

Digestive System

University of Jordan

Faculty of Medicine

Batch of 2013-2019



Slide Sheet Handout Other

Anatomy

Embryology

Physiology

Histology

Pathology

Pharmacology

Microbiology

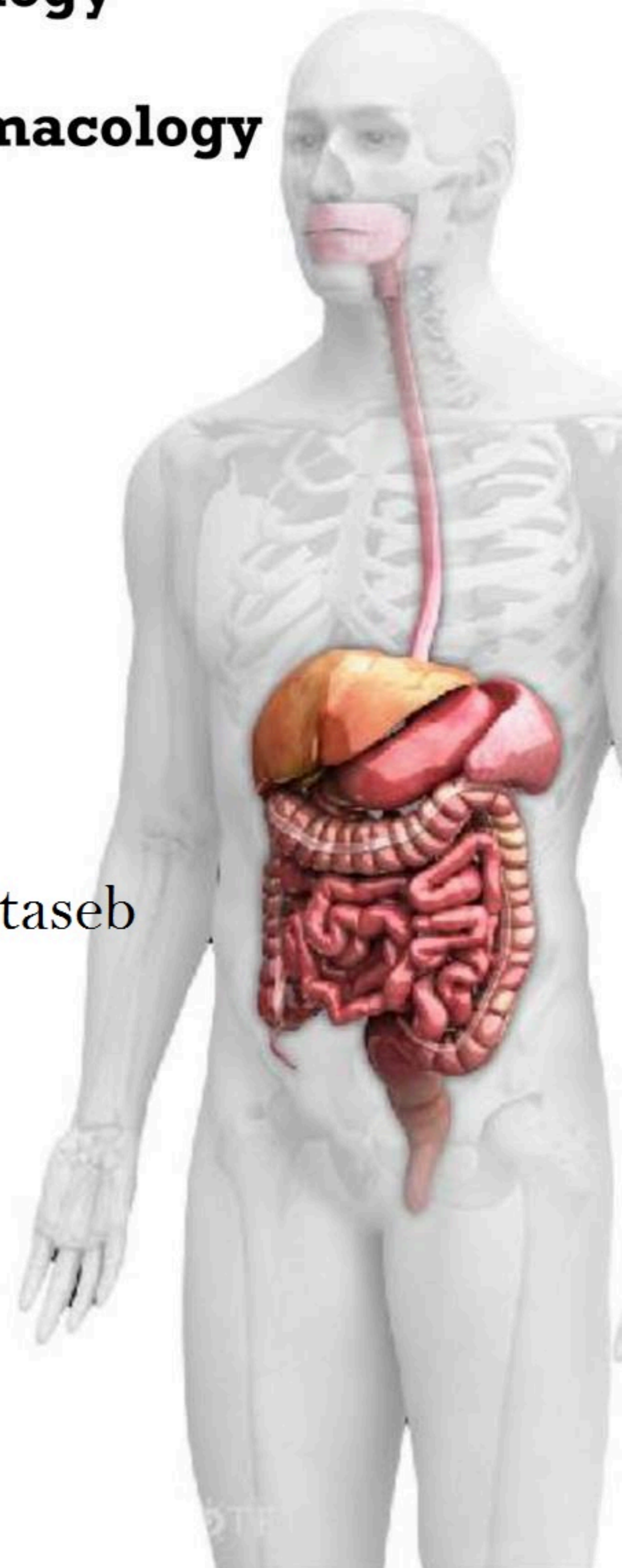
PBL

Slide #: 11

Doctor: Mohammad Al-Mohtaseb

Date: 5-4-2015

Price:



Pelvic mesocolon

Begins:

- begins as a continuation of the descending colon Lt side of pelvic brim(inlet of pelvic)
- **Parts of the pelvic mesocolon**
 - Sigmoid colon
 - Rectum
 - Upper part of the anal canal

Sigmoid Colon

Location and Description

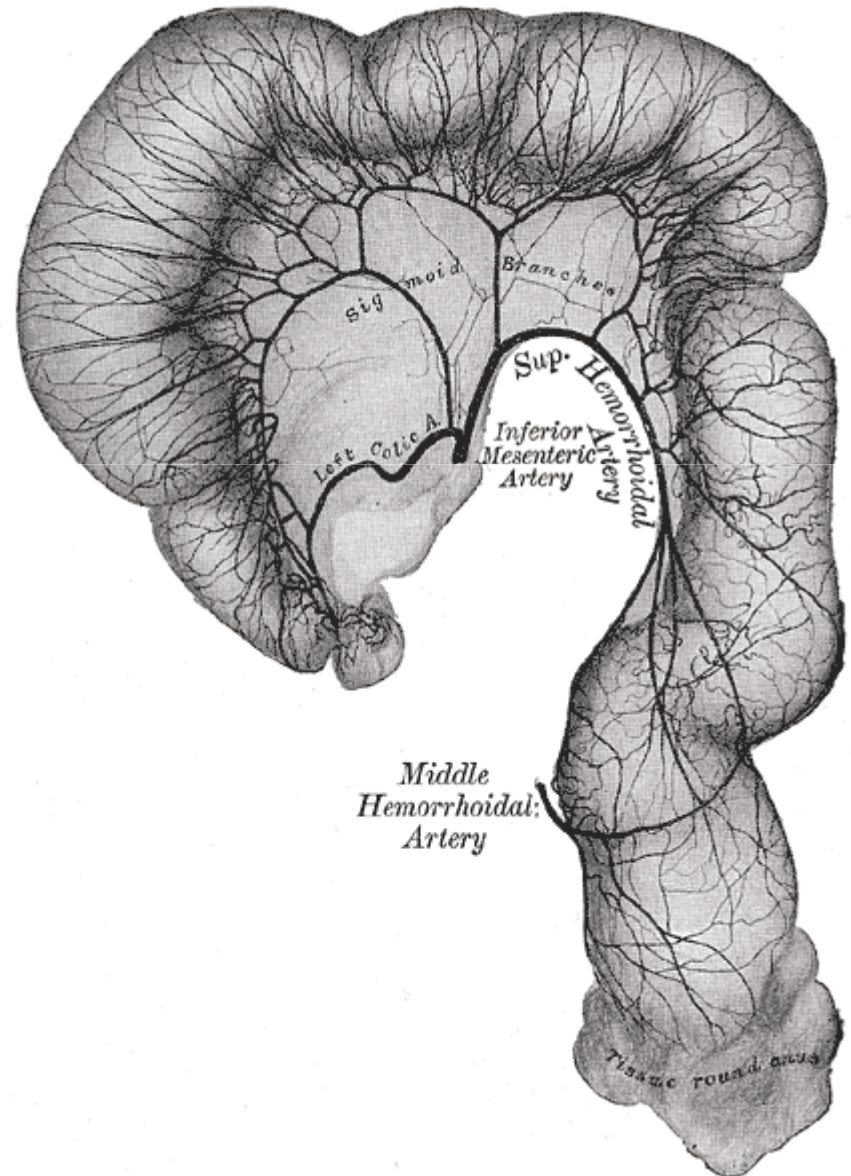
- The sigmoid colon is 10 - 15 in. (25 to 38 cm) long
- It is a part of large intestine in pelvic cavity

Begin: Lt. 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).

Parts:

- Lateral limb → contains lower Lt. colic artery
- Medial limb → contains sup. Rectal artery
- Free margin → curved to Rt. of mid line
- Root → has an inverted V shape attachment

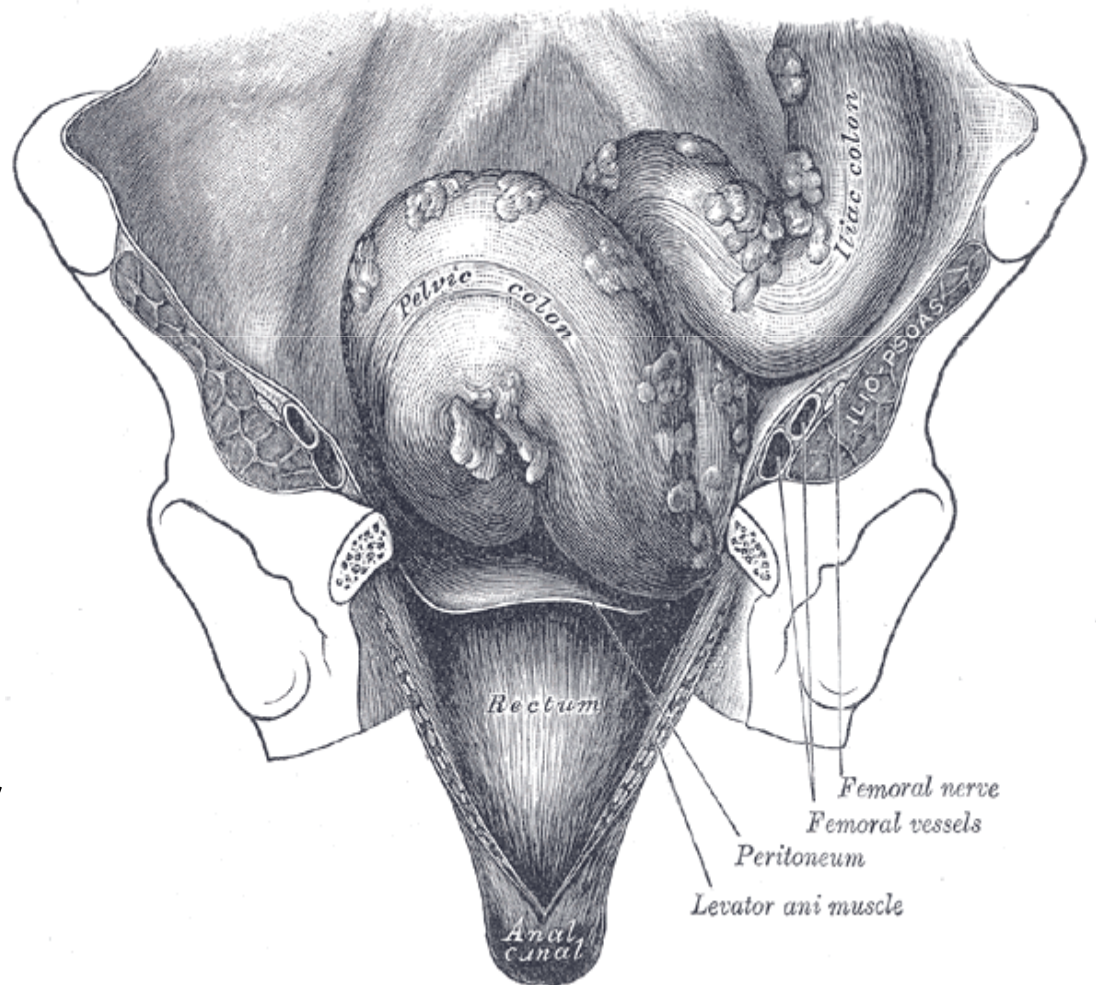


Pelvic colon.....cont

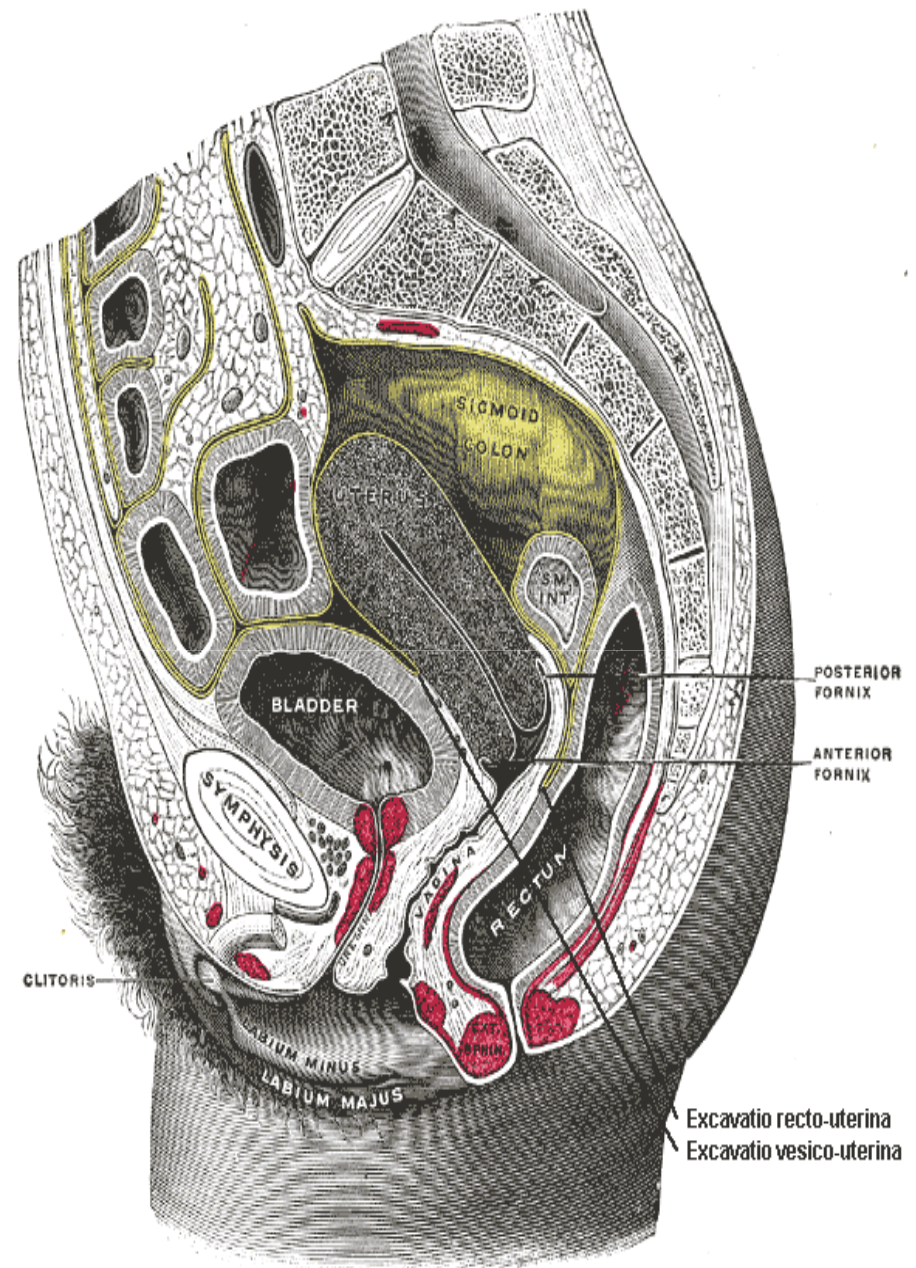
- The sigmoid colon is mobile and hangs down into the pelvic cavity in the form of a loop.
- It is attached to the posterior pelvic wall by the **fan-shaped sigmoid mesocolon**.

Attachment of the root of mesocolon

- **At middle piece of sacrum**
 - **Bifurcation of Lt.common iliac artery**
 - **Middle of Lt.Ext.iliac artery**
-
- The **appendices epiploicae** (omental appendages) are very long in the sigmoid colon



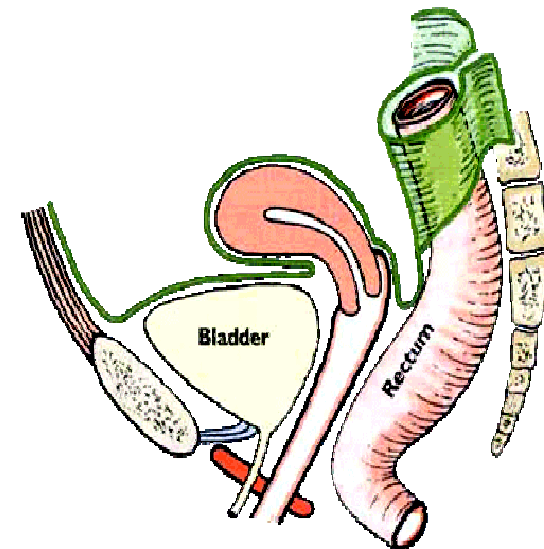
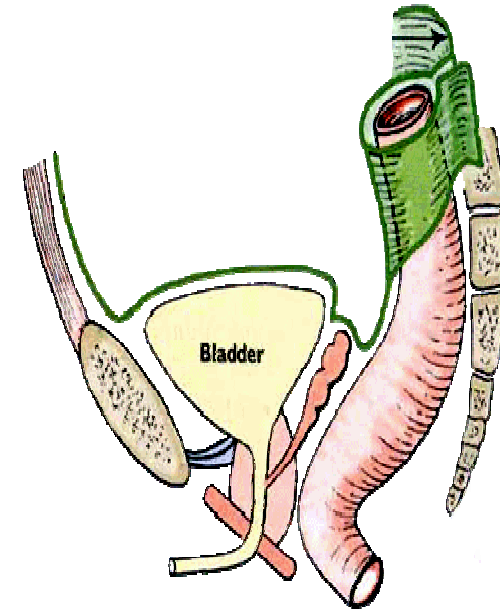
- **Relations of sigmoid c**
- **Left**
 - Lt.Ext. iliac vesseles
 - Lat.wall of pelvis
 - Vas defferance or ovary
- **Right**
 - Small intestines
- Superior**
 - Coils of small intestine
- Inferior**
 - In mal: urinary blabber
 - In femal : uterus



Relations of sigmoid colon

- **Posteriorly:**

- The rectum
 - the sacrum.
 - the lower coils of the terminal part of the ileum
 - Sacral plexus
 - Lt.periformis muscle
 - Lt. external iliac vessels
 - Lt.Ureter
 - Lt. internal common iliac artery
-
- The sigmoid colon usually occupies the **rectovesical pouch in males** and the **rectouterine pouch in females**



Blood Supply of sigmoid colon

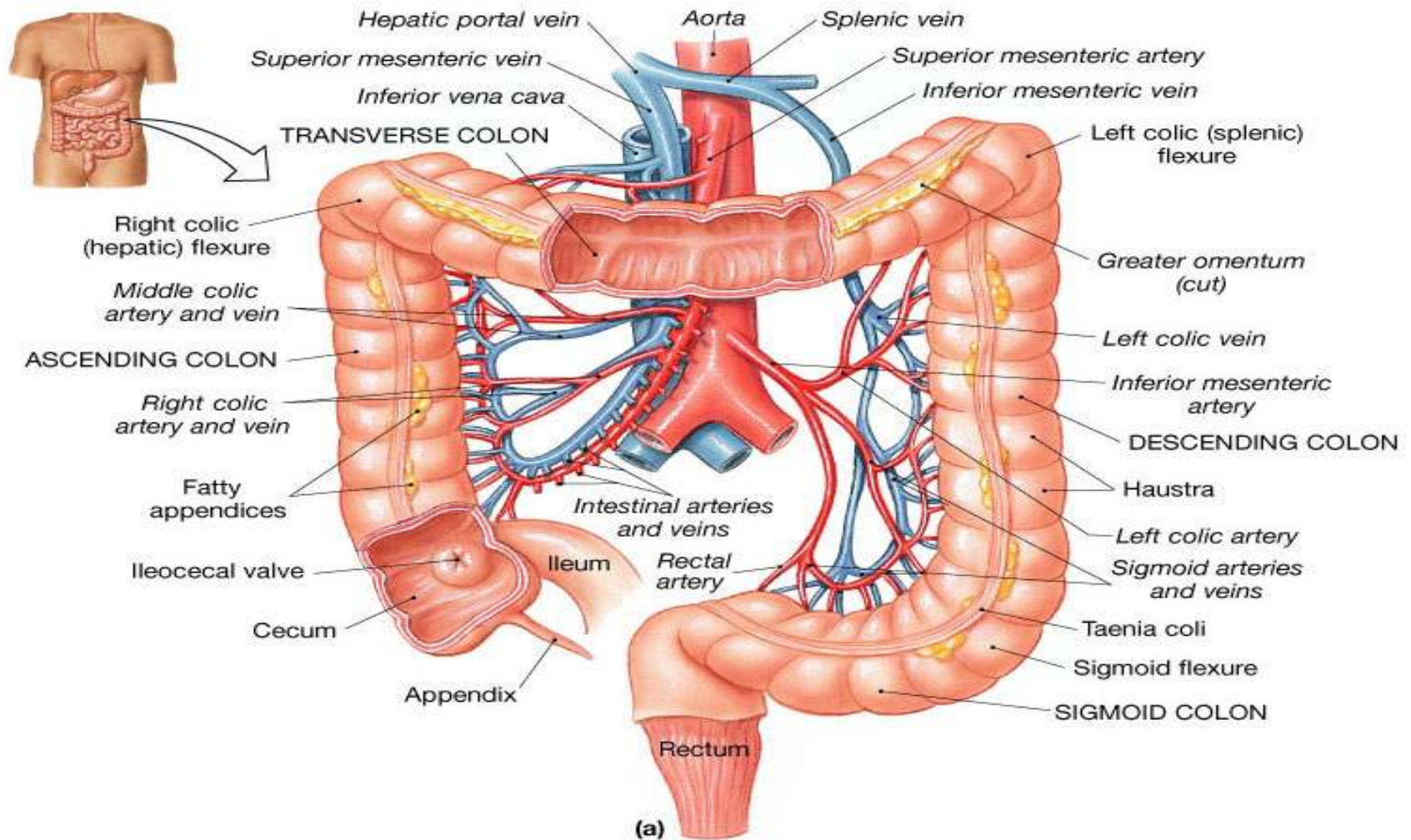
- Arteries

- Sigmoid branches of the inferior mesenteric artery.
- The **most superior sigmoid artery** anastomoses with the descending branch of the **left colic artery**.

- Veins

- The veins drain → the inferior mesenteric vein → the portal venous system.

Blood supply for sigmoid colon



Lymph Drainage of sigmoid colon

- The lymph drains into nodes along the course of the sigmoid arteries → the inferior mesenteric nodes.

Nerve Supply of sigmoid colon

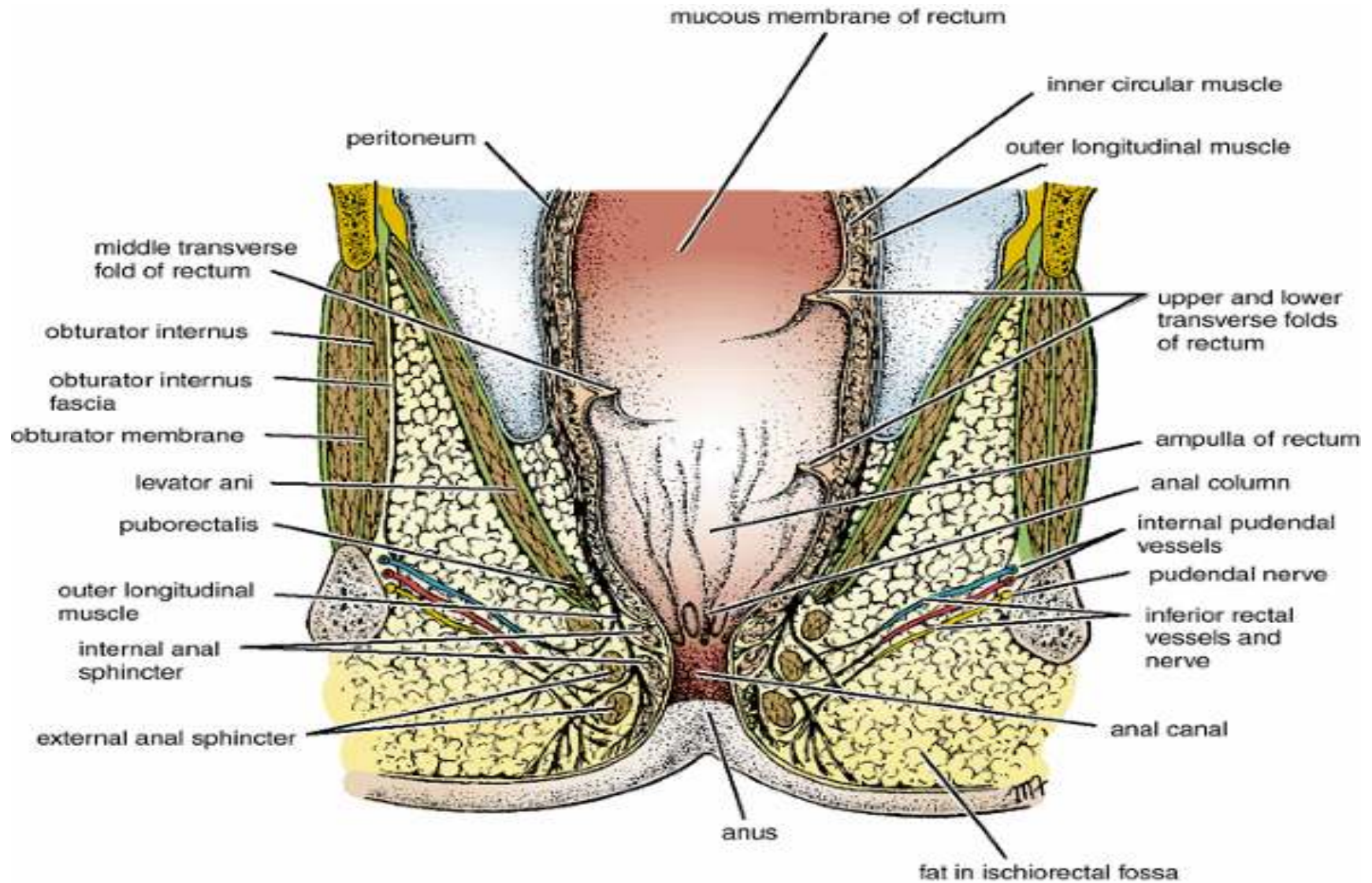
- The sympathetic and parasympathetic nerves from the inferior hypogastric plexuses
- The **parasympathetic supply** is derived from the **pelvic splanchnic nerves**

Rectum

Location and Description

- The rectum is about 5 in. (13 cm) long
- 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 lower part of the rectum is dilated to form the **rectal ampulla**.
- The rectum deviates to the left, but it quickly returns to the median plane
- On lateral view, the rectum follows **the anterior concavity** of the sacrum before bending downward and backward at its junction with the anal canal
- **The puborectalis portion of the levator ani muscles** forms a sling at the junction of the rectum with the anal canal and pulls this part of the bowel forward, producing the anorectal angle.

Rectum



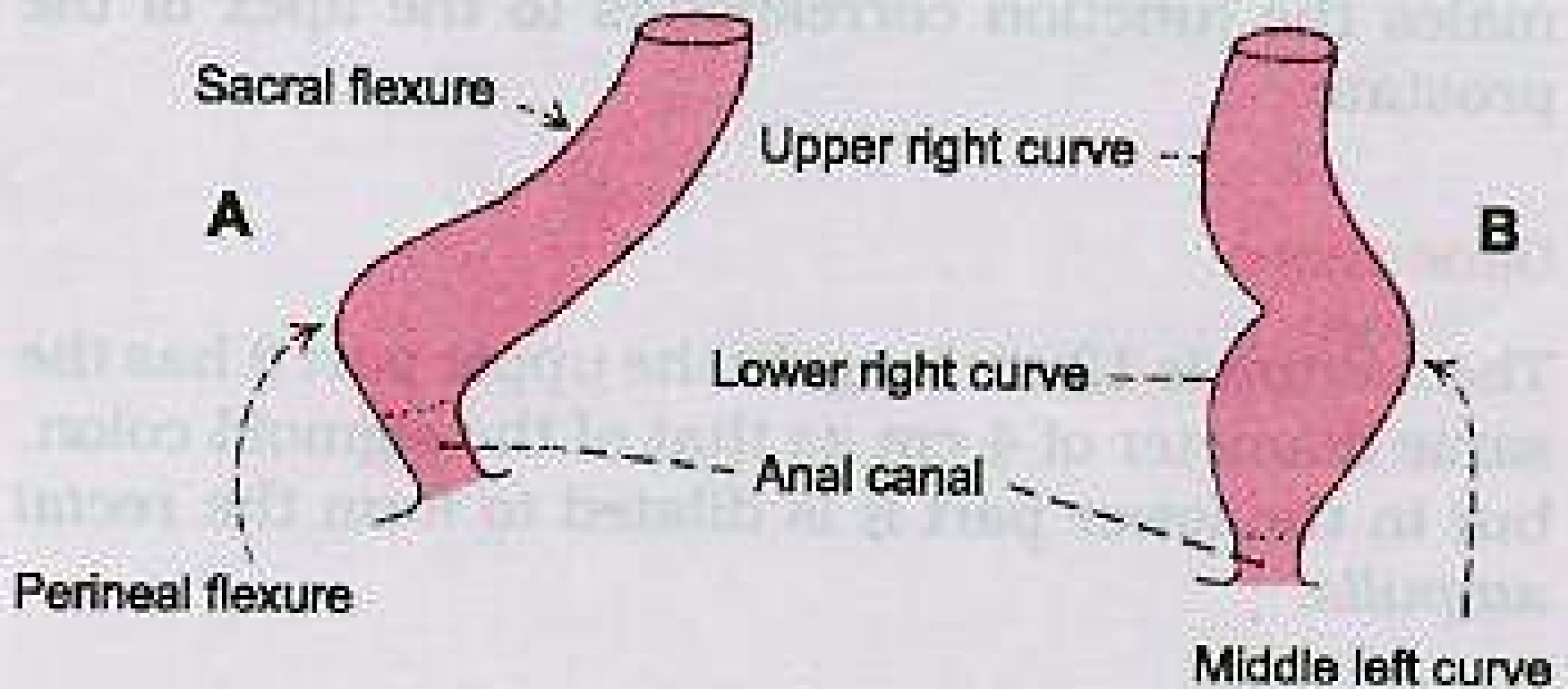
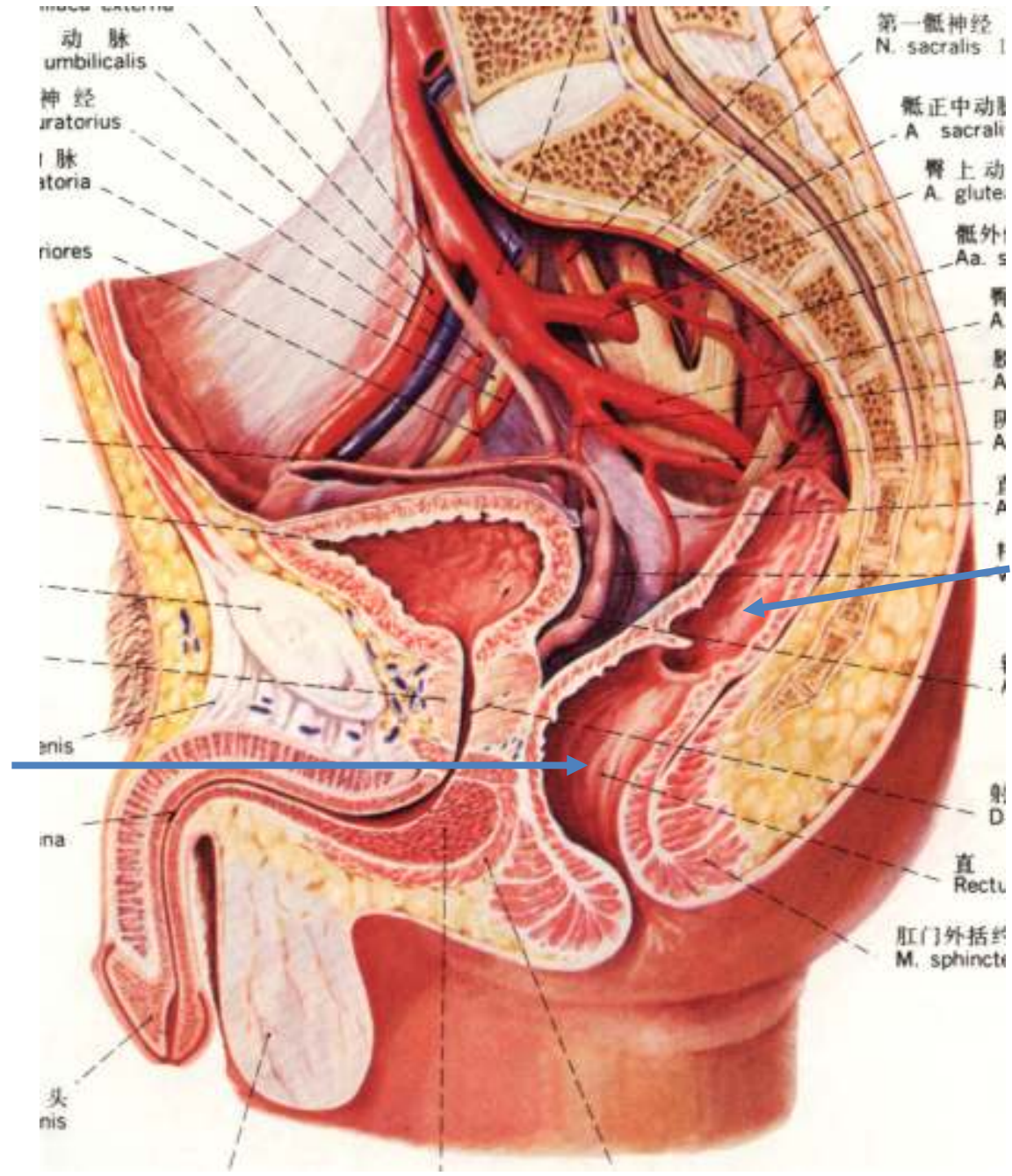
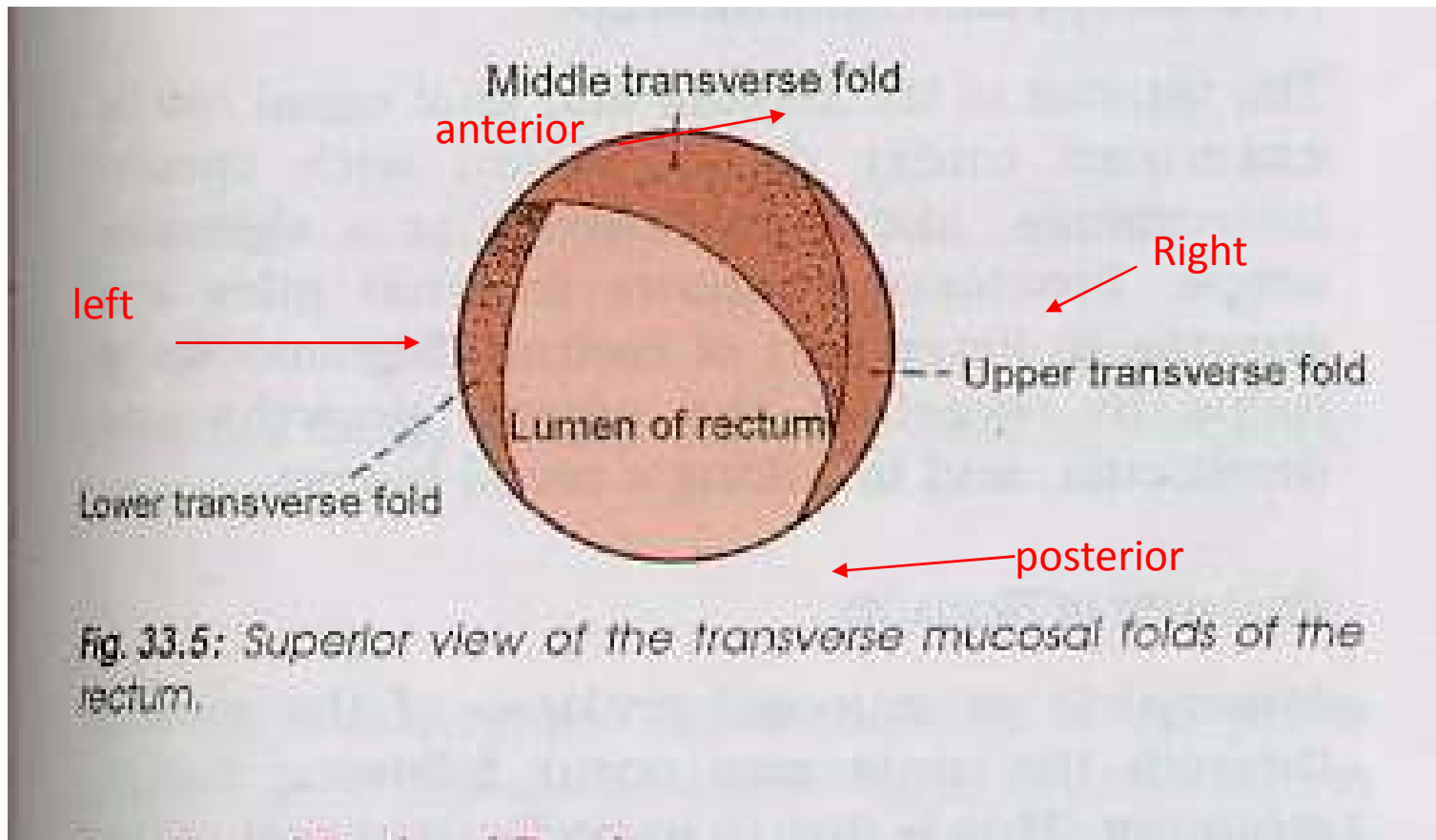


Fig. 33.2: Curvatures of the rectum. (A) Anteroposterior curves; and (B) side to side (lateral) curves.



Sacral flexure

Perineal flexure



Mucosal folds: the transverse or horizontal folds or
Houston's valve: upper fold projects from right,
middle fold projects from anterior and right wall,
lowest fold projects from left wall.

rectum.....cont

- The peritoneum
- first third → covers the anterior and lateral surfaces
- middle third → only the anterior surface of the
- the 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:**

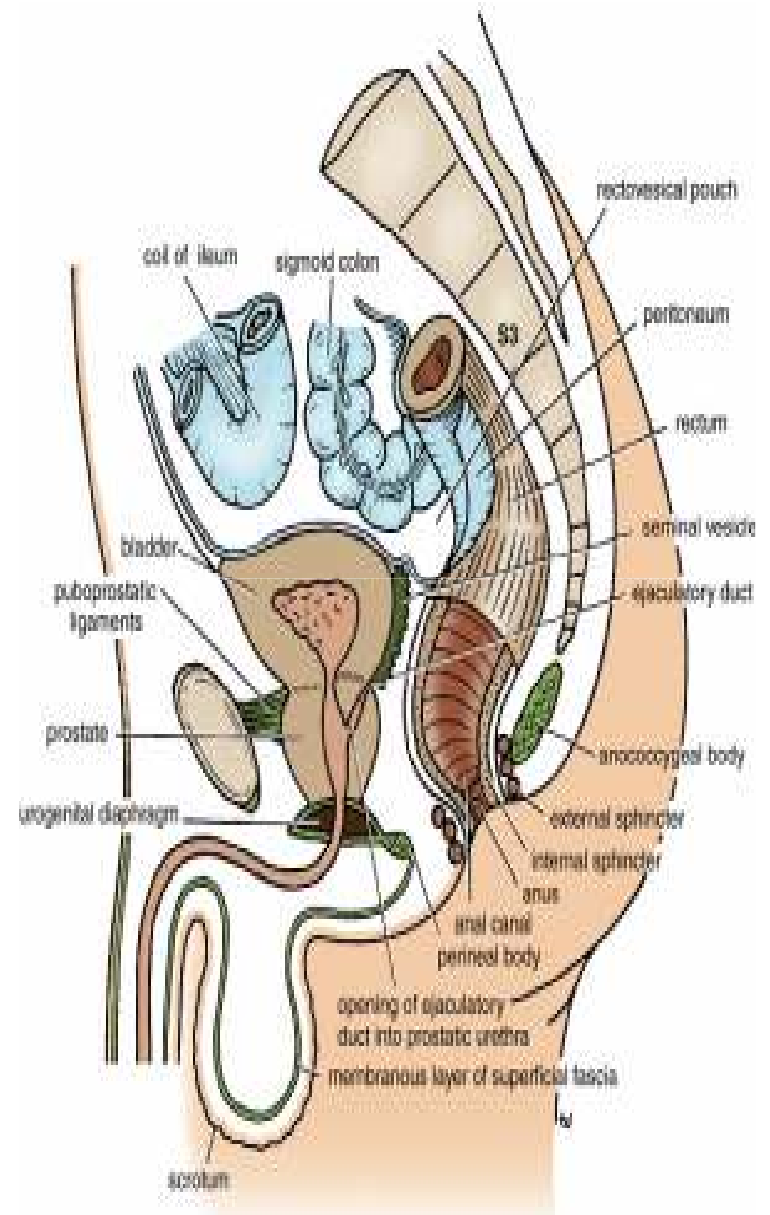
- 1- **In the male**

- 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**

- It is devoid of peritoneum
- It is related to the posterior surface of the bladder
- to the termination of the vas deferens
- the seminal vesicles on each side
- and to the prostate



Relations of rectum...cont

Anteriorly:

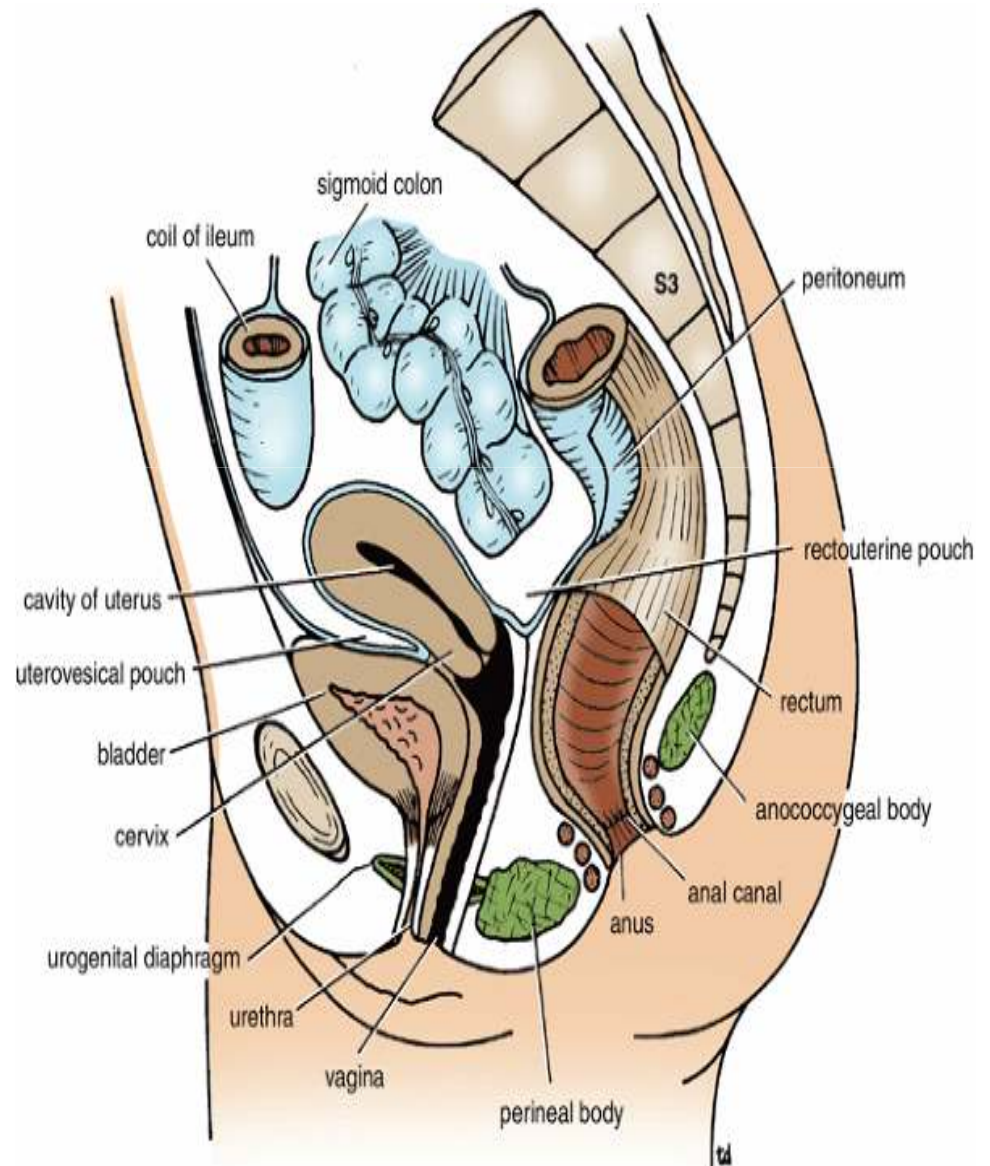
2- In the female

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

- It is devoid of peritoneum
- It is related to the posterior surface of the vagina.



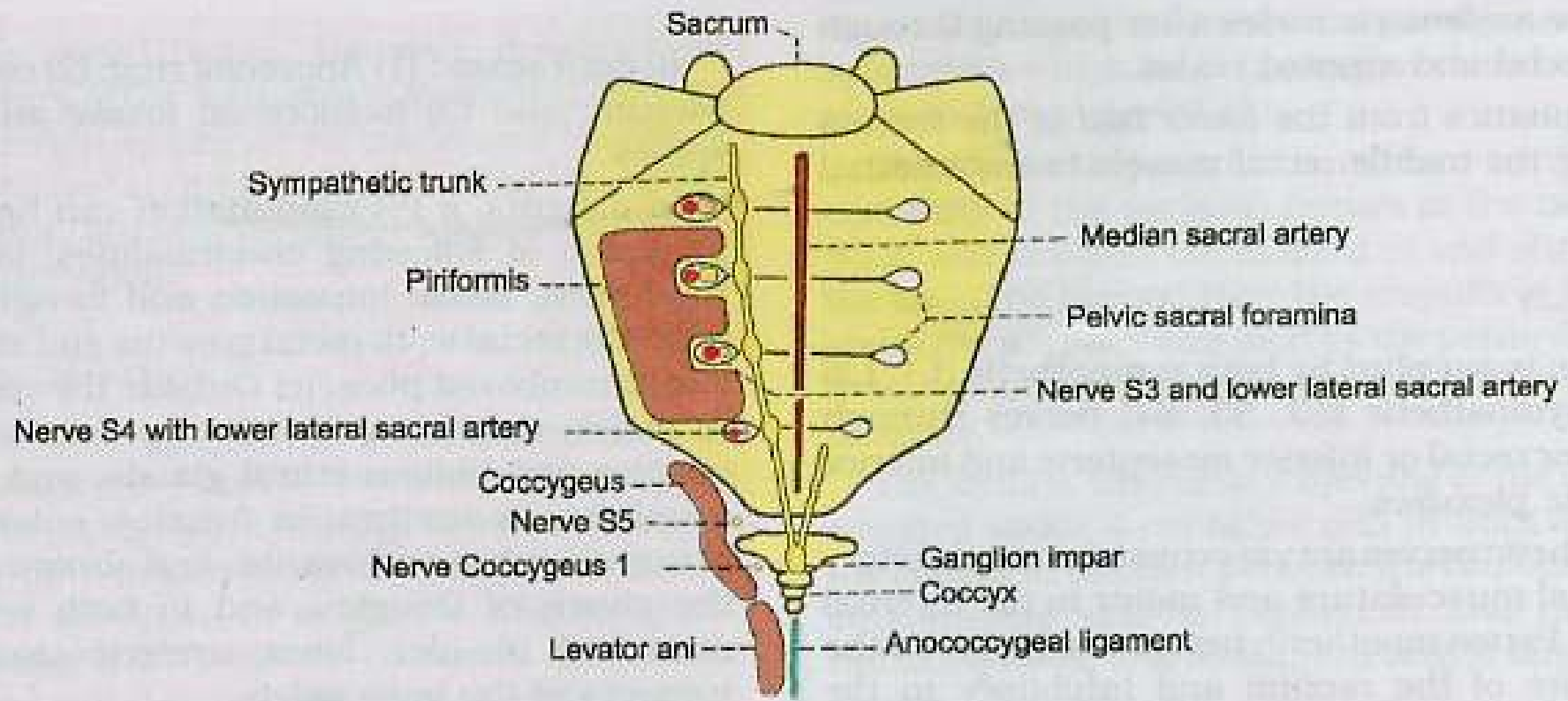
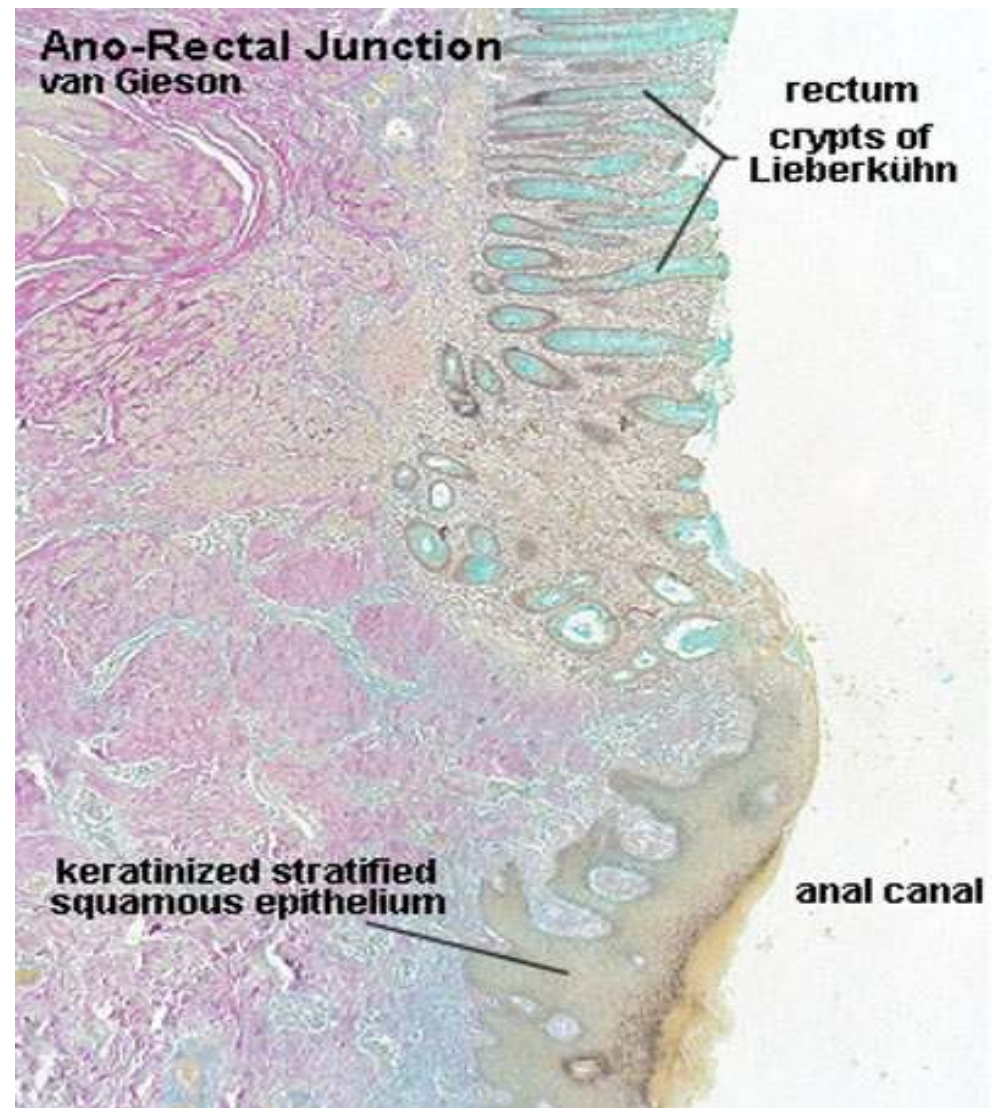
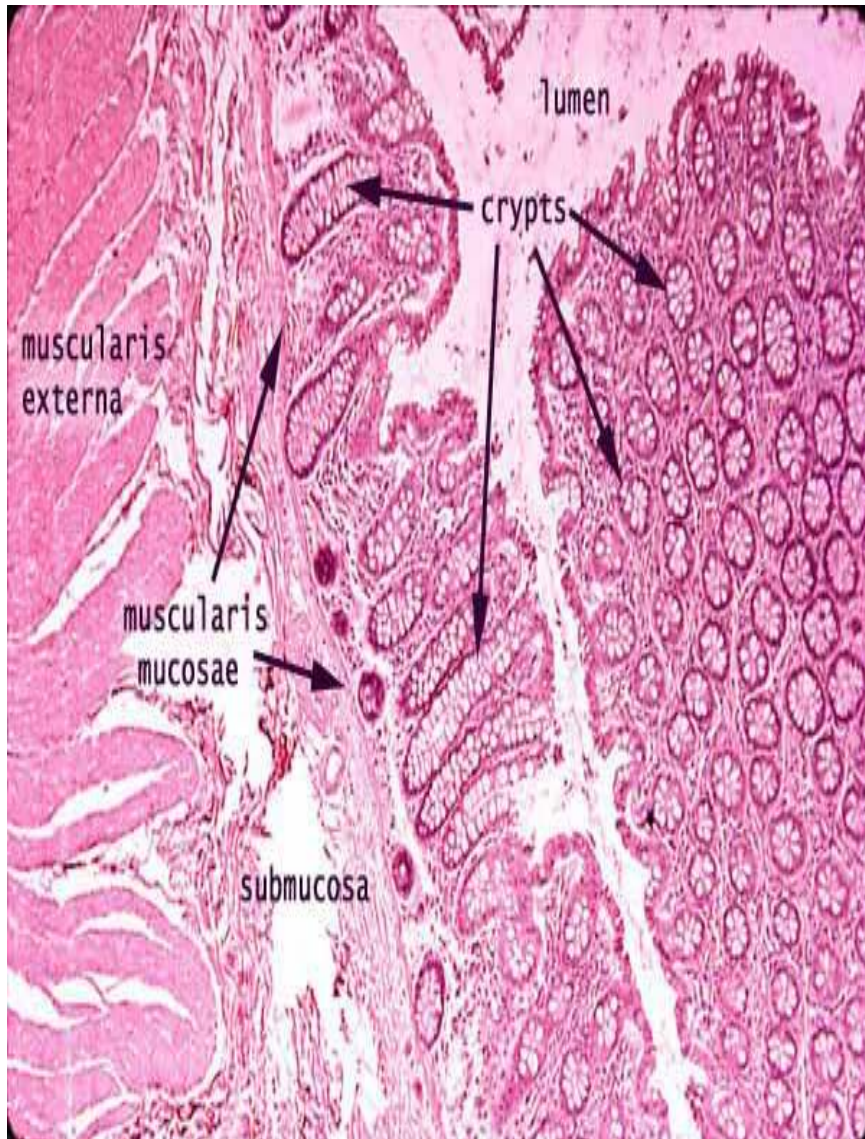


Fig. 33.4: Posterior relations of the rectum (below the level of the middle of the third piece of the sacrum).

Histology of rectum



Histology of the rectum

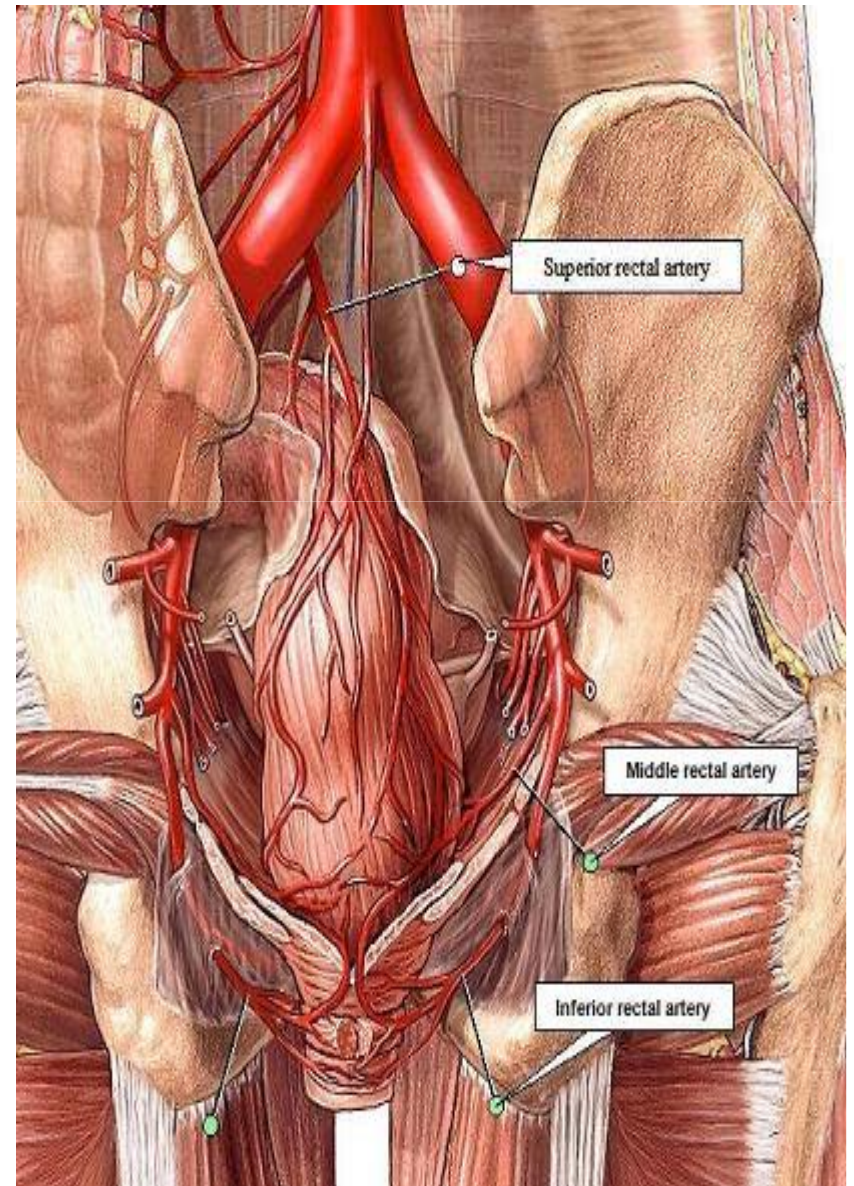
- **The muscular coat** of the rectum is arranged in
 - 1- **outer longitudinal** of smooth muscle
 - 2- **inner circular layers** of smooth muscle
- **The three taenia coli** of the sigmoid colon however, come together so that the longitudinal fibers form a broad band on the anterior and posterior surfaces of the rectum → No taenia coli
- **transverse folds of the rectum** (semicircular permanent folds) → 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**

- It is a direct continuation of the inferior mesenteric artery and is the chief artery supplying the mucous membrane.
- 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.



Blood supply of rectum

2- The middle rectal artery

- It is a small branch of the internal iliac artery
- It is distributed mainly to the muscular coat.

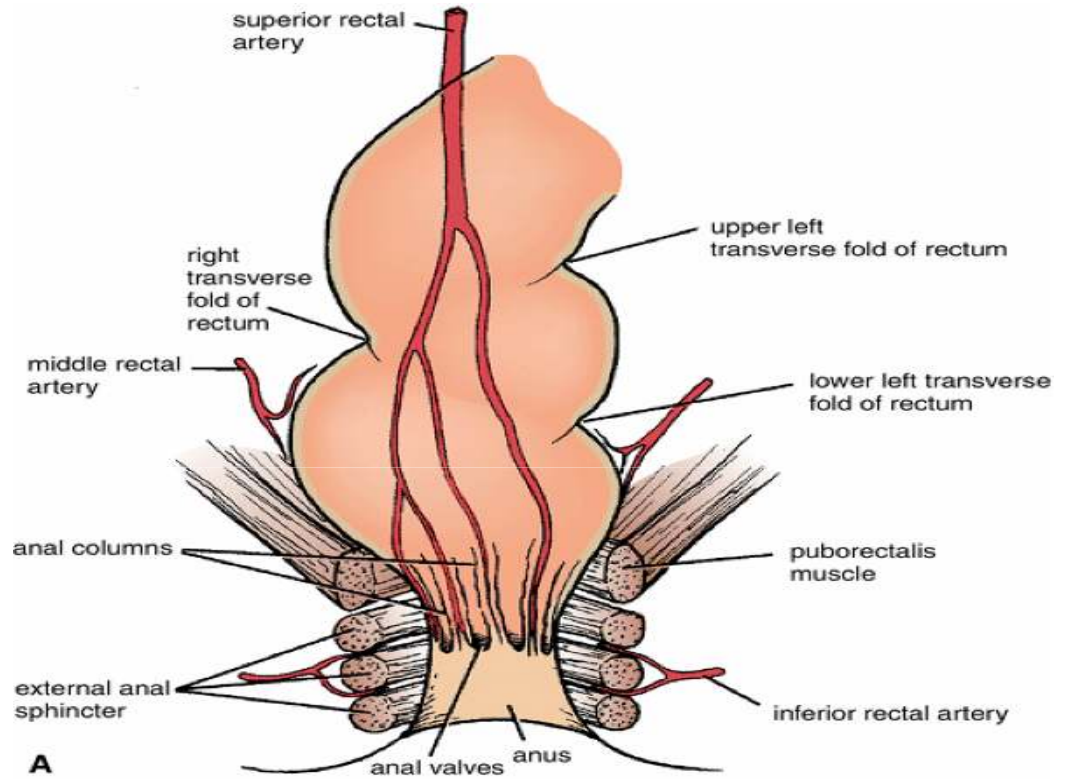
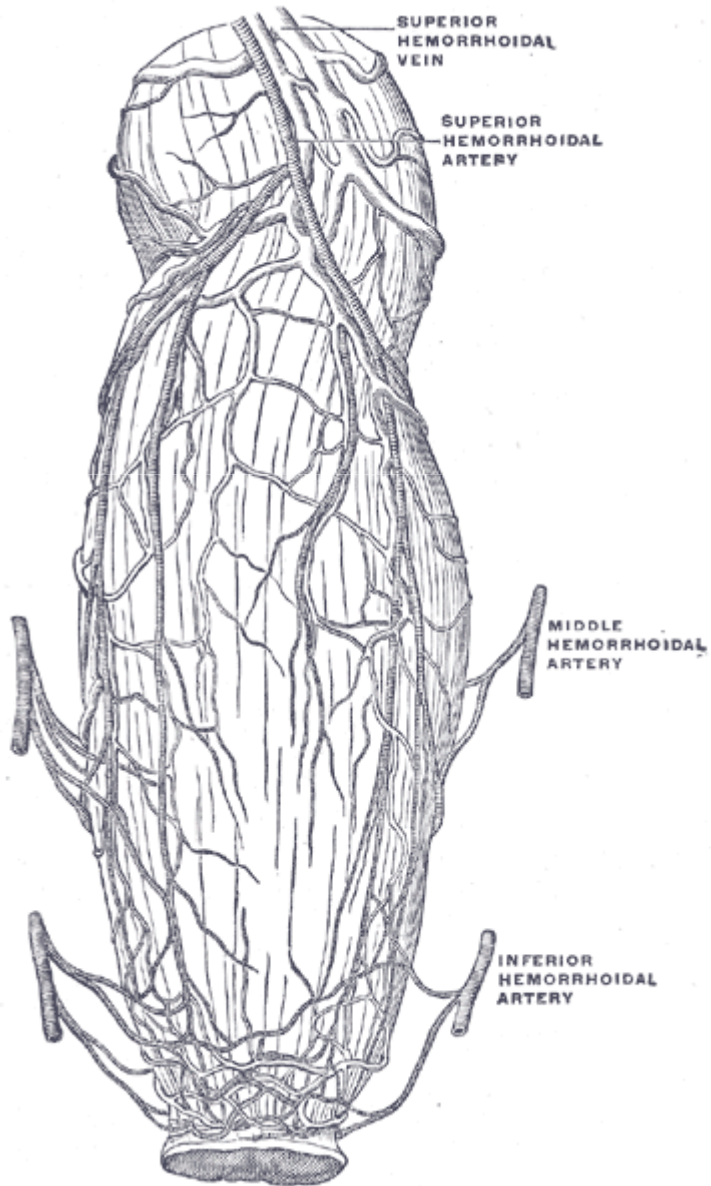
3- The inferior rectal artery

- It is a branch of the internal pudendal artery in the perineum.
- It anastomoses with the middle rectal artery at the anorectal junction.

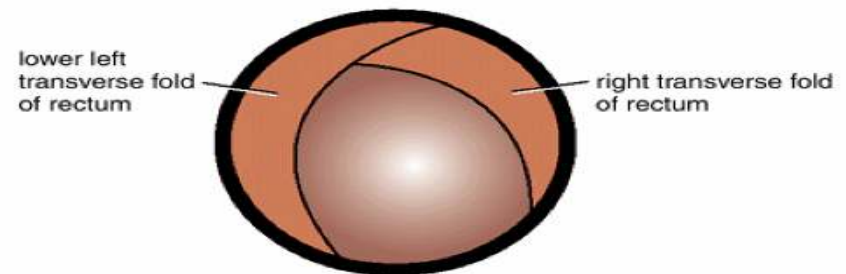
Blood supply of rectum

- Veins
- The veins of the rectum correspond to the arteries.
- The superior rectal vein is a tributary of the portal circulation and drains into the inferior mesenteric vein.
- The middle rectal vein → the internal vein
- inferior rectal vein → internal pudendal veins
- The union between the rectal veins forms an important portal systemic anastomosis .

Blood supply of rectum



A

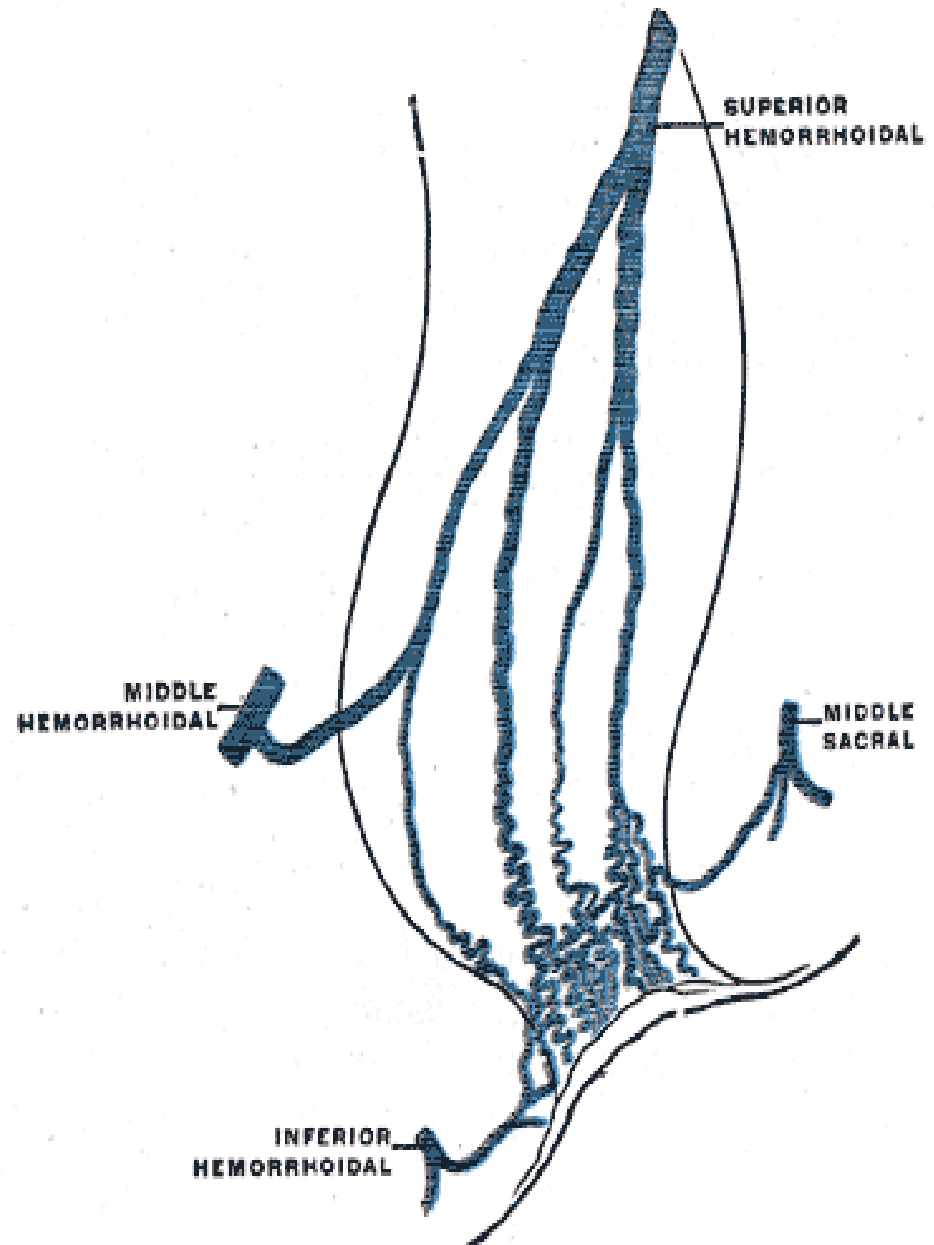


LEFT
B

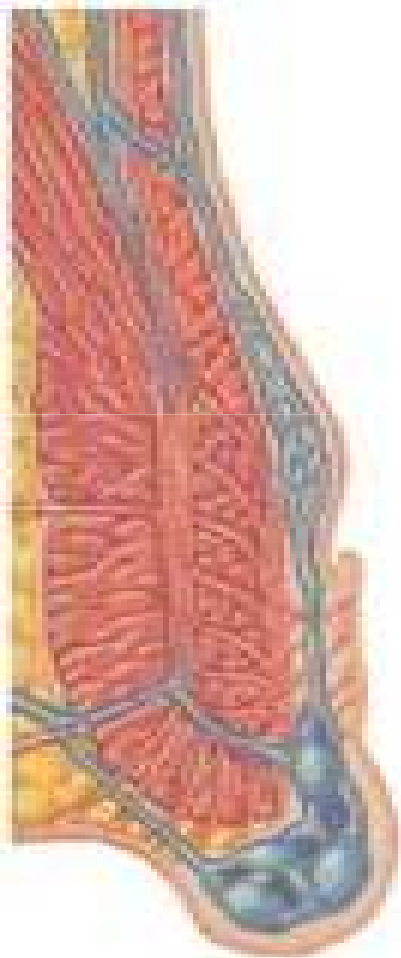
RIGHT

The hemorrhoidal plexus (or rectal venous plexus)

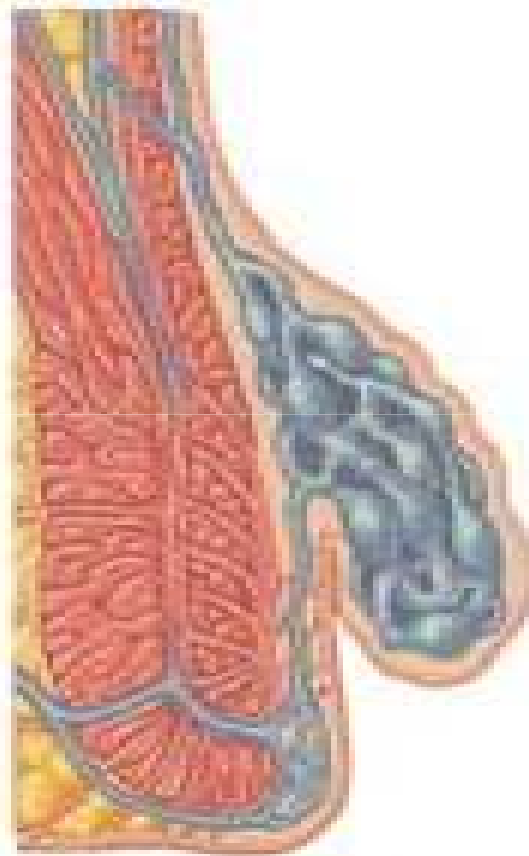
- surrounds the rectum, and communicates in front with the vesical venous plexus in the male, and the uterovaginal plexus in the female.
- A free communication between the portal and systemic venous systems is established through the hemorrhoidal plexus.



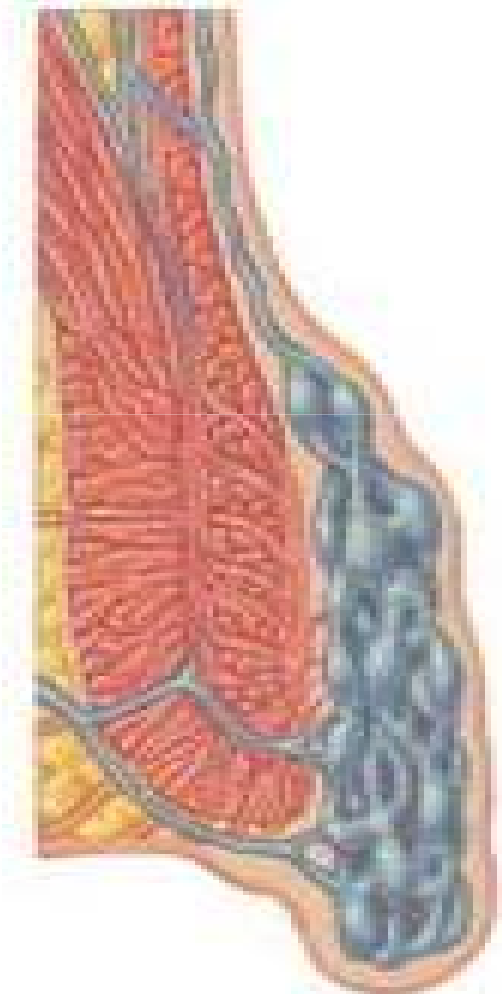
Rectal plexus & Hemorrhoids



Origin below dentate line
(external rectal plexus)



Origin above dentate line
(internal rectal plexus)



Origin above and below dentate line
(internal and external rectal plexus)

Lymph Drainage of rectum

- the upper part drain → into the pararectal nodes → then into inferior mesenteric nodes.
- the lower part follow the middle rectal artery → to the internal iliac nodes.

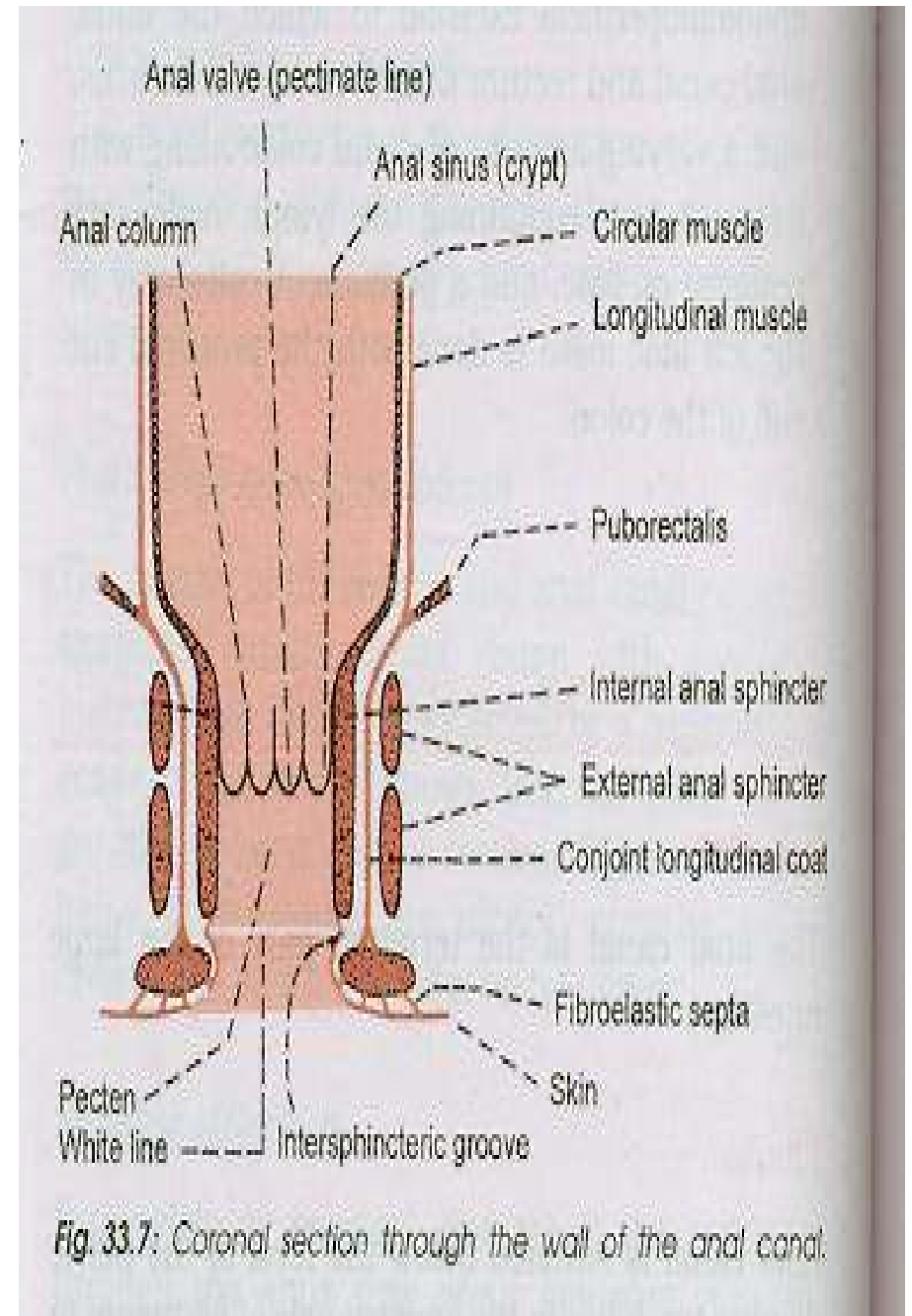
Nerve Supply of rectum

- The nerve supply is from the sympathetic and parasympathetic nerves from the inferior hypogastric plexuses.
- The rectum is sensitive only to stretch.

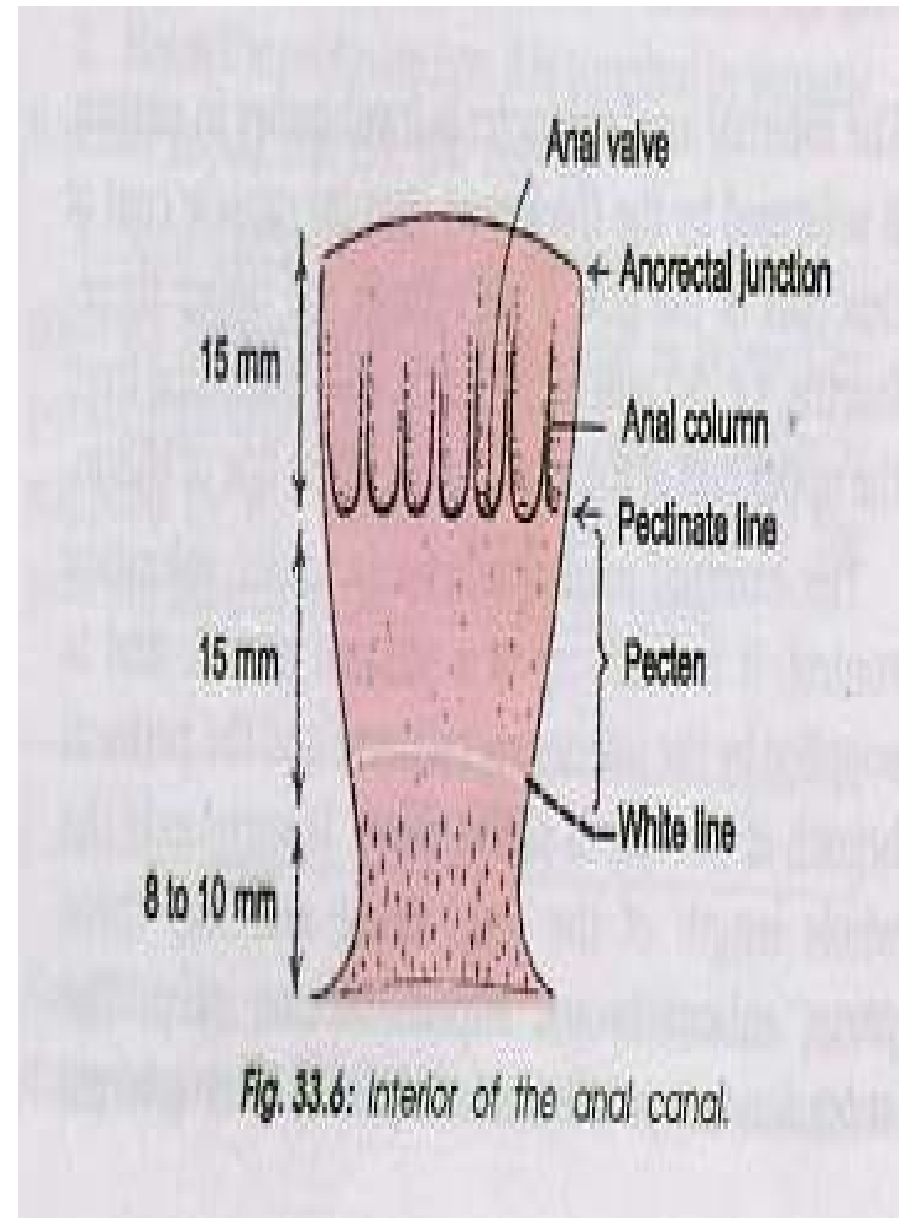
Anal canal

The 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 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 4cm below and in front of the tip of the coccyx in the cleft between two buttocks.

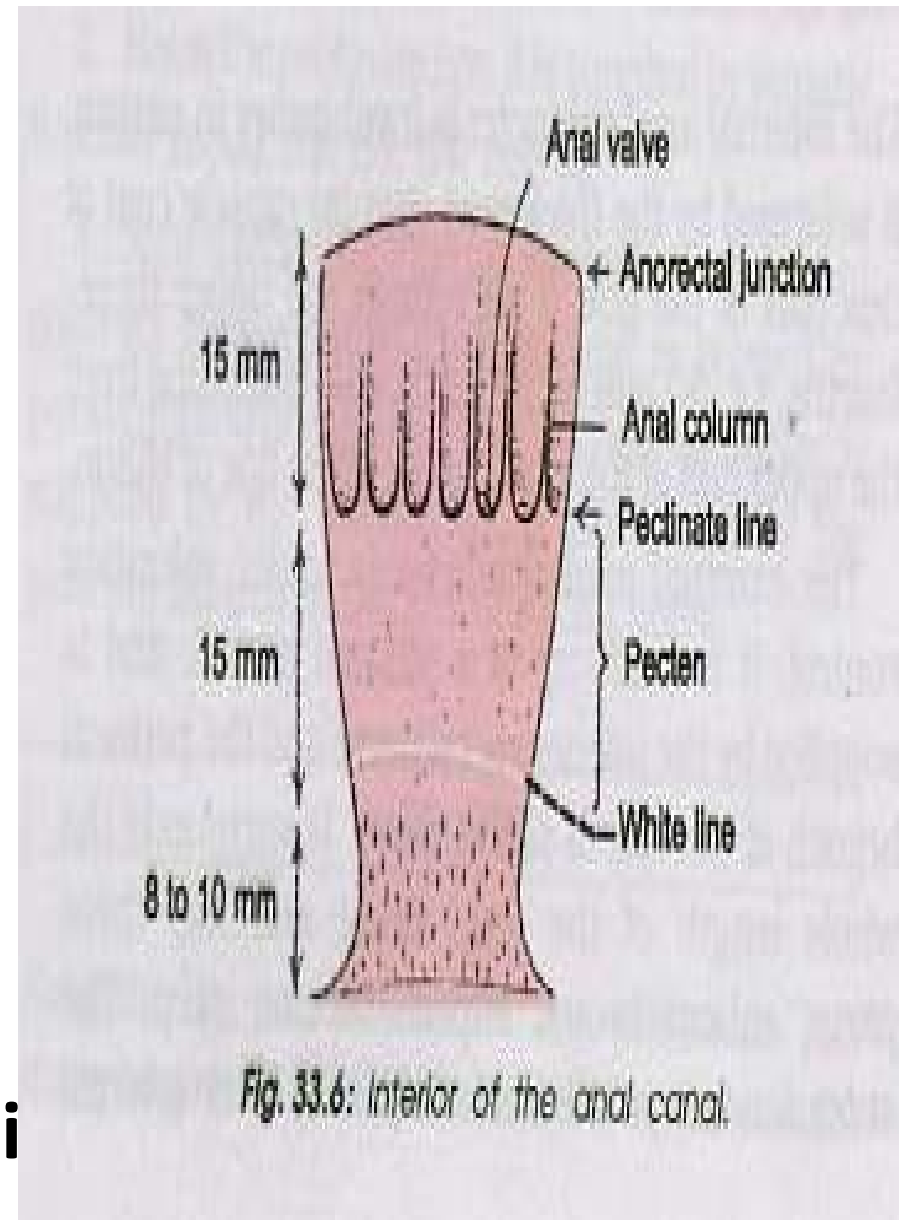


- **Anorectal ring:**
- this is a muscular ring present at the anorectal junction.
- It is formed by the fusion of the puborectalis, deep external sphincter and the internal sphincter, which can be felt on rectal examination .

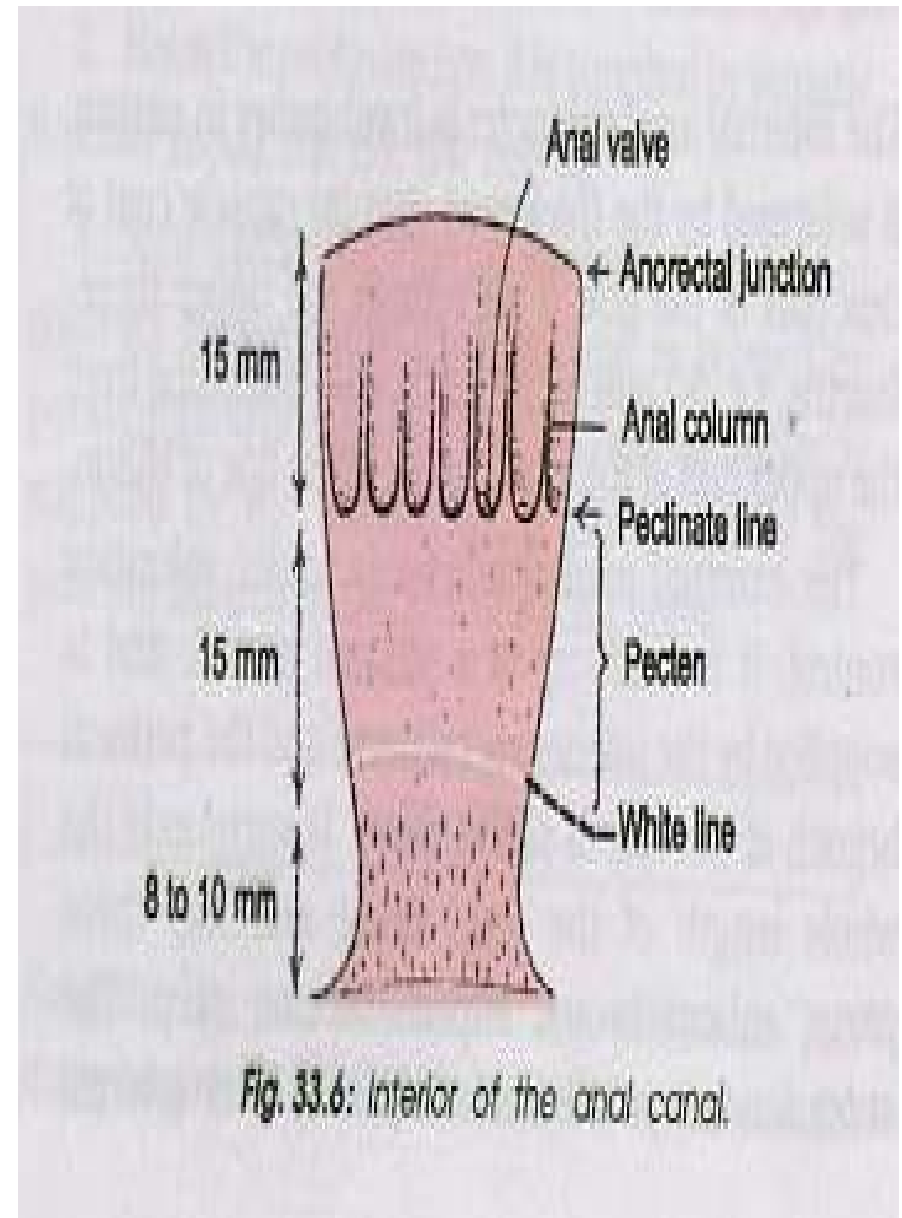


Interior of the anal canal shows many features and can be divided into three parts :

1- upper part is lined by mucous membrane, & is of endodermal origin. 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**.

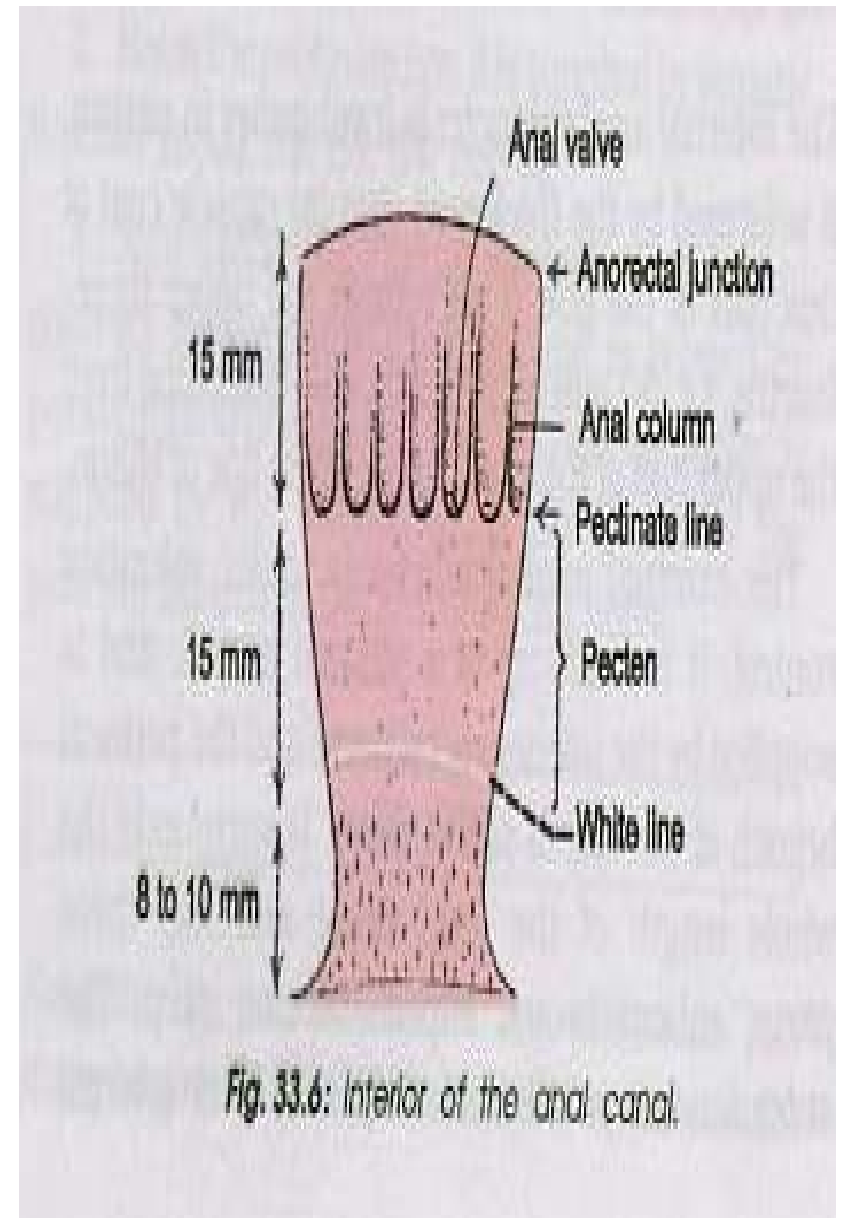


2- The middle part of anal canal

- It is termed as transitional zone or pecten, it is also lined by mucous membrane.
- The mucosa has a bluish appearance because of a **dense venous plexus** that lies beneath.
- The lower limit of the pecten often has a whitish appearance because of which it is referred to as the white line or Hilton's line, is situated at the level the interval between the subcutaneous part of external anal sphincter and the lower border of internal anal sphincter.

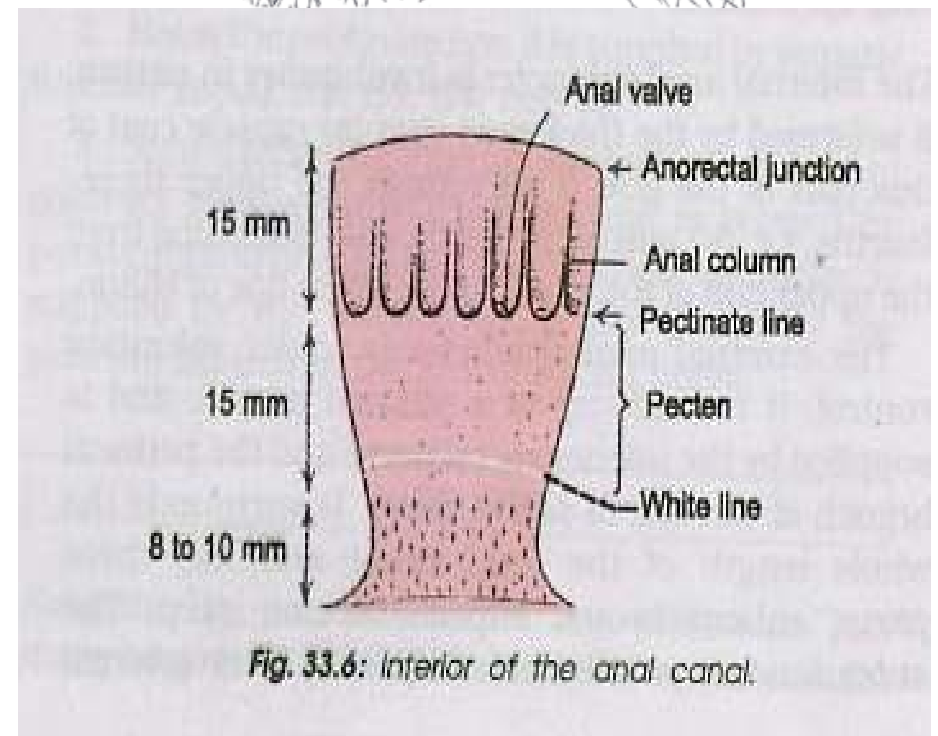
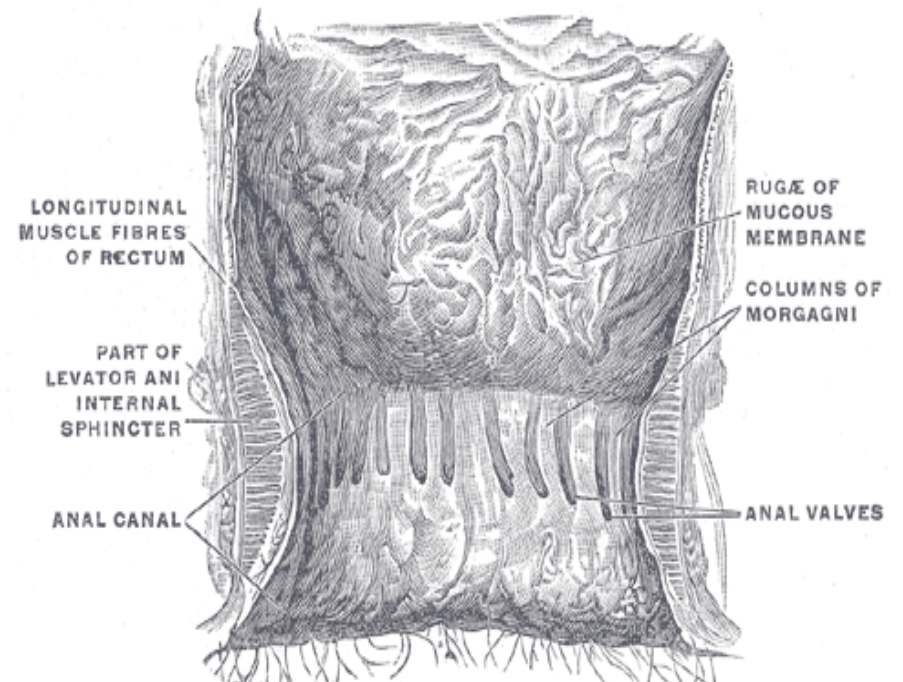
3- Lower cutaneous part

is about 8mm long and is lined by true skin containing sweat and sebaceous glands.



White 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

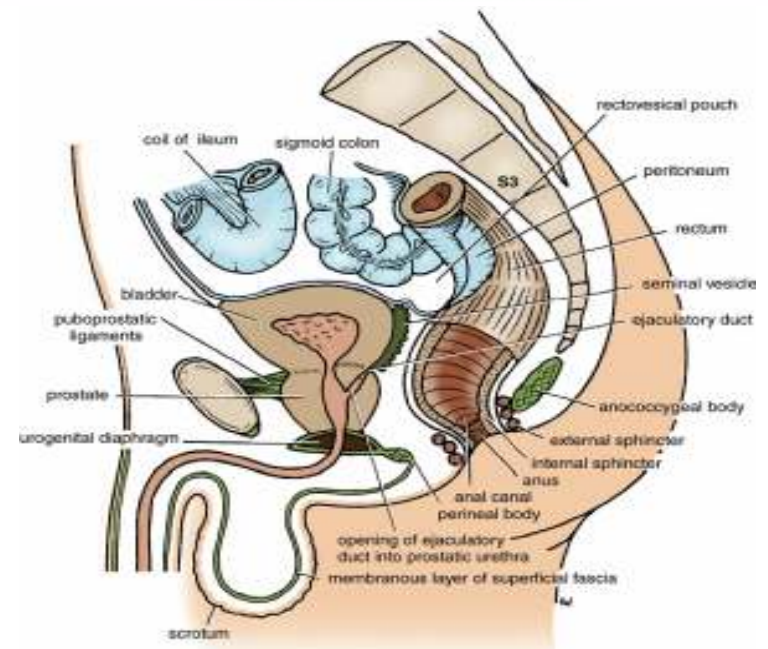
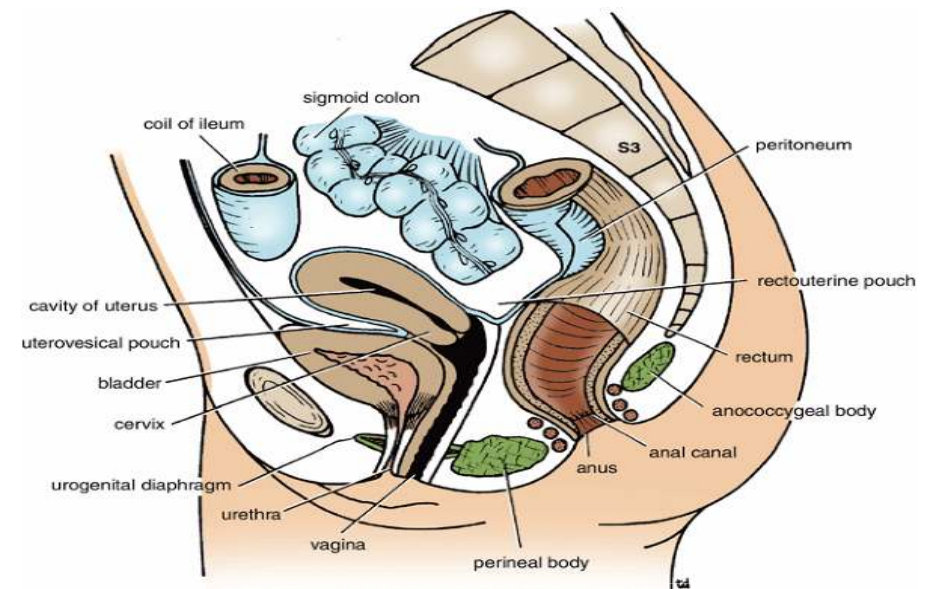
- lower end of the vagina

Posteriorly

- anococcygeal ligament
- tip of the coccyx

laterally

- ischiorectal fossae.



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.the external anal sphincter is under voluntary control. & 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 fibres surround the lower part of the internal sphincter and are inserted into the perineal body.

The deep part surrounds the upper part of the internal sphincter and is fused with the puborectalis.

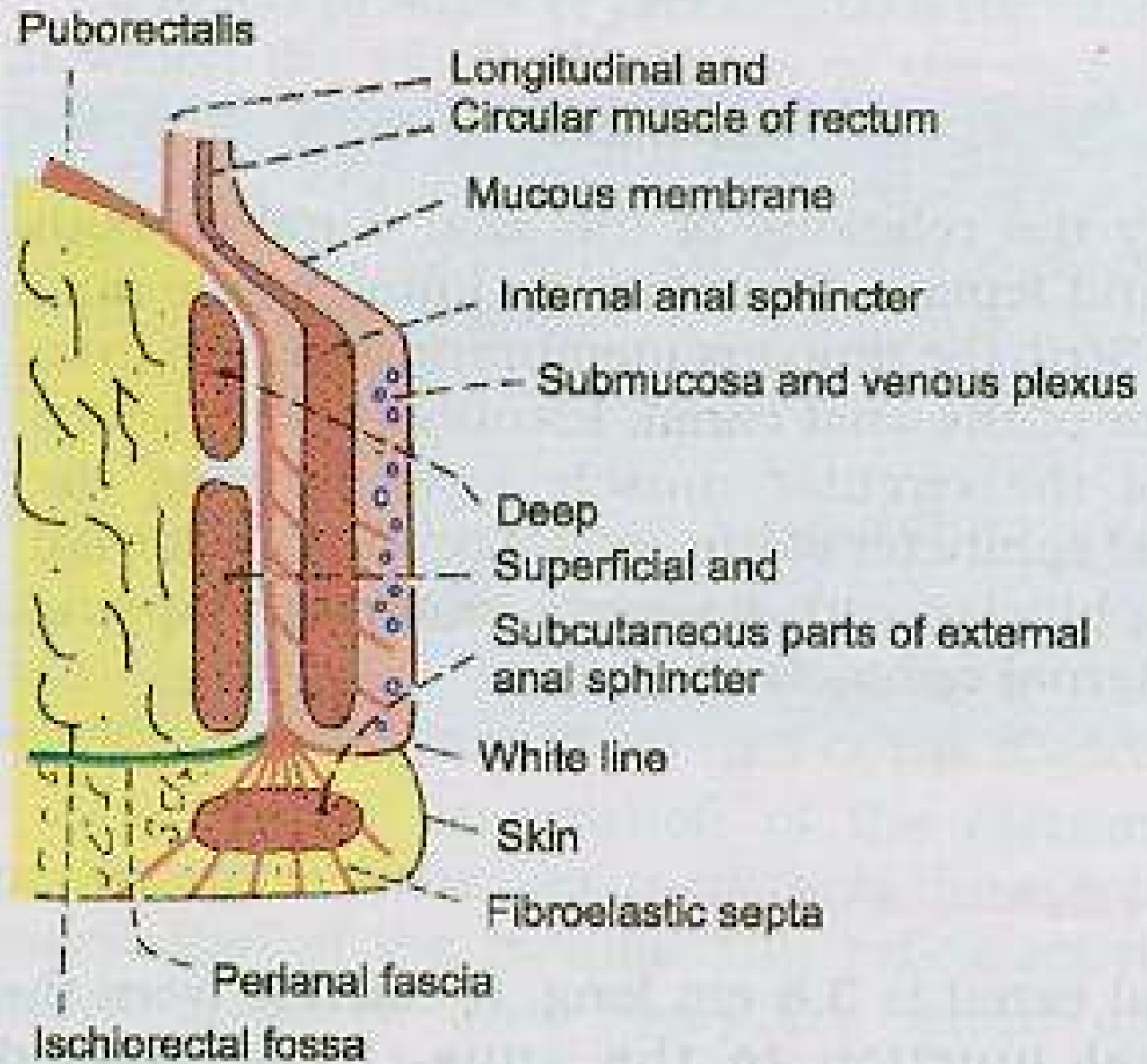


Fig. 33.8: Coronal section through the anal canal.

Blood supply of anal canal

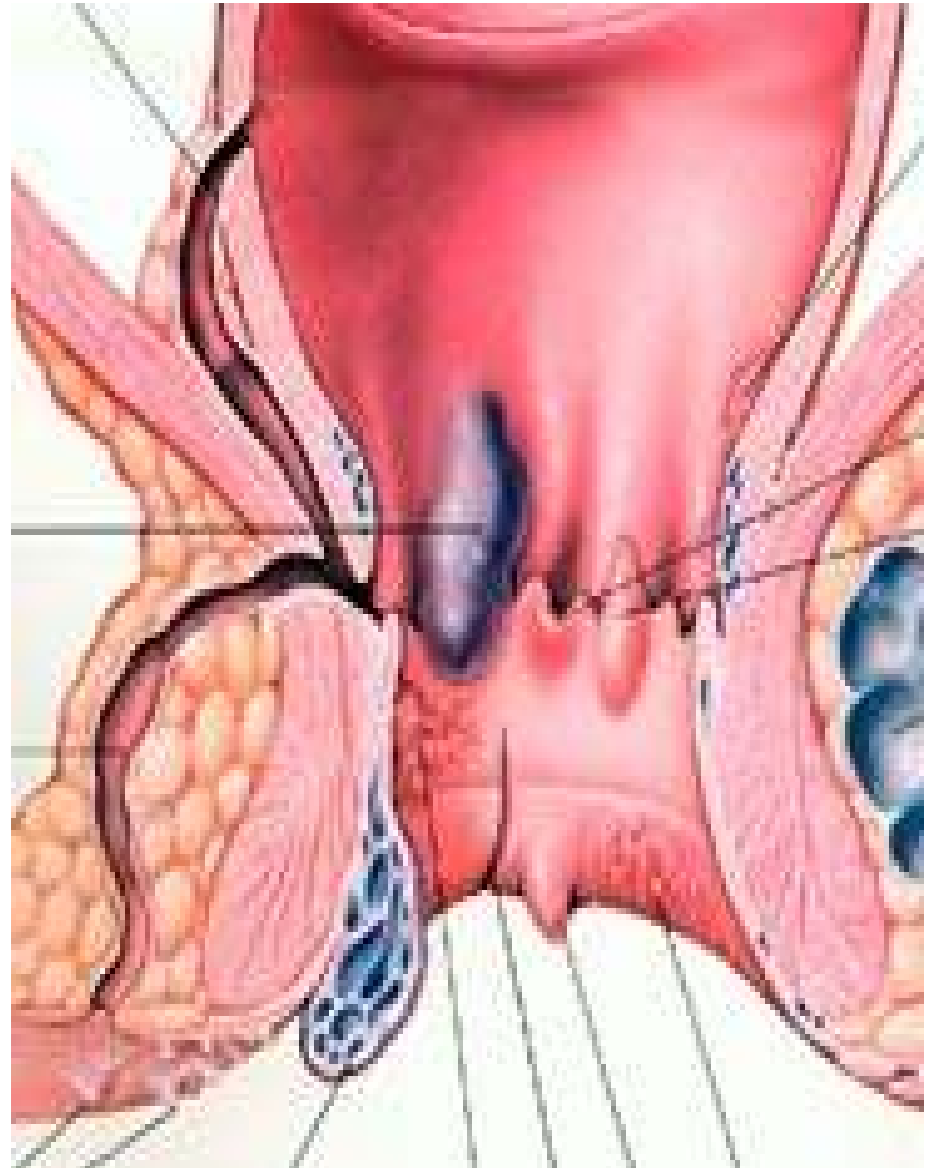
Arterial supply:

- 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.

- **Venous drainage:**
- internal rectal venous plexus drains into superior rectal vein
- 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
- upper part by the superior rectal vein into the inferior mesenteric vein.
- The anal vein 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 hemorrhoids refers to a condition in which the veins around the anus or lower rectum are swollen and inflamed.

- Hemorrhoids may result from

1- straining to move stool.

2- Other contributing factors include **pregnancy, aging, chronic constipation or diarrhea, and anal intercourse.**

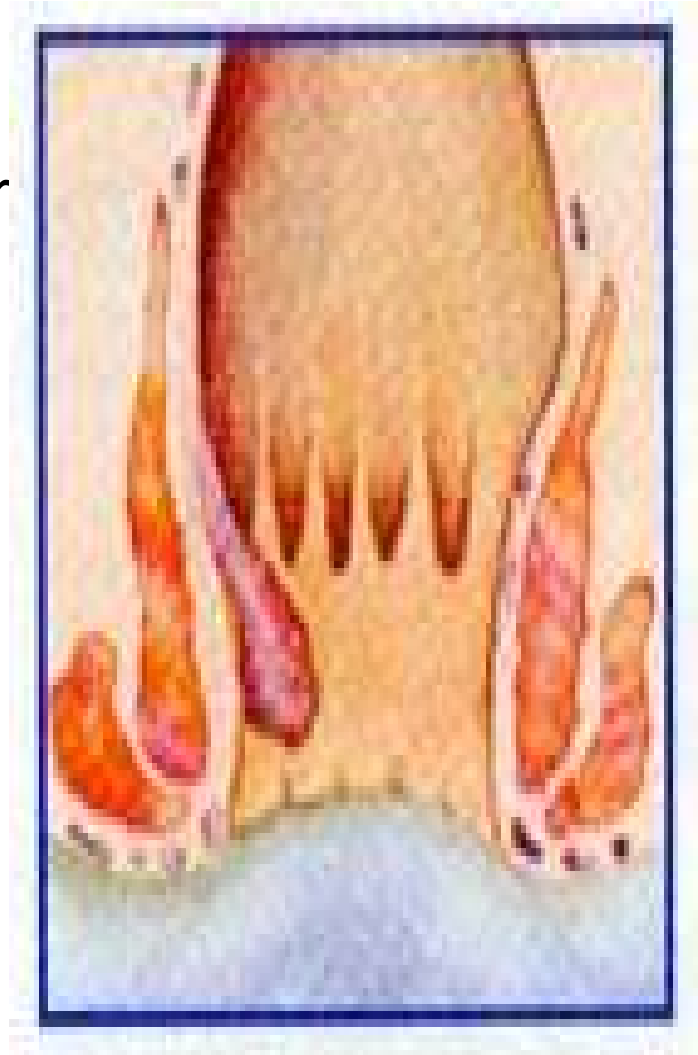
Two types

1- Hemorrhoids are both inside and above the anus (internal)

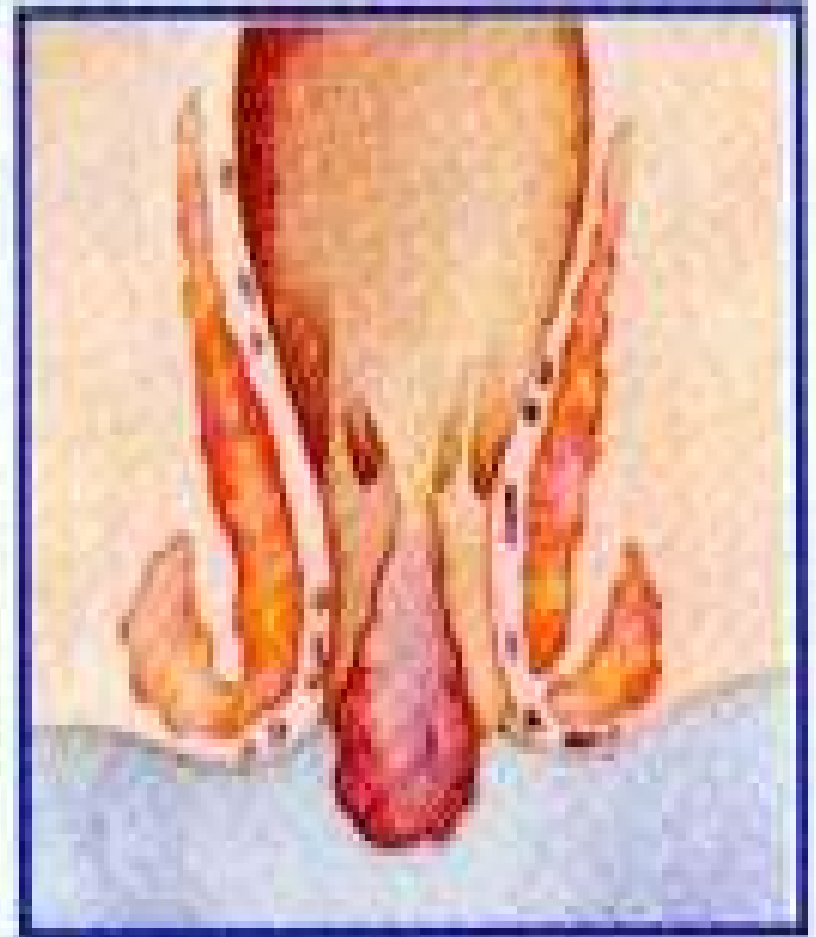
2- Under the skin around the anus (external).

Hemorrhoids (piles) arise from congestion of internal and/or external venous plexuses around the anal canal

- **Internal hemorrhoids (piles)** 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.
- Varicosities of the sup. Rectal vein
- Lies in the anal columns at 3,7,11 o'clock (lithotomy position)



- **External hemorrhoids** are visible-occurring out side 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 and tender.
- Inferior rectal vein
- Thrombosis is common



Causes for hemorrhoids

- Congenital weakness of the venous walls
- Superior rectal vein is the most dependant and valvless
- Chronic constipation and cough
- Pregnancies
- Portal hypertension
- Cancer in the rectum

- Sometimes, internal hemorrhoids will come through the anal opening when straining to move your bowels. This is called a prolapsed internal hemorrhoid; it is often difficult to ease back into the rectum, and is usually quite painful.



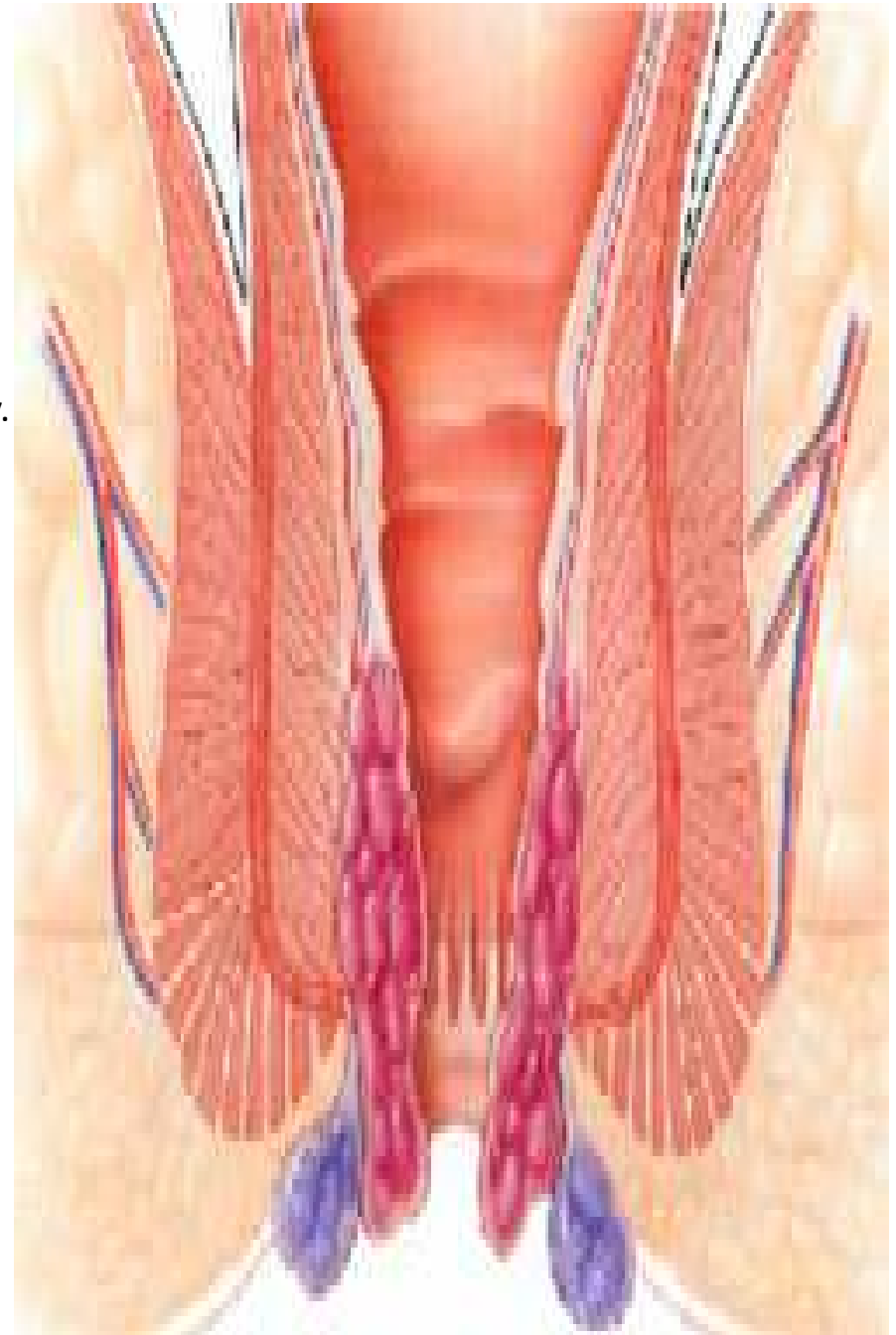
- When a blood clot forms inside an external hemorrhoid, it often causes Severe pain. This thrombosed external hemorrhoid can be felt as a firm, tender mass in the anal area, about the size of a pea.



- **Surgical Classification of Hemorrhoids**

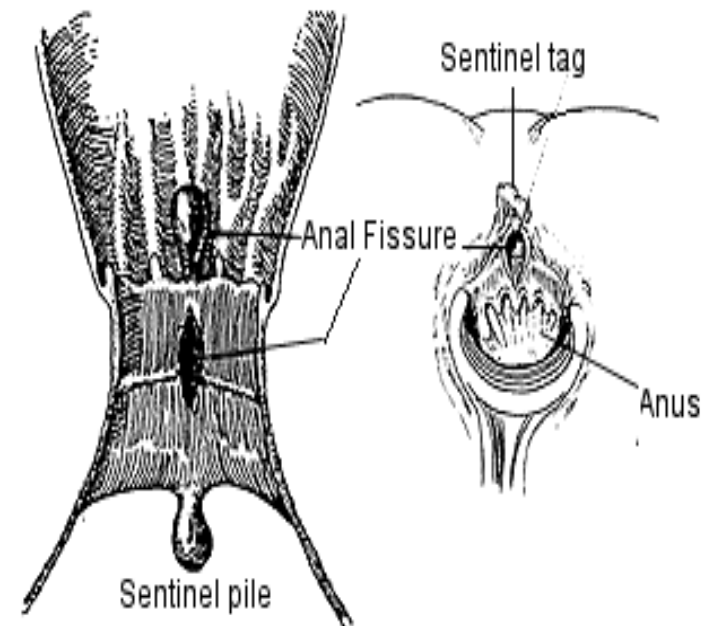
Hemorrhoids (piles) arise from congestion of internal and/or external venous plexuses around the anal canal. They are classified, depending on severity, into four degrees.

- **First degree** hemorrhoids bleed but do not prolapse outside of the anal canal;
 - **second degree** prolapse outside of the anal canal, usually upon defecation, but retract spontaneously.
 - **Third degree** hemorrhoids require manual placement back inside of the anal canal after prolapsing,
 - **fourth degree** hemorrhoids consist of prolapsed tissue that cannot be manually replaced and is usually strangulated or thrombosed.
-
- **Symptoms associated with hemorrhoids include pain**, bleeding, puritus ani (itching) and mucus discharge.
 - In IV degree prolapse, the area where the rectal mucous membrane meets the anal skin (the dentate line) is positioned almost outside the anal canal, and the rectal mucous membrane permanently occupies the muscular anal canal



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 is extremely painful
- Its site is in the midline , either posterior or anteriorly to the superficial part of the external anal sphincter (no support)



Perianal abscess

- 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 ext. anal sphincter
- Anal fistula may rise as a result of the spread or inadequate treatment of the anal abscess

PR examination

- Finger is in the rectum canal:
- In the female the vagina lies anteriorly, while in the male the urinary bladder and the superior vena cava, ampulla vas deferens, prostate
- The sacrum and the coccyx lies posteriorly, while the ischiolateral 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.

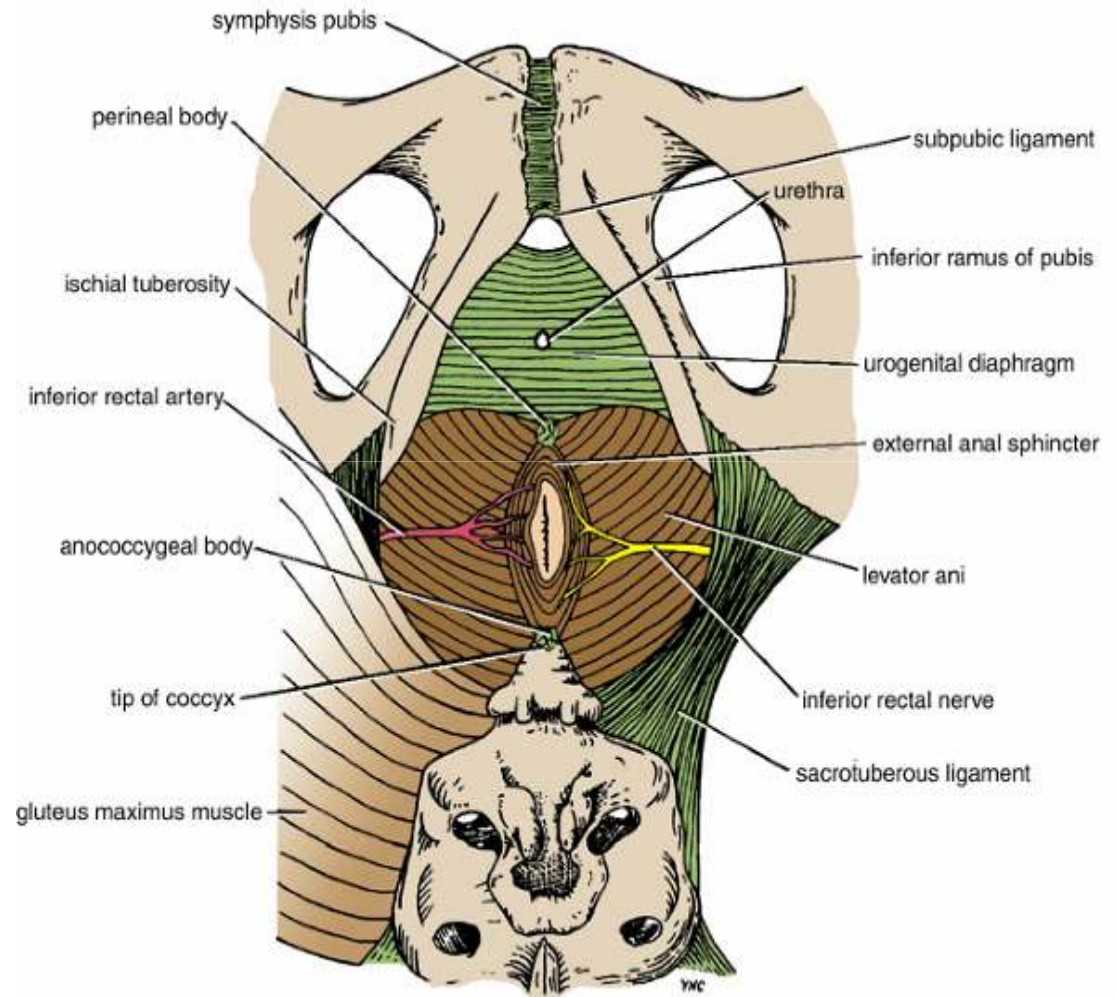
Nerve supply of anal canal

- 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)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

The anal triangle is bounded

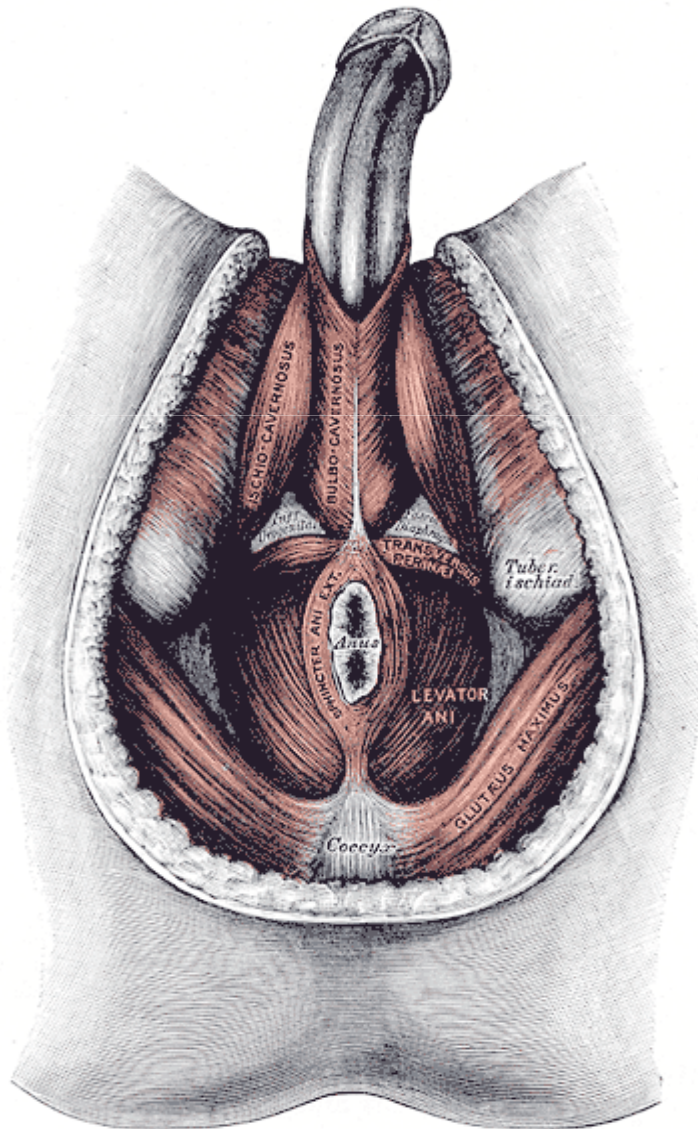
- ant. → perineal membrane
- post → by the tip of the coccyx
- on each side → by
 - the ischial tuberosity
 - the sacrotuberous ligament, overlapped by the border of the gluteus maximus muscle .
 - ischiorectal fossa
- in the midline → The anus, or lower opening of the anal canal.



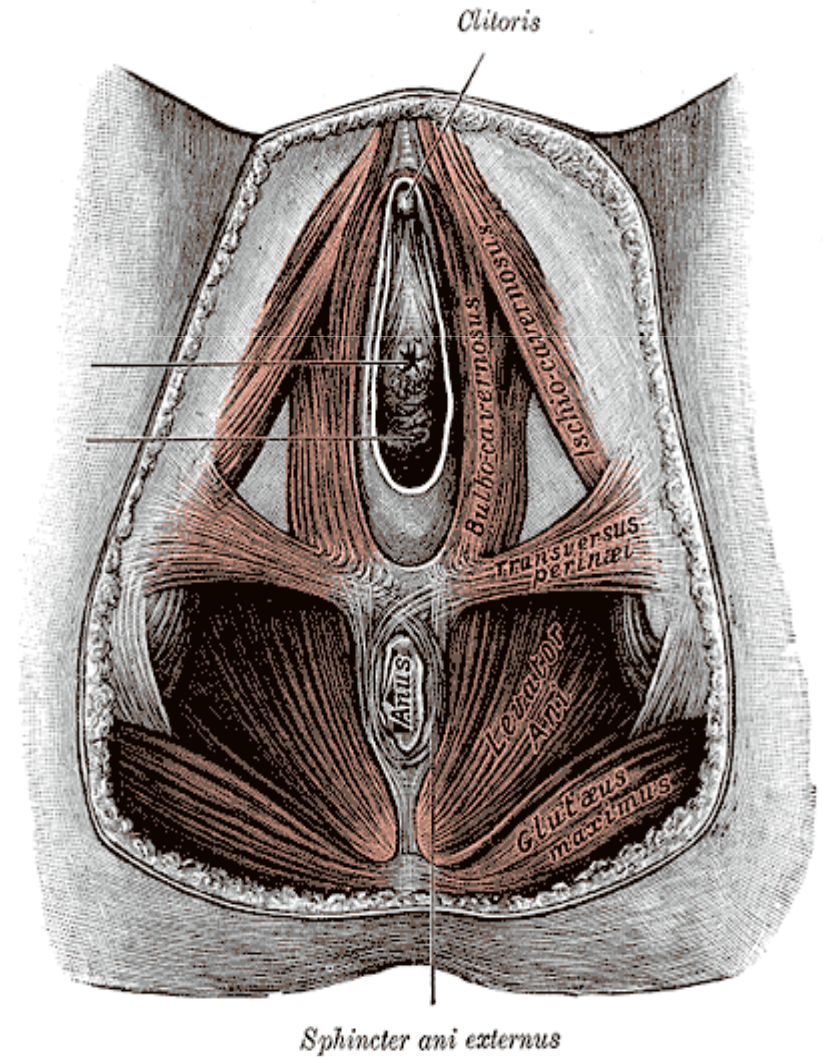
Contents of anal triangle

- Some components of the anal triangle include:
- Ischioanal fossa
- Sacrotuberous ligament
- Sacrospinous ligament
- Pudendal nerve
- Internal pudendal artery and Internal pudendal vein
- Anal canal
- **Muscles**
 - Sphincter ani externus muscle
 - Gluteus maximus muscle
 - Obturator internus muscle
 - Levator ani muscle
 - Coccygeus muscle

Anal triangle



Urethra
Vagina



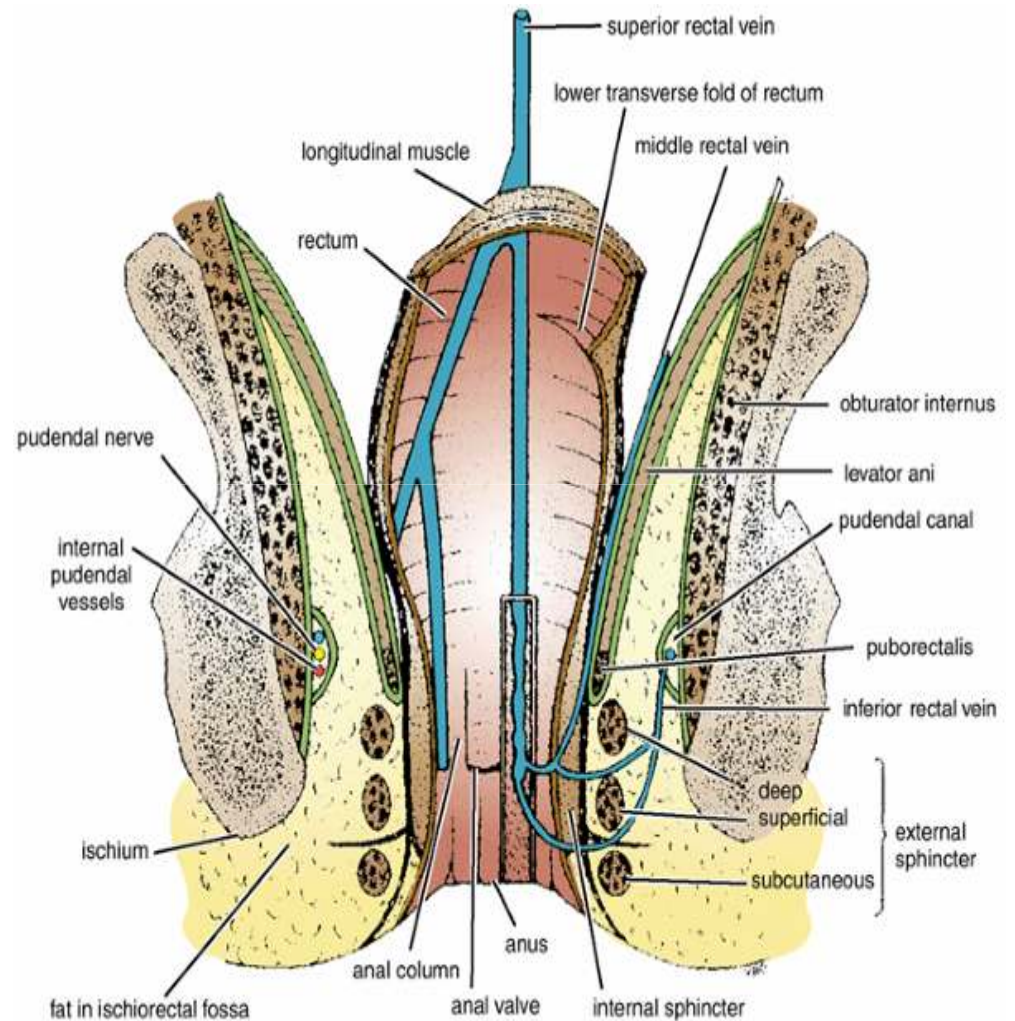
- The skin around the anus is supplied by the **inferior rectal (hemorrhoidal) nerve.**

Lymphatic drainage of anal triangle

- The lymph vessels of the skin drain into the medial group of **the superficial inguinal nodes**

Ischiorectal Fossa

- The ischiorectal fossa (ischioanal fossa) is 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 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.

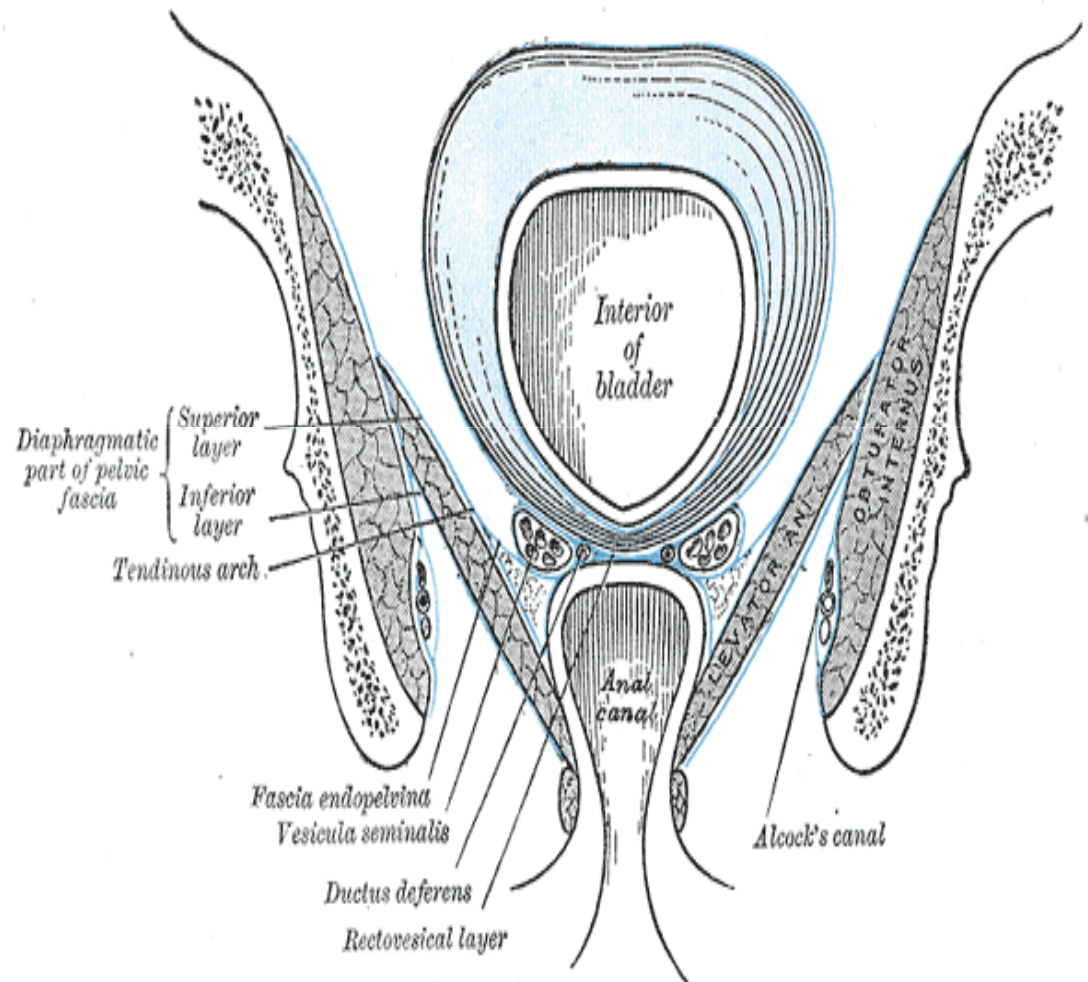
The pudendal canal

Structure

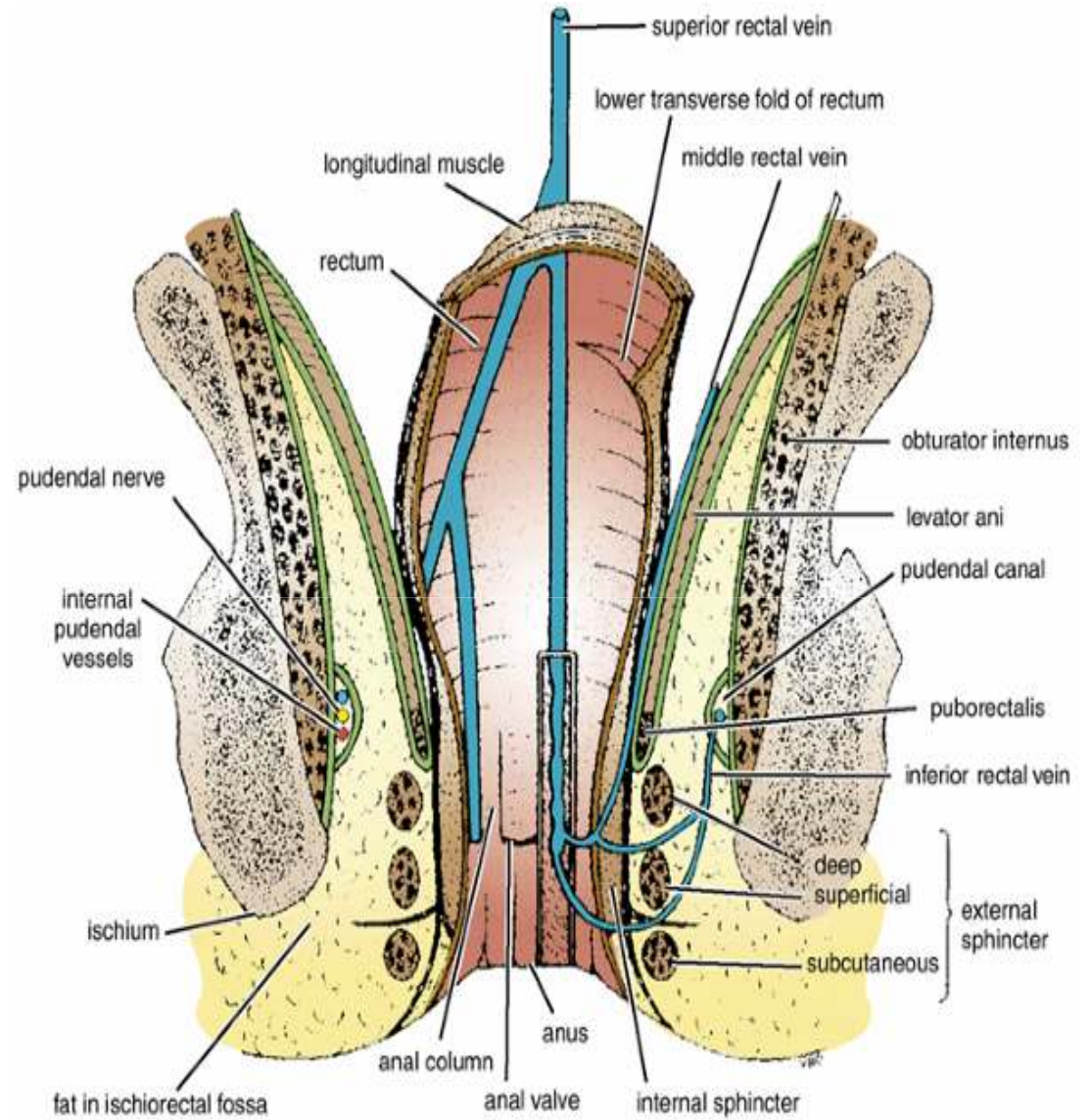
- The pudendal canal (also called **Alcock's canal**) is an anatomical structure in the pelvis formed by the **obturator internus fascia**
- **Runs in the lateral wall of the ischiorectal fossa**
- **Ends in the deep perineal pouch**

Its contents

- Internal pudendal artery
- Internal pudendal veins
- Pudendal nerve
- These vessels and nerve cross the pelvic surface of the obturator internus.



- Pudendal canal



Thank you