Pelvic mesocolon

- The Pelvic Mesocolon begins as a continuation of the descending colon left side of pelvic brim (inlet of pelvic).
- Parts of the pelvic mesocolon:
  - Sigmoid colon.
  - Rectum.
  - Upper part of the anal canal.

• Sigmoid Colon

- Its length is between 10 - 15 inches (25 to 38 cm).
- It is a part of large intestine in pelvic cavity.
- Begins at the left side of the pelvic brim (inlet of the pelvis).
- End: it becomes continuous with the rectum in front of the third sacral vertebra (mid of the sacrum).
- The sigmoid colon is mobile and hangs down into the pelvic cavity in the form of a loop.
- It is attached to the posterior pelvic wall by fan-shaped sigmoid mesocolon.

• Sigmoid Mesocolon (Mesentry):
- The root of the sigmoid mesocolon has an inverted V-shaped attachment which is formed by lateral limb and medial limb.
- Lateral limb (left): contains the lower Left Colic Artery (sigmoidal artery).
  - Medial limb (right): contains the Superior Rectal artery (which is the direct continuation of the inferior mesenteric artery).

- Attachment of the root of mesocolon:
  - Middle of left External iliac artery (attachment of the lateral limb).
  - Bifurcation of the left common iliac artery.
  - At middle piece of sacrum.

  Extending first medially and superiorly (along the external iliac artery) then medially and inferiorly (from the bifurcation of the common iliac vessels to the anterior aspect of the sacrum.)

- Appendices Epiploicae (omental appendages) are very long in the sigmoid colon.

- Relations of sigmoid colon
  - Left: Left External iliac vessels
    Lateral wall of pelvis
    Vas deferens or ovary

  - Right: Small intestines
  - Superior: Coils of small intestine
  - Inferior: - In males: urinary bladder
    - In females: uterus
- **Posteriorly:**
  - The rectum
  - the sacrum.
  - the lower coils of the terminal part of the ileum
  - Sacral plexus
  - Left periformis muscle
  - left external iliac vessels
  - Left Ureter
  - Left internal common iliac artery

The sigmoid colon usually occupies the **rectovesical pouch in males** and the **rectouterine pouch (Douglas pouch) in females**.

- **Blood Supply of sigmoid colon**
  - Arteries
    - **Sigmoidal** branches of the inferior mesenteric artery. (The sigmoid arteries descend obliquely to the left, where they divide into ascending and descending branches. The superior branch of the most superior sigmoid artery anastomoses with the descending branch of the left colic artery.)
    
    **NOTE:** the inferior mesenteric artery gives: 1-left colic 2-sigmoid 3-superior rectal arteries.
- **Veins**
  - The veins drain to the inferior mesenteric vein to the portal venous system.

- **Lymph Drainage of sigmoid colon**
  The lymph drains into nodes along the course of the sigmoid arteries to the inferior mesenteric nodes (around the origin of inferior mesenteric artery).

- **Nerve Supply of sigmoid colon**
  - The sympathetic and parasympathetic nerves from the **inferior hypogastric plexuses**.
  - The parasympathetic supply is derived from the **pelvic splanchnic nerves** (S2, S3, S4).

- **Rectum**
  - The rectum is about 5 inches long (13 cm).
  - **Begins** in front of the third sacral vertebra as a continuation of the sigmoid colon.
  - **Ends** in front of the tip of the coccyx by piercing the pelvic diaphragm and becoming continuous with the anal canal.
- The dilated lower part of the rectum -lying directly superior to and supported by the pelvic diaphragm (levator ani)- is the rectal ampulla (where feces are stored until they are eliminated via the anal canal).
- On lateral view, the rectum follows the anterior concavity of the sacrum, forming the sacral flexure of the rectum.
- When the rectum is viewed anteriorly:
  Three sharp lateral flexures are apparent: two flexures on the left side (upper and lower flexures) and one flexure on the right side (middle flexures).
- Mucosal folds:
  - Transverse (horizontal) rectal folds (Houston’s valve):
    - Two on the left, one on the right

![Diagram](image)

- The puborectalis portion of the levator ani muscles (pelvic diaphragm) forms a U-shaped muscular “sling” at the junction of the rectum with the anal canal (anorectal junction), and pulls this part of the bowel forward, producing the anorectal angle.
• **The peritoneum & Rectum:**
  - **first third:** peritoneum covers the anterior and lateralsurfacesof the rectum.
  - **middle third:** only the anterior surface, pouches are in this region.
  - **lower third:** devoid of peritoneum.

• **Relations of rectum**
  - Posteriorly:
    - The rectum is in contact with the sacrum and coccyx
    - the piriformis muscle
    - Coccygeus muscle
    - levatores ani muscle
    - the sacral plexus
    - the sympathetic trunks.
  - Anteriorly:
    1. In the male
      - the upper two thirds of the rectum
        - It is covered by peritoneum
        - It is related to the sigmoid colon and coils of ileum that occupy the rectovesical pouch.
      - The lower third of the rectum (NO peritoneum), it’s related to:
        - the posterior surface of the bladder
        - the termination of the vas deferens
        - the seminal vesicles on each side
        - the prostate
    2. In the females:
      - the upper two thirds of the rectum:
        - It is covered by peritoneum.
        - It is related to the sigmoid colon and coils of ileum that occupy the rectouterine pouch (pouch of Douglas).
      - The lower third of the rectum (NO peritoneum):
        - related to posterior surface of the vagina.

  these Relation are important in PR examination.
• **Histology of the rectum**
  - The muscular coat of the rectum is arranged in:
    1- outer longitudinal of smooth muscle.
    2- inner circular layers of smooth muscle.
  - The three taenia coli of the sigmoid colon however, come together so that the longitudinal fibers form a broad band on the anterior and posterior surfaces of the rectum >> No taenia coli along the rectum.
  - Transverse folds of the rectum (semicircular permanent folds) formed by the mucous membrane of the rectum & the circular muscle layer..

• **Blood Supply of rectum**
  - **Arteries**
    - The superior, middle, and inferior rectal arteries>>supply the rectum.
  1- The superior rectal artery (Main Blood Supply)
    - It is a direct continuation of the inferior mesenteric artery and is the chief artery supplying the mucous membrane.
      - It may be joined by median sacral artery which arises from the back of the bifurcation of the abdominal aorta..
    - It enters the pelvis by descending in the root of the sigmoid mesocolon and divides into right and left branches, which pierce the muscular coat and supply the mucous membrane.
    - They anastomose with one another and with the middle and inferior rectal arteries.
  2- The middle rectal artery:
    - It is a small branch of the internal iliac artery
    - It is distributed mainly to the muscular coat.
  3- The inferior rectal artery:
    - It is a branch of the internal pudendal artery (from the internal iliac artery) in the perineum.
    - It anastomoses with the middle rectal artery at the anorectal junction.
- **Veins** (also called hemorrhoidal veins)
  - The veins of the rectum correspond to the arteries.
  1. The superior rectal vein is a tributary of the **portal circulation** and drains into the inferior mesenteric vein then to the splenic vein.
  2. The middle rectal vein drains into the internal iliac vein.
  3. Inferior rectal vein drains into internal pudendal veins then to the internal iliac vein.
    - The union between the rectal veins forms an **important** portal systemic anastomosis.

- **The hemorrhoidal plexus (or rectal venous plexus)**
  - surrounds the rectum, and communicates in front with the vesical venous plexus in the male, and the uterovaginal plexus in the female.
  - A free communication between the portal and systemic venous Systems is established through the hemorrhoidal plexus forming **portal systemic anastomosis**.

- **Lymph Drainage of rectum**
  - The upper part drains into the para-rectal nodes then into inferior mesenteric nodes.
  - The lower part follows the middle rectal artery and drains into the internal iliac nodes.
    - IN THE END, both drains to the para-aortic lymph nodes.

- **Nerve Supply of rectum** (it’s autonomic innervation, no pain)
  - The nerve supply is from the sympathetic and parasympathetic nerves from the inferior hypogastric plexuses.
  - The rectum is sensitive only to stretch.

- **Anal canal**
  - It is the terminal part of the large intestine.
  - It is situated below the level of the pelvic diaphragm and lies in anal triangle of perineum.
  - The anal canal is 3.8cm long.
- It extends from the anorectal junction (downward & backward) to the anus.
- The anorectal junction is marked by the forward convexity of the perineal flexure of the rectum, the anus is the surface opening of the anal canal, situated about 4 cm below and in front of the tip of the coccyx in the cleft between two buttocks.

- **Anal canal is divided into upper half and lower half by the pectinate line.**
- **Embryologic origine:**
  - Upper half is enddermal in origine. Lower half is ectodermal.
- **lining epithelium:**
  - Upper half: simple columnar epithelium.
  - Lower half: stratified squamous:
    - Upper part: non-keratinized.
    - Lower part: keratinized.
- **Innervation**
  - Upper half (like the rectum): Autonomic innervation, Sensitive to stretch.
  - Lower half (Somatic innervation): Pernieal branch (S4) & inferior rectal nerve, Sensitve to Pain, Touch, Temperature...

- **UPPER HALF** is lined by mucous membrane.
  - The mucous membrane shows 6 to 10 vertical folds, these folds are called the anal columns of Morgagni.
  - The lower ends of the anal columns are united to each other by short semilunar folds of mucous membrane; these folds are called the anal valves.
  - Above each valve there is a depression in the mucosa which is called the anal sinus.
  - The anal valves together form a transverse line that runs all-round the anal canal, this is pectinate line.
• **Anorectal ring:**
  - This is a muscular ring, present at the anorectal junction.
  - It is formed by the fusion of the puborectalis, deep external sphincter and the internal sphincter, which can be felt on rectal examination.

• **Musculature of the anal canal:**
  1. **Internal anal sphincter** is involuntary in nature. It is formed by the thickened circular muscle coat of this part of the gut.
  2. **External anal sphincter** is under voluntary control (its innervation is the same of the lower anal canal) and has three parts: subcutaneous, superficial and deep parts.
    - **Subcutaneous part** lies below the level of internal sphincter and surrounds the lower part of the anal canal.
    - **The superficial part** is elliptical in shape and arises from the terminal segment of the coccyx and anococcygeal ligament, the fibers surround the lower part of the internal sphincter and are inserted into the perineal body.
      - the only part that has a bony attachment
    - **The deep part** surrounds the upper part of the internal sphincter and is fused with the puborectalis muscle.

• **White line (Hilton’s Line):**
  - A landmark for the intermuscular border between internal and external anal sphincter muscles.
  - This line represents the transition point from non-keratinized stratified squamous epithelium to keratinized stratified squamous epithelium in the anus.

• **Relations of anal canal**
  - Anteriorly
    - In male
      - perineal body
      - membranous urethra
      - bulb of penis
    - In female
      - lower end of the vagina.
  - Posteriorly
    - laterally:
      - anococcygeal ligament.
      - tip of the coccyx.
• **Blood supply of anal canal:**
  - Arterial supply:
    - the part of the anal canal above the pectinate line is supplied by the superior rectal artery.
    - the part below the pectinate line is supplied by the inferior rectal artery, arising from the internal pudendal artery.

• **Venous drainage:**
  - Internal rectal venous plexus drains into superior rectal vein (Portal).
  - The lower part of the external rectal venous plexus is drained by inferior rectal vein into the internal pudendal vein.
  - the middle part by the middle rectal vein into the internal iliac vein. (middle and inferior rectal veins>>Systemic).
  - Upper part by the superior rectal vein into the inferior mesenteric vein.
  - The anal veins are arranged radially around the anal margin. They communicate with the internal rectal plexus and with the inferior rectal vein.

• **Anal Hemorrhoids**
  - Internal hemorrhoids
  - External hemorrhoids

• **What Are Hemorrhoids?**
  The term “hemorrhoid” refers to a condition in which the veins around the anus or lower rectum are swollen and inflamed.
  - Hemorrhoids (piles) arise from **congestion** of internal and/or external venous plexuses around the anal canal.

• **Hemorrhoids may result from:**
  1- Straining to move stool.
  2- Other contributing factors include pregnancy, aging, chronic constipation or diarrhea, and anal intercourse.
Two types

1- **Internal:** Hemorrhoids are both inside and above the anus:
   - Occur higher up in the anal canal, out of sight.
   - Bleeding is the most common symptom of internal hemorrhoids, and often the only one in mild cases. *(Painless, cuz the nerve supply is autonomic)*
   - Varicosities of the **superior Rectal vein.**
   - It has three stages:
     - Internal, out of sight.
     - During defecation it exits through the anus, after defecation it backs to its original place.
     - During defecation it exit through the anus, and remains outside after defecation.
   - Thrombosis is very rare, but usually rapture and bleeding occurs.
   - Lies in the anal columns at 3, 7, 11 o’clock (lithotomy position), these three veins are very common to develop piles.

2- **External:** Under the skin around the anus:
   - Visible, occurring outside the anus. They are basically skin-covered veins that have ballooned and appear blue.
   - Usually they appear without any symptoms. When inflamed, however, they become red, painful, and tender.
   - Related to tributaries of Inferior rectal vein.
   - Thrombosis is common.
   - **Painful.**

**Causes for hemorrhoids:**
- Congenital weakness of the venous walls.
- Superior rectal vein is the most dependent and valvless.
- Chronic constipation and cough.
- Pregnancies.
- Portal hypertension.
- Cancer in the rectum.

Surgical Classification of Hemorrhoids مش مطلوب
• **Anal fissure:**
  - A thin slit-like tear in the anal tissue, an anal fissure is likely to cause itching, pain, and bleeding during a bowel movement.
  - An elongated ulcer is formed.
  - It’s extremely painful.
  - Its site is in the midline, either posterior or interiorly to the superficial part of the external anal sphincter (no support).

• **Perianal abscess:**
  - It accours in the ischiorectal fossa.
  - Its most common cause the fecal trauma to the anal mucosa, which might spread to the submucosa.
  - It’s a complication of the anal fissure.
  - Its located in relation to the external anal sphincter.
  - **Anal fistula** may rise as a result of the spread or inadequate treatment of the anal abscess.
    o Types of perianal abscess:
      ▪ Subcutaneous.
      ▪ More deep between two muscles.
      ▪ High up and reach rectoanal junction (most dangerous).
    o It’s recurrent.
    o Treatment by drainage.
    o Horse shoe abscess: the abscess move from one side behind the anal canal to the other side
  o Complications of perianal abscess:
    ▪ **Anal fistula:** One end of this abnormal canal (fistula) opens into the anal canal, and the other end opens into an abscess in the ischiorectal fossa, this leads to presence of pus with the stool.
    ▪ **Sinus:** the tract open to outside surface through the skin

• **PR examination:**
  It is highly advised in emergency room, that if any patient above 40 years came, he must take this test. This test aims mainly to check the prostate because it is usually hypertrophied in this age, calcified or the patient may have a prostate cancer.
  - Finger is in the rectum canal.
- In the female the vagina lies anteriorly, while in the male the urinary bladder and ampulla vas difference, prostate.
- The sacrum and the coccyx lies posteriorly, while the ischiorectal fossae lie laterally.

**Lymphatic drainage of anal canal:**
1- lymph vessels from the part above the pectinate line drain into the internal iliac nodes.
2- Vessels from the part below the pectinate line drain into *superficial inguinal nodes*.

**Nerve supply of anal canal**
- Above the pectinate line, the anal canal is supplied by autonomic nerves (inferior hypogastric plexus and pelvic splanchnic).
- Below the pectinate line, it is supplied by somatic (inferior rectal & S4) nerves. Painful as a result of high sensation.
- The external sphincter is supplied by inferior rectal Nerve and by branch of the fourth sacral nerve.

**Anal triangle:**

![Diagram of female pelvis, inferior view](image)
• Contents of anal triangle:
  ▪ Ischioanal fossa
  ▪ Sacrotuberous ligament
  ▪ Sacrospinous ligament
  ▪ Pudendal nerve
  ▪ Internal pudendal artery and Internal pudendal
  ▪ Anal canal

  - Muscles
    ▪ Sphincter ani externus muscle
    ▪ Gluteus maximus muscle
    ▪ Obturator internus muscle
    ▪ Levator ani muscle
    ▪ Coccygeus muscle

• Ischiorectal Fossa (ischioanal fossa)
  - a wedge-shaped space located on each side of the anal canal.
  - The base of the wedge is superficial and formed by the skin.
  - The apex is between Levator ani & Obturator internus muscle.
  - The edge of the wedge is formed by the junction of the medial and lateral walls.
  - The medial wall is formed by the sloping levator ani muscle and the anal canal.
  - The lateral wall is formed by the lower part of the obturator internus muscle, covered with pelvic fascia.

• Contents of Fossa:
  - The ischiorectal fossa is filled with dense fat which supports the anal canal and allows it to **distend during defecation.**
  - The pudendal nerve
  - internal pudendal vessels are embedded in a fascial canal
  - the pudendal canal, on the lateral wall of the ischiorectal fossa
  - on the medial side of the ischial tuberosity. The inferior rectal vessels and nerve cross the fossa to reach the anal canal.
  - **Disadvantage of ischiorectal fossa:** This area is a common site of infection (forming Perianal abscess).
• The pudendal canal:
  - (Also called Alcock's canal) is an anatomical structure in the pelvis formed by the obturator internus fascia. So, it's a tunnel in the facia.
  - Runs in the lateral wall of the ischiorectal fossa.
  - Ends in the deep perineal pouch.
  - Its contents:
    ▪ Internal pudendal artery.
    ▪ Internal pudendal veins (which gives inferior rectal vein).
    ▪ Pudendal nerve.
      • These vessels and nerve cross the pelvic surface of the obturator internus.

Sorry for any mistake....

Done by: M7MD S. SHWAYAT