manifestation depending on the site:
  - Right:
    - Occult blood in stool, Anemia (palpitations, shortness of breath, pallor, fatigue).
    - Right iliac fossa mass.[37]
    - Appendicitis: pt presents w/ appendicitis due to ca cecum → highly suspicious in old age 40-45.

  - Left:
    - Change in bowel habits[38], Constipation, or constipation alternating with diarrhea.[39]
    - Distention (more due to obstruction) and bloating.
    - Intestinal obstruction: Presents to ER complaining that he didn't pass stool for 2-3 days.
    - Bleeding: is not that much in left cancer because they present very early.
    - Abdominal pain → Perforation (peritonitis and acute abdomen), Left iliac fossa mass.

  - Right vs Left:
    - Rt colon is wider than Lt colon[40].
    - The right is capacious so the tumor will grow undetected and the patient will present with metastasis or right mass (delayed presentation pt present with only anemia and right iliac fossa mass).

  - Rectal and sigmoid: fresh bleeding, tenesmus[41], secondary piles[42] (haemorrhoids).

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[36] The main storage site of the stool, and because the stool is toxic to the epithelium it causes cancer
[37] A mass presentation is seen More common in right colon cancer than in left. very rarely seen, only if its very late presentation or if the obstruction involved the ileocecal junction.
[38] This term is very important and fundamental in cancer patients. Ask the patient about his normal bowel habits, because patient may have normal bowel habits then he develops constipation or he have chronic constipation that's why the word change is important.
[39] tumor obstructs the bowl leveling small narrow lumen ! stool accumulate ! liquefaction→ the stool is watery it can pass through the narrow lumen ! then he gets diarrhea and this is called spurious diarrhea (chronic constipation with overflow)
[40] It has more tendency to cause obstructive Sx "constipation" while Rt is capacious tumor can grow undetected and pt present late anemic w/ Rt iliac fossa mass.
[41] defined as feeling of incomplete defecation it is more in sigmoid and rectal.

- Constitutional symptoms: weight loss, night sweats, Anorexia, low grade fever, fatigue.
- Manifestation due to metastasis:[43]
  - Liver: right upper quad pain, jaundice & itching, dark urine, RUQ mass fullness.
  - Lung: hemoptysis, SOB (due to pleural effusion), pleuritic pain (due to pleuritis).

- Special pattern of presentation: appendicitis in right sided tumors, piles in sigmoid or rectal ca.

- Manifestation of invading adjacent structures:
  - Perforation: causing peritonitis and acute abdomen.
  - Fistula to the bladder (colovesical fistula): with left cancer, the patient presents with cystitis, air in bladder (pneumaturia), fecal matter in urine.
  - Fistula to the stomach: with transverse colon cancer, patient present with vomiting stool.

Diagnosis

- Hx & PEx (mass, cachexia, LN adenopathy).
- Routine blood work (CBC, Electrolytes).[44] & CEA (Baseline for follow up).
- Colonoscopy: For definitive diagnosis, to take tissue Bx[45], to know location[46] (to decide the type of operation).
- CT scan CAP: for staging and to exclude any metastases. if contrast contraindicated do CXR, U/S .
- MRI: A must for rectal ca (to see invasion and give neoadjuvant), not done for colon ca unless there is something found in liver.
- Endoscopy: for rectal to see invasion and give neoadjuvant → reduce local recurrence.
- Barium enema (X-ray w/ contrast): Used long time ago, it gives a special pattern the most common one is **apple core** appearance (usually seen with left sided tumors, but can be seen with any side). Pathology: could be (Fungating, Anular or Ulcer).

- Treatment:
- The anatomical differences between rectum and colon:
  - Taenia coli (haustration) and Appendices epiploicae are present in colon while absent in rectum, on colonscopy around 13-15 cm from anal fissure is considerd rectum above that is colon.

[42] Patients with sigmoid or rectal cancer may present with secondary piles (haemorrhoids), it's very important because the patient may only present with hemorrhoids and he only gets treatment for hemorrhoids, while his main issue is the cancer. So old patient presenting with piles, or patient with a family history of cancer or patients with recurrent haemorrhoids always keep in your mind that the piles could be due to the cancer. And this is because the mass compresses and obstructs the blood flow.
[43] The two most common organs involved in the colorectal metastasis are Liver, Lung (you have to remember them). Liver is first involved because the GI tract has a portal circulation so the blood will first go to the liver, if not caught by liver it will proceed to heart which doesn;t catch ca so blood will proceed to lung and it will be affected.
[44] To assess the patient and decide the type of the operation (patient with renal failure or severe anemia, you won't do total colectomy on him) so the routine labs will give you an idea about the general condition of the patient o also it gives an idea about the metastasis (high LFT in liver metastasis).
[45] You have to have the pathology because In some cases, we give neoadjuvant chemotherapy, and the hospital can't give the pt chemotherapy if he doesn't have a tissue pathology.
[46] To look for another tumor in colon in another place (synchronous tumor) so if you saw a tumor in the left colon and you took a biopsy from it, you should also look at the whole colon to exclude the presence of other tumors.

- The colon
  1. Surgery:
     A. The resection
     - The main treatment is surgery regardless of the stage
     - The surgery type required differs (due to different blood supply) depending on the site:
       - Colon: hemicolectomy or extended hemicolectomy.
       - Sigmoid: sigmoidectomy (limited resection to the sigmoid), Anterior resection (removing the sigmoid with the upper rectum), Low anterior resection, Ultra low anterior resection.
       - Precautions taken when removing the tumor is 5 cm margin above and below.

★ Blood supply of the colon and the associated types of surgeries[47] :

- Abdominal aorta → inferior mesenteric artery (IMA):
  - Left colic A (supplies Lt colon) → marginal artery for anastomosis.
  - Sigmoidal branches, Superior rectal artery.
  - Tumors in Lt colon (splenic flexure, descending colon, sigmoid) either Let hemicolectomy or extended left hemicolectomy.
  - Lt colon is supplied mostly by Lt colic A → Ligate Lt colic A (No need for proximal/high ligation i.e IMA ligation).

- Abdominal aorta → superior mesenteric artery (SMA):
  - Middle colic A: first branch of the SMA supplies the transverse (has right and left branches).
  - Right colic A: supplies right colon.
  - Ileocolic A: supplies Rt colon and gives a branch to the appendix (appendicular A).
  - Tumors in the right colon (cecum, ascending colon, hepatic flexure) either right hemicolectomy and , Or extended right hemicolectomy. In the transverse → transverse hemicolectomy, Or total colectomy with ileorectal anastomosis.

Colon site	Name of procedure	Ligation
Right	Rt hemicolectomy	Rt colic A + Ileocolic A.
Hepatic flexure	Extended Rthemicolectomy	Rt colic + Ileocolic A+ Rt branch of middle colic A.
Transverse	Transverse hemicolectomy	Middle colic A.
Left	Lt hemicolectomy	Lt colic A.
Splenic flexure	Extended Lt hemicolectomy	Lt colic (or IMA) + Lt branch of Middle colic A.
Sigmoid	Anterior resection	Proximal ligation of IMA.

[47] Because the pattern of spread is by lymphatics and because all the lymph nodes of the colon are on the arteries so we have to remove the whole artery, then we should also remove the part of the colon that is supplied by this artery (remove the ischemic part and leave the healthy one). So every part of the colon has different blood supply with different placement of the draining lymph nodes requiring different type of procedure

B. The Anastomosis:
   - Usually we resect and anastomose in the same procedure this is the standard procedures in straightforward cases.
   - Hartman procedure: resection and stoma placement without anastomosing. this is done when:
     - Patient condition doesn't allow us to do a long procedure.
     - If we are worried about leakage.
     - In emergency cases.[48]

2. Neoadjuvant: Not given for colon cancer.
3. Adjuvant (chemo and radio after the procedure): for all stage 3 and above, Or high risk[49] stage 2.

- The Rectum:

1. Surgery:
   A. The resection:
      - Upper rectum (anterior resection), Middle rectum (low anterior resection), Lower rectum (ultra low anterior resection). In rectal cancer it is very imp to take safety margin of 2 cm.
      - If we couldn't leave a safety margin because the cancer was very close to the anal fissure we do APR (abdominoperineal resection) other indication for APR is if the tumor invaded the muscle layer.

   B. The Anastomosis The draining lymph nodes are all over the IMA, so we do high ligation (ligate the IMA) So we anastomose the viable tissue that is left with the anal fissure (sometimes we do coloanal, we remove the whole rectum and ligate the colon with the anal).

2. Neoadjuvant[50]: ALL stage 2 and 3 radio and chemo to decrease local recurrence.
3. Adjuvant: Any patient that received neoadjuvant should receive adjuvant.
4. Follow up:
   - Baseline CEA.
   - Colonoscopy: 1 y post-op, after 2 then at year 5. Whenever you suspect anything you do colonoscopy.
   - CT scan CAP: CAP Usually done with the colonoscopy, Or yearly.
   - Work up: Every 3 m or every 6 m in the first 2 years. Then every 6 months or every year.
   - Abdominal examination and per rectal (PR): it is required in every visit.
   - Relative screening:
     - For the family of young patients with HNPCC or polyposis coli.
     - By colonoscopy 10 years earlier than the patients age of onset of cancer or at the age of 40.

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[48] When patient comes with obstruction or very neglected with liver failure or ascites or renal failure in these cases, we avoid doing definitive procedures, we do Hartman and after 6 months we regain the continuity of the colon and do the anastomosis.

[49] Young pt, +ve FHx, Poorly differentiated, perineural/ perivascular invasion, inadequate retrieval of LN during resection, obstruction/perforation.

[50] Always when you hear rectum say neoadjuvant. Some studies proved that administering neoadjuvant therapy will give better, in terms of local recurrence. (but for the survival some studies proved that others disprove it). So now the standard of care is to give neoadjuvant. (except for stage one some say give other says no) but as a whole we should give neoadjuvant. (It is called Radio chemosensitizer): Chemoradio very minimal dose of chemo works as a sensitizer the main thing here is the radio. There is a long and a short course then after 6-8 weeks the patient will do the surgery.

★ **TNM** classification and **staging** system :

T stage: How far into the wall has it grown?	
Tis	invasion of mucosa only
T1	invasion of submucosa.
T2	invasion of muscularis propria.
T3	Full thickness (Serosa) in case of colon cancer. Perirectal fat and adjacent organs (as T4) in rectal cancer.
T4	Invasion into adjacent organs (Bladder, stomach,...).
N stage: How many lymph nodes have been involved?	
N0	No lymph node involvement.
N1	1-3 LNs
N2	> 3 LNs
N3	Distant lymph nodes
M stage: Are there distant organ metastasis?	
M0	No distant organ metastasis.
M1	Distant organ (liver, lung, Peritoneum).

Based on the TNM classification, we have 4 stages of Colorectal Cancer:		5 years survival
T0	Tis tumors	
T1	T1 and T2 tumors (No nodes nor mets)	90%
T2	T3 and T4 tumors (No nodes nor mets) / ^T3N0 tumors	80%
T3	Any LN involvement (+ve node/s with any T) * (depends on number of nodes involved)	27-69%
T4	Distant metastases (+ve mets with any T)	Up to 50%

★ In OSCE u have to know these things about stoma (Type, indications, complications).
★ Explanations for indications (In) & complications (Cn) in the next page.

Stoma

- Opening made in the abdominal wall to pass the stool.
- Stomas are divided into two classes:

1. **Permanent**: Generally colostomies (in the colon)
   - left side, bigger diameter, bag contains stool.
   - It is made in level with the skin. We bring the colon and suture it with the skin at the level of the skin and fix the bag. Temporary stoma.

2. **Temporary**: Generally ileostomies (in terminal ileum).
   - Right side, smaller diameter, bag contain fluid.
   - The ileostomy contents contains pancreatic juices, if it comes in contact with the skin it will cause skin digestion. Because of that, when we make an ileostomy the stoma comes out to the abdominal wall for 5 cm and then you evert it and you suture the edge to the skin. So it is projecting on the abdominal wall and the bag can be fitted (tight). If it was at level, it will be difficult to fix, but if it is pouching it can be fixed very tightly. (Ileostomies are always pouching stomas. they project outside). Permanent stoma.

- Indications:
  1. Removal or excision of the distal colon with the anal canal (Permanent stoma). How?
  2. To give rest to the distal intestine (Temporary stoma). How?
  3. Protection of anastomosis (Temporary stoma). How?

- Complications:
  1. Ischemia of the stoma: most common complication of the first day. (most important) How?
  2. Retraction of stoma into the abdominal wall. How?
  3. Hernia or prolapse. How?
  4. Recurrence of the initial disease in the stoma. How?

- Stoma reversal: Ideally it should be reversed after **3 months** when the **inflammation** has subsided. Before 3 months there will be inflammation, tissues will be friable and it will be likely to cause more damage.

I1: After removal of the distal colon and anal canal you will need a stoma. Suppose there was a cancer and you removed the rectum and anal canal so you have to make abdominal colostomy.

I2: In some diseased intestine for which you want the intestine to get rest, you divert the stool, so the intestine can have a rest for some time (from a couple of months to 5 years) and once the disease is cured or controlled you can reverse this stoma.

I3: After colon surgery, for example you have removed the sigmoid, you have done the anastomosis of the descending colon with the rectum but your patient is old ,diabetic with multiple comorbidities, you think that this anastomosis may not heal and you do not want the stool to go to the site of anastomosis for the next 3 months. In this case you make a temporary stoma to protect your anastomosis. After 3 months if the patient is ok you reverse it. {It is not similar to hartmann's procedure, because in hartmann's we remove and that's it and after 3 months we do anastomosis. Here we do anastomosis but on top of that anastomosis we make a stoma so next time you don't have to do a laparotomy. For reversal of the hartmann's you have to do laparotomy.}

C1: While making a stoma, you cut the mesentery (with the blood vessels) and you bring it out. In some cases when that patient is obese and the abdominal wall is very thick, the opening may be very tight so when you pull the intestine there is pressure and compression of the blood vessels and the stoma can develop ischemia (develops deficiency of blood supply) and when you check the next day it is black.

C2: Sometimes after doing the stoma it does not develop complete ischemia, just minor ischemia and that deficiency of blood supply impairs wound healing, so the stoma is lying on the abdominal wall but healing is not good. Because of this pressure, stoma gradually goes down because of deficiency of healing and it goes within the abdominal wall, it does not stay on the skin, it is pulled down in the abdominal wall.

C3: There is a principal that when you make the opening of the stoma that it should admit 2 fingers easily, it is a generalised principal it is not fixed. If the patient is thin maybe 2 fingers, but if he has 4 inches of fat, probably 3-4 fingers. If the mesentery is so thick it can reach even 5 fingers. But minimum it should allow 2 fingers. So if the opening is small, the first complication is ischemia. But if your opening is big, patient may develop parastomal hernia or prolapse (opposite of retraction).

C4: When you are doing a surgery for a disease like crohn's or cancer, and the technique is not good, you may implant the cancer cells or cells from the crohn's into the stoma, as a result that disease occur in the stoma.

❖ Acute appendicitis:

- Commonest position of the appendix is retrocecal 75%
- Microorganisms which cause acute appendicitis, are Either from large intestine (anaerobes) or from small intestine (E. coli).
- What starts an attack of acute appendicitis ?[51]
  1. Obstruction.
  2. Distention of the appendix.
  3. Inflammation due to:
  a. Microorganism growth.
  b. Increased intraluminal pressure and ischemia of the wall.

- What causes obstruction of the appendix?
  1. Feculent material.
  2. Familial.
  3. Tumors of the appendix (e.g. carcinoid tumor ; when appendectomy is done all the specimens are sent for histopathology to confirm the presence or absence of carcinoid tumor).
  4. Foreign bodies (e.g. fruit seeds).
  5. Intestinal worms (e.g. round warm).

- Clinical picture of a patient with acute appendicitis:
  - Young male/female, comes walking to the ER, Mild pain in the right lower abdomen generally for 1 day, pain NEVER severe. Maybe having chronic constipation or family history of appendectomy.

- Dx[52]: "Clinical exam W/ CBC"
  - Hx[53]: Periumbilical pain (colicky) which later on shifts to right iliac fossa, Anorexia, Vomiting only once, Low grade fever (37.5).
  - PEx: Tenderness, rebound tenderness, guarding and rigidity, decreased bowel sounds in the right iliac fossa.
  - Ix: CBC (WBCs).
    - Sometimes Dx is difficult due to:
      i. Patient has taken medications: painkillers or Abx. Atypical presentation(25% of pts).
      ii. Females, genital problems may be confused with appendicitis (mid-cycle Sx).

    - Investigation of choice **CT scan with oral and IV contrast**.
      i. Appendix dilation, appendix inflammation, collection of mucus in appendix, Feculent material.
    - US: Only if we're suspecting female genital problem to rule it out.

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[51] The appendix is a tube-like structure, which opens into the cecum. It is lined by mucous membrane that secretes mucus, which contains antibodies, and it goes into the cecum, some of this mucus is absorbed by the large intestine. If the lumen of the cecum is blocked, the mucus will accumulate inside the appendix, it cannot go into the cecum, the appendix will get distended and bigger and because of this distention and collection of mucus in the appendix, 2 things happen: 1. In the mucus microorganisms grow 2. The internal pressure rises and the blood vessels in the wall of the appendix become compressed which leads to necrosis and ischemia of the wall.

[52] Acute appendicitis should be diagnosed clinically; the only thing that we require is the WBC count. Normal count of WBC is up to 11,000 but in the appendix it is raised to 15,000, maximum to 18,000. More than 18,000 " not acute appendicitis, CBC is considered as part of the clinical examination.

[53] 2 vomits: maybe appendicitis, 3 vomits" not appendicitis. High grade fever: 38-39 " not appendicitis.

Treatment

1. **Resuscitate**:[54] NPO, IV line and 1 surgical bolus (2L within 1 h).
2. **Appendectomy** within 6-8 h from admission ”not from attack” (either laparoscopic or open).
3. OR: prophylactic Abx, Cefuroxime (2nd generation cephalosporin) or/and flagyl (metronidazole).
   - Prophylactic antibiotics has to be: 1 hour before the surgery, Narrow-spectrum, Single dose.

- Post-op complications:
  A. During operation: Perforation of the cecum (most important). Bleeding is not a complication because you control it and that’s it.
  B. On the first day: Intra-abdominal hemorrhage.[55]
  C. On the fifth day: Infection (UTI, chest, wound, intra-abdominal)[56]
  D. After discharge: **Adhesions** (most important) He will present as intestinal obstruction. **Incisional hernia**.

- F/U: After 1 week (check if patient is doing well, wound healing good, remove clips and check the histopathology for carcinoid tumor).

Best wishes 💪😍
Adel Alshihri

[54] When the patient presents to the ER he’s not in severe pain so he doesn’t require analgesia. The patient will be dehydrated for 1 day, so we must give him fluid. Generally a person needs 2.5-3L of fluid per day. NPO Post-op patients usually receive 3L of fluid per day. So when the patient present to the ER and he’s dehydrated we give him at least 2L of fluid. 2L of fluid given rapidly within 1 hour is called a surgical bolus.
[55] In the operation you ligate the mesoappendix which contain the appendicular artery, that ligature may slip so appendicular artery starts bleeding slowly and by the next morning the abdomen has collected a sufficient quantity of blood and the patient has hypovolemic shock. The first thing you should ask about after the operation is the pulse rate.
[56] If you inject microorganisms in the skin in any person, it will take about 3 days (after 48 hours) to produce inflammation. During appendectomy, you pass endotracheal tube, Foley catheter, IV line and you remove the appendix from the abdomen, all these sites can develop inflammation but they will manifest after the fourth day. The patient can have chest infection, thrombophlebitis, UTI, wound infection or intra abdominal infection. Infections start appearing from the 3rd day but they are most prominent and dangerous on the fifth day.