



GI ANATOMY

#4



WRITER:
Hussam M Daraghmeh

DOCTOR:
Mohtasib

CORRECTOR:
Abd alrahman
Abu Shaweesh

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.

(It pierce the diaphragm)

-The anal canal is 3.8cm long

-It extends from the anorectal junction to the anus.

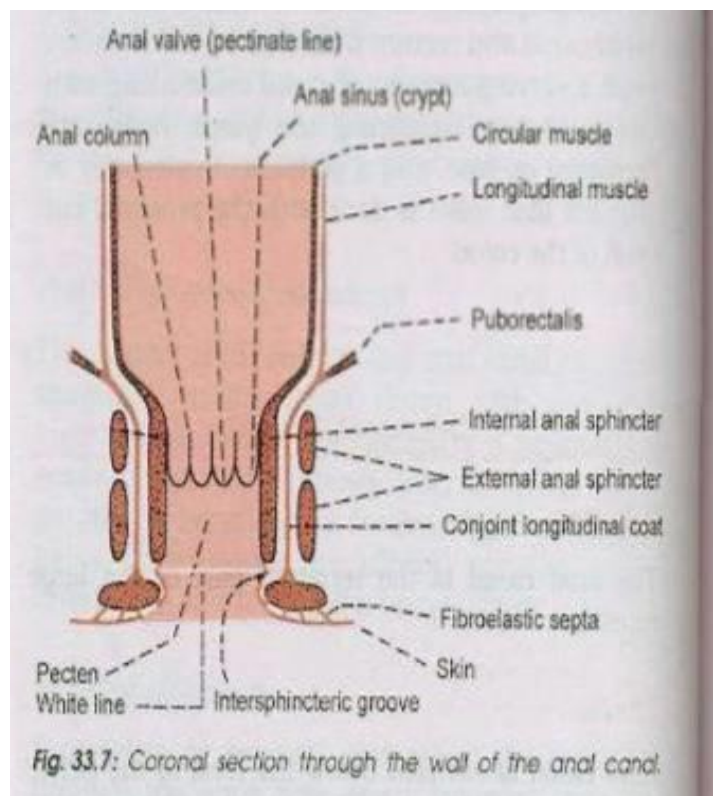
There are 3 structures lies at the level of anorectal junction

(**PUBORECTALIS** , Deep part of the **EXTERNAL ANAL SPHINCTER** , **INTERNAL ANAL SPHINCTER**

-The anorectal junction is marked by the forward convexity of the perineal.

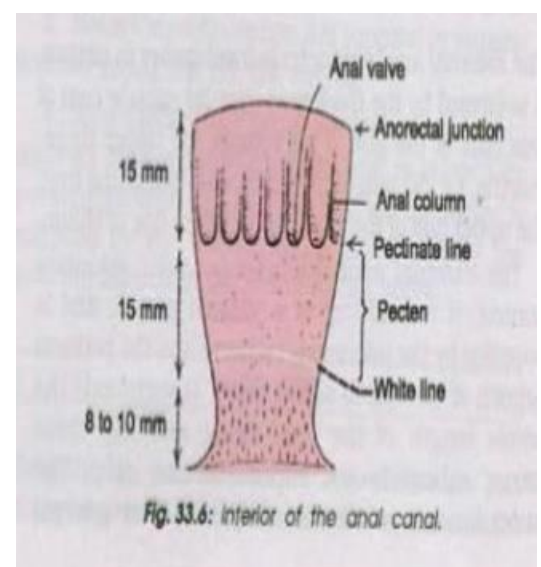
The direction of it relative to rectum? **BACKWARD DOWNWARD**

-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.



- The anal canal divided into 2 halves (Upper half 2cm , lower half 2cm) by the **PECTINATE LINE**(below anal coulomn) .
- The Upper half which covered by simple columnar epithelium with goblet cell derived from **ENDODERM** , The lower half which covered by stratified squamous epithelium derived from **ECTODERM**.
- The upper half follows the rectum in innervation so it is just sensitive to the stretch.
- The lower half is sensitive to the pain, temperature , touch .
- The lower half divided into 2 halves by the **WHITE LINE** , The upper 1 cm is different from the lower 1 cm by the lining epithelium , both are stratified squamous epithelium but the upper is non-keratinized and the lower is keratinized , so we can see (hair follicles , sebaceous and sweat glands) in the lower 1 cm.
- Anal canal has 2 sphincters (internal , external)
- Internal anal sphincter:
 - It consists of inner circular smooth muscle.
 - It is **involuntary** so it has an autonomic innervation.
 - If injured that will **NOT** led to incontinence.
- External anal sphincter:
 - It is divided into 3 parts (deep, superficial, cutaneous) .
 - It is **voluntary**, inferior rectal nerve (s4).
 - If external anal sphincter or inferior rectal nerve injured, that will led to incontinence (failure of controlling defecation).
- PUBORECTALIS: part of levator ani muscle attached to the anorectal junction anteriorly towards the symphysis pubis ,If injured that will led to incontinence.

FIG33.6 RELATED TO NEXT PAGE.



• **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 .
- If injured specifically to the deep external sphincter, that will lead to incontinence.

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

- The doctor told us to focus on the 2 halves.

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:

-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.

Whiteline

- 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, prostate.

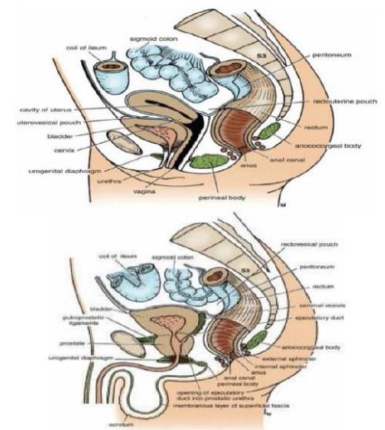
In female : lower end of the vagina.

Posteriorly

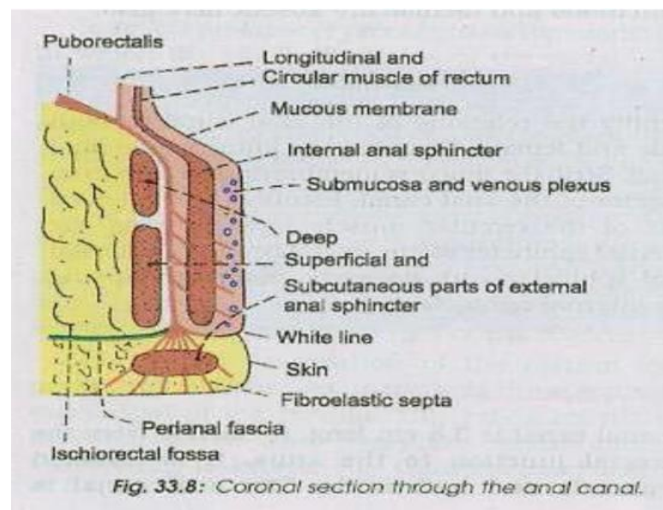
anococcygeal ligament and tip of the coccyx.

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.

-NO BONY ATTACHMENT

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.

-HAS BONY ATTACHMENT

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

-NO BONY ATTACHMENT

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**.
- And **middle rectal artery**.

• Venous drainage:

- **internal rectal venous plexus drains into superior rectal vein.**

-superior rectal vein drains into inferior mesenteric vein which drains into **portal vein**.

- **the lower part of the external rectal venous plexus is drained by inferior rectal vein into the internal pudendal vein.**

-the internal pudendal vein drains into internal iliac vein which drains into **inferior vena cava**.

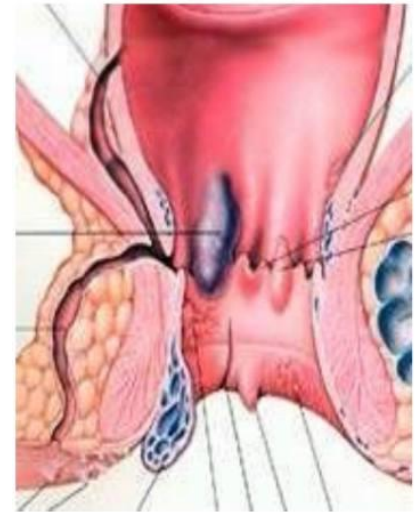
- **the middle part by the middle rectal vein into the internal iliac vein.**
- **upper part by the superior rectal vein into the inferior mesenteric vein.**
- **The anal vein are arranged radially around the anal margin. They communicate with the internal rectal plexus and with the inferior rectal vein.**

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 what?

1-straining to move stool.

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

-but after pregnancy it disappears.

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

- Treatment : surgical excision

• Internal hemorrhoids(piles)

- In the upper half above the pectinate line

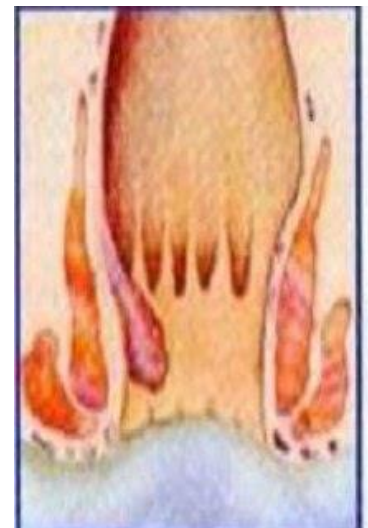
Occur higher up in the anal canal, out of sight.

Bleeding is the most common symptom of internal hemorrhoids, and often the only one in mild cases.

- Varicosities of the sup. Rectal vein

- Varicosities: dilated

- Lies in the anal columns at 3,7,11

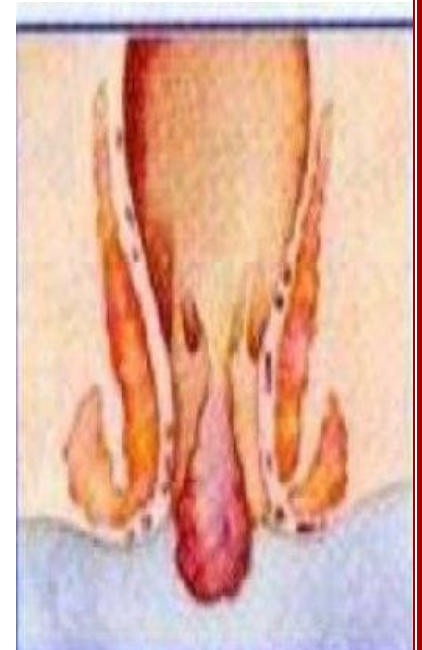


o'clock (lithotomy position)

- In early stage it is painless, sometimes it is going out just during defecation and then return to its site, in advanced stage it is painful because it lies out of the anus.

• External hemorrhoids

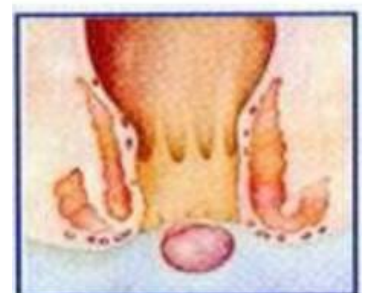
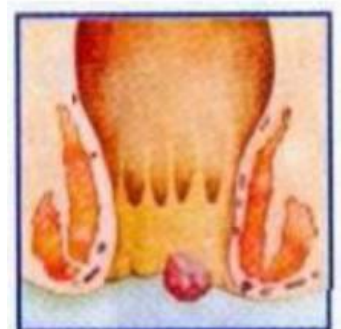
- Lower half of anal canal below the pectinate line **are visible-occurring out side the anus. They are basically skincovered veins that have ballooned and appear blue.**
- **Usually they appear without any symptoms. When inflamed, however, they become red and tender.**
- **Inferior rectal vein**
 - middle rectal vein(less common)
- **Thrombosis is common**
 - Tender and painful.



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**



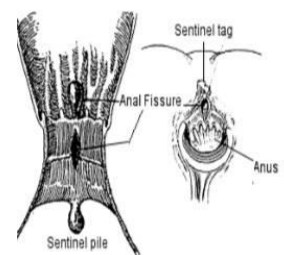
is often difficult to ease back into the rectum, and is usually quite painful.

- 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.

ANALFISSURE

- A thin slit-like tear in the anal tissue, an anal fissure is likely to cause itching, pain, and bleeding during a bowel movement.

- hard pieces of stool cause stretch and bleeding.
- 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).
- it is treated surgically.
- related to the sinus.



PERIANAL ABSCESS

- Common site: the ischiorectal fossa.
- Recurring of PERIANAL ABSCESS in ischiorectal fossa present so it is dangerous .
- 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 abcess.
- fistula: track between 2 cavities.
- puss move within the fistula and mix with stool and blood.
- If PERIANAL ABSCESS opens to skin, It will led to sinus.
- If PERIANAL ABSCESS opens to anal canal or rectum, It will led to fistula.

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 lie 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.**

-which drains to **inferior mesenteric lymph node.**

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).**

- Sensitive to stretch only.

• Below the pectinate line, it is supplied **by somatic (inferior rectal) nerves.** Painful as a result of high sensation.

- Sensitive to pain, touch, temperature.

• The external sphincter is supplied by inferior rectal Nerve and by branch of the **fourth sacral nerve.**

ANAL TRIANGLE

Boundaries

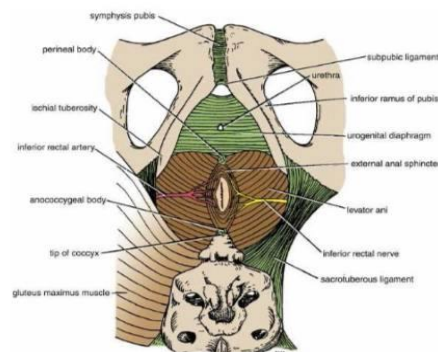
- anteriorly: **perineal membrane.**

- posteriorly: **the tip of the coccyx.**

- on each side: **the ischial tuberosity,**

the sacrotuberous ligament, overlapped by the border of the gluteus maximus muscle, ischioanal fossa.

- ischioanal fossa is also found in each side of the rectum.



- **in the midline:** The anus, or lower opening of the anal canal.

Contents of anal triangle

- **Ischioanal fossa**

- Ischioanal fossa = Ischioanal Fossa

- **Sacrotuberous ligament**

- **Sacrospinous ligament**

- **Pudendal nerve**

- In pudendal canal

- **Internal pudendal artery and Internal pudendal vein**

- In pudendal canal

- **Anal canal**

- In the midline

- **Anus**

- **Muscles**

- **Sphincter ani externus muscle**

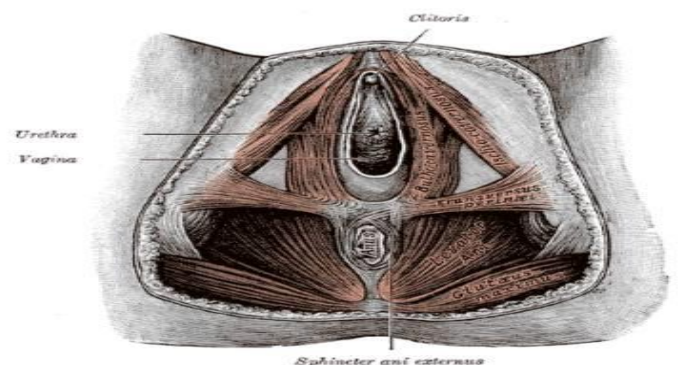
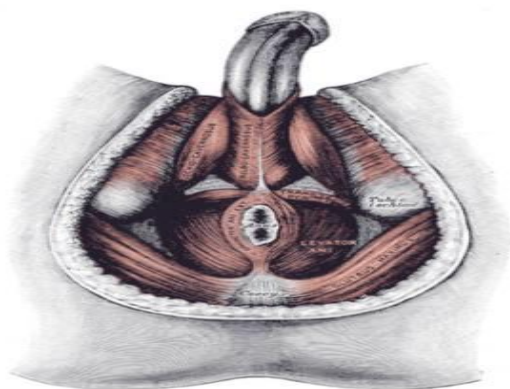
- **Gluteus maximus muscle**

- **Obturator internus muscle**

- **Levator ani muscle**

- **Coccygeus muscle**

ANAL TRIANGLE



- Anteriorly: urogenital triangle , pulp of the penis.
- We will take it in urogenital system.

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

- Somatic nerve.

LYMPHATIC DRAINAGE OF ANAL TRIANGLE

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

ISCHIORECTAL FOSSA

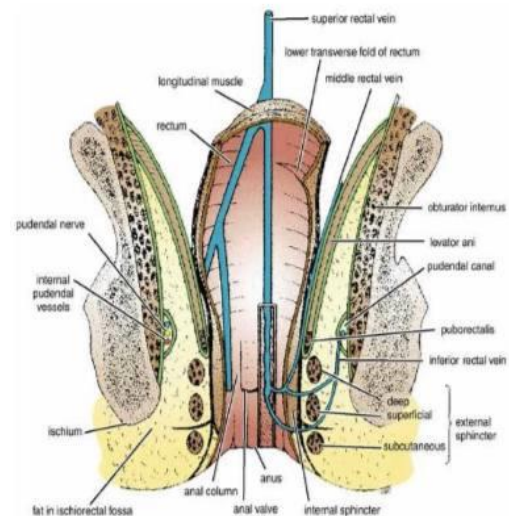
- The ischiorectal fossa (ischioanal fossa) is a wedge-shaped space located on each side of the anal canal.

- 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 obturatorinternus muscle, covered with pelvic fascia.



CONTENTS OF FOSSA

- The ischioanal fossa is filled with dense fat which supports the anal canal and allows it to distend during defecation.

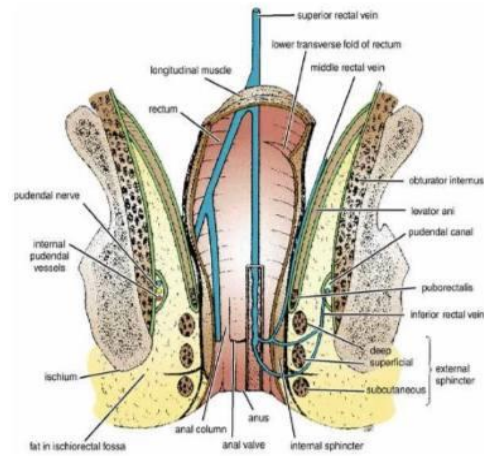
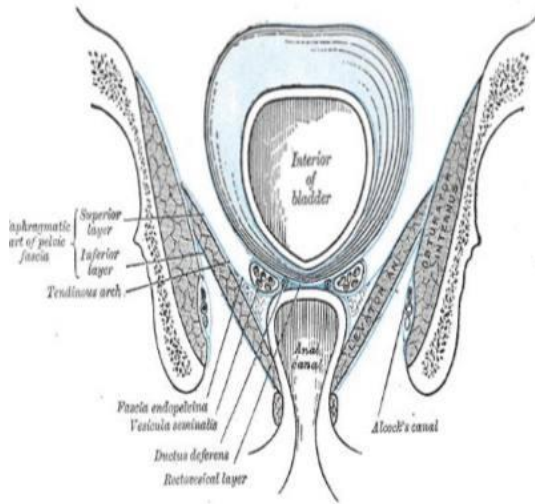
- The pudendal nerve

- internal pudendal vessels are embedded in a fascial canal

- the pudendal canal, on the lateral wall of the ischioanal 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 ischioanal 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.
- Lymphatic vessels.