

# **Anatomy of Anal Canal**

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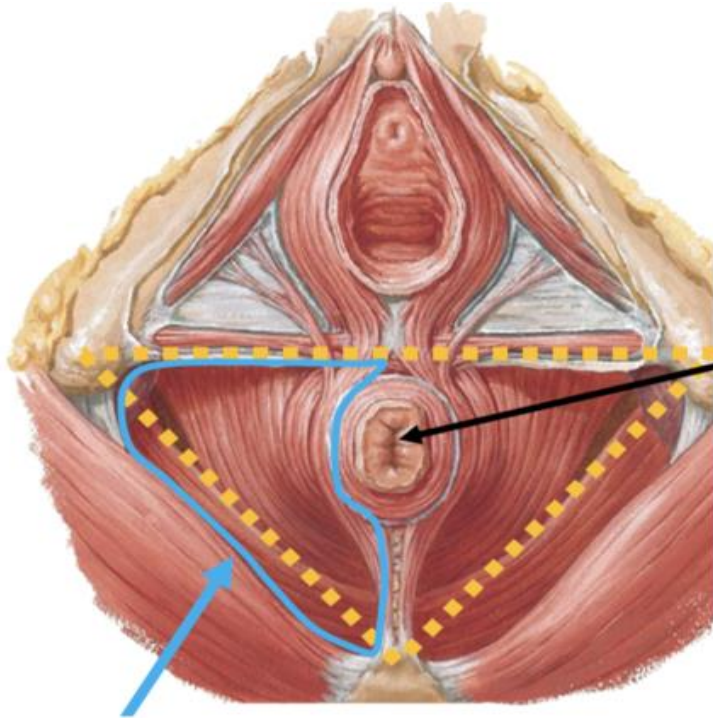
**King George's Medical University, UP, Lucknow**

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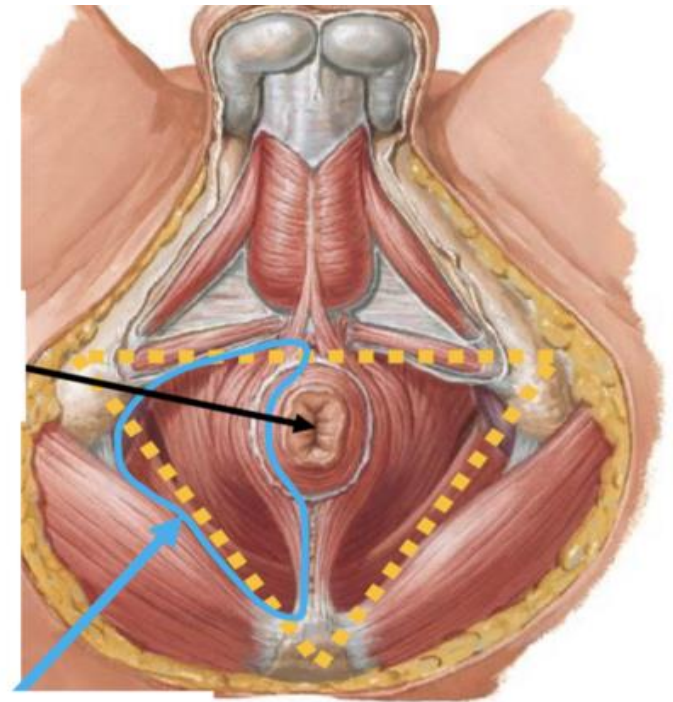
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# Subdivisions of the perineum

- Transverse line joining the anterior part of ischial tuberosities divides perineum into:
  1. Urogenital region / triangle- ANTERIORLY
  2. Anal region / triangle - POSTERIORLY



Female



Male

Anal canal may be affected by many conditions that are not so rare, not necessarily serious and endangering to life but on the contrary very INCAPACITATING

**Haemorrhoids**

**Anal fistula**

**Anal fissure**

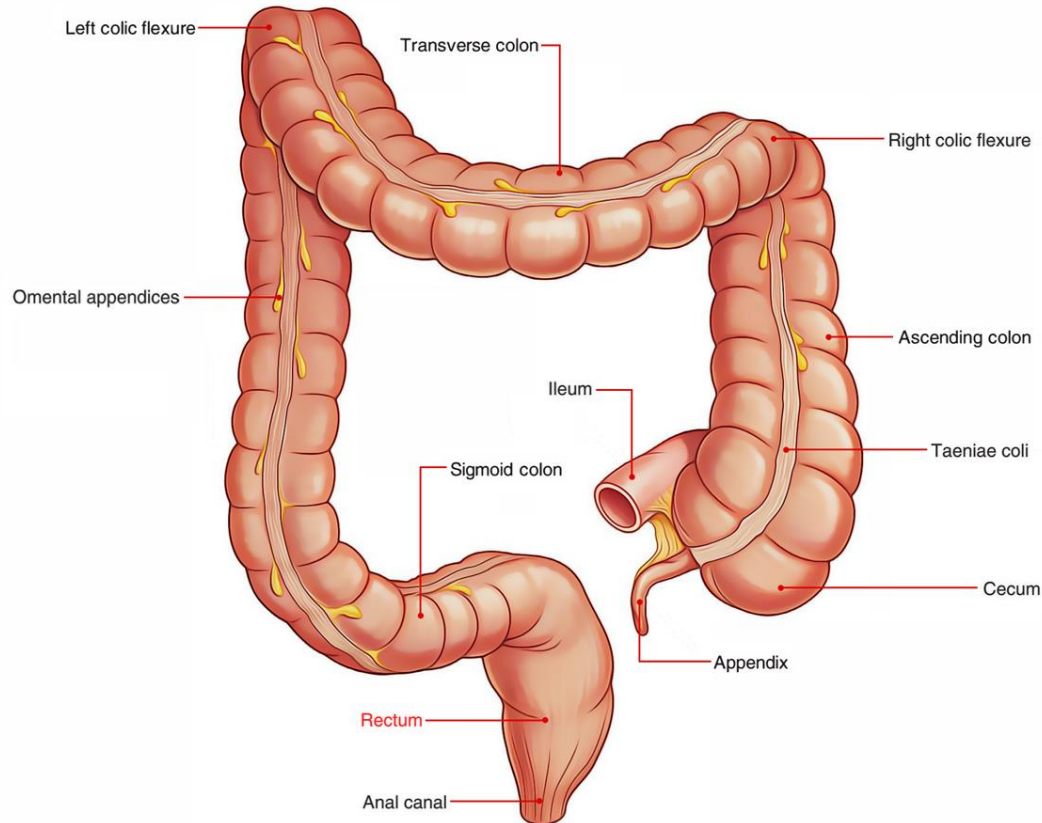
**Perianal abscess**

# Learning objectives

At the end of this teaching session on anatomy of Anal canal all the MBBS 1<sup>st</sup> Year students must be able to correctly:

- Describe the location, extent and dimensions of the anal canal
- Enumerate the relations of the anal canal
- Enumerate the subdivisions of anal canal
- Describe & Diagrammatically display the special features on the interior of the anal canal
- Discuss the importance of pectinate / dentate line
- Write a short note on the arterial supply, venous drainage, nerve supply & lymphatic drainage
- Write a short note on the sphincters of the anal canal
- Describe the anatomical basis of internal & external hemorrhoids & anal fistula, anal fissure, perianal abscess
- Enumerate the structures palpable on per rectal examination

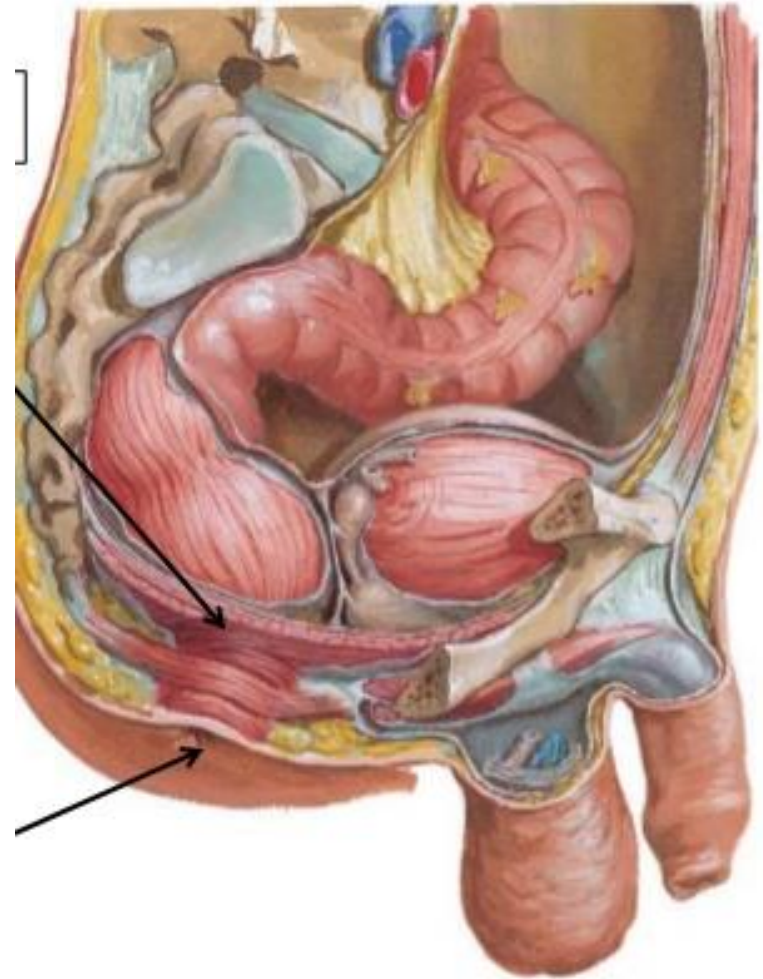
# Anal Canal



- Anal canal forms the lowest part of the gastrointestinal tract
- Gross Cardinal features of large intestine absent

# Location & Extent of anal canal

- Situated below levator ani muscle
- It lies in the anal region/ triangle
- From – anorectal junction to anus
- Anorectal junction-
  - 2-3 cm in front and little below tip of coccyx
- Anus –
  - Surface opening of canal
  - 4 cm in front & below tip of coccyx



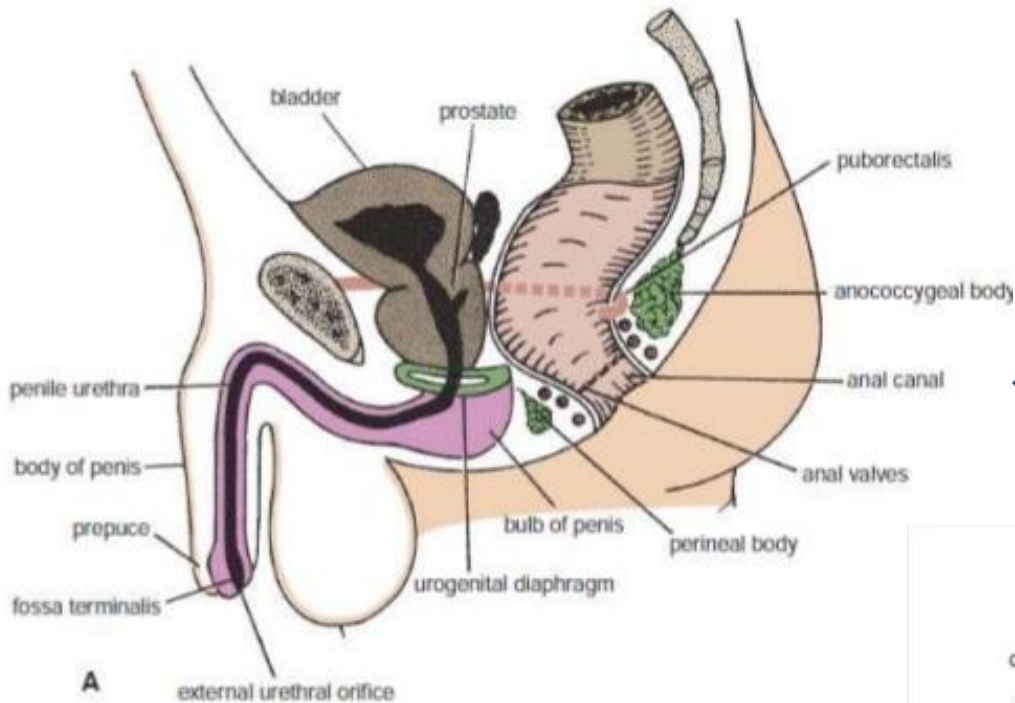
# Direction & Dimensions

- Directed downwards & backwards
- Length – 3.8- 4 cm
- Closed side to side – anteroposterior slit





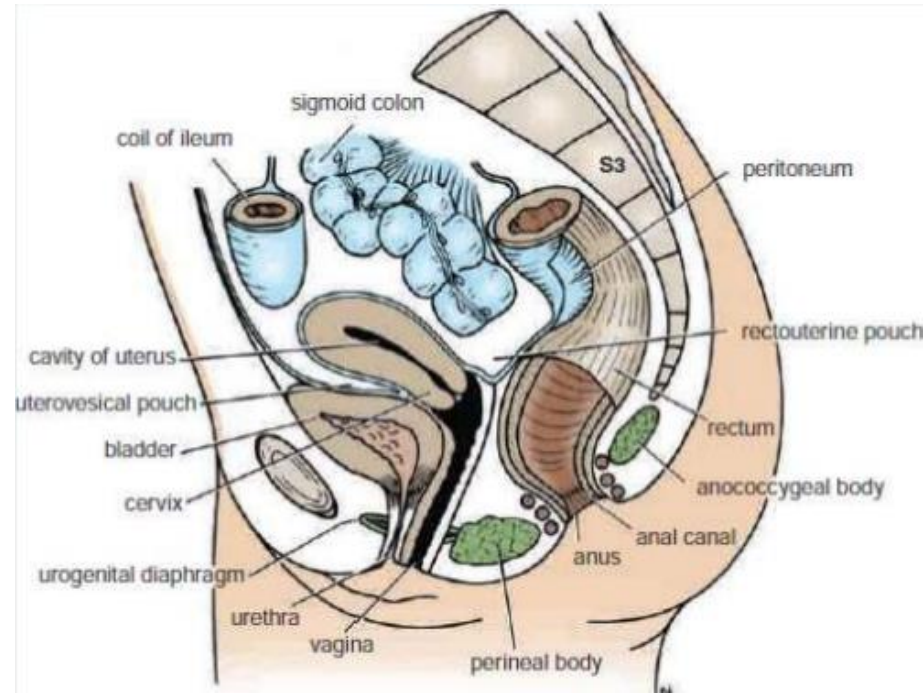
# Relations of anal canal



**Anterior & posterior  
Relations of anal canal in  
males**

**Sagittal Sections of male & female pelvis**

**Anterior & posterior  
Relations of anal canal in  
females**



# Relations of anal canal

**ANTERIORLY-**

**Perineal body &**

**In Males- membranous urethra**

**& bulb of penis**

**In Females – Lower part of  
vagina**

**POSTERIORLY –**

**Anococcygeal ligament**

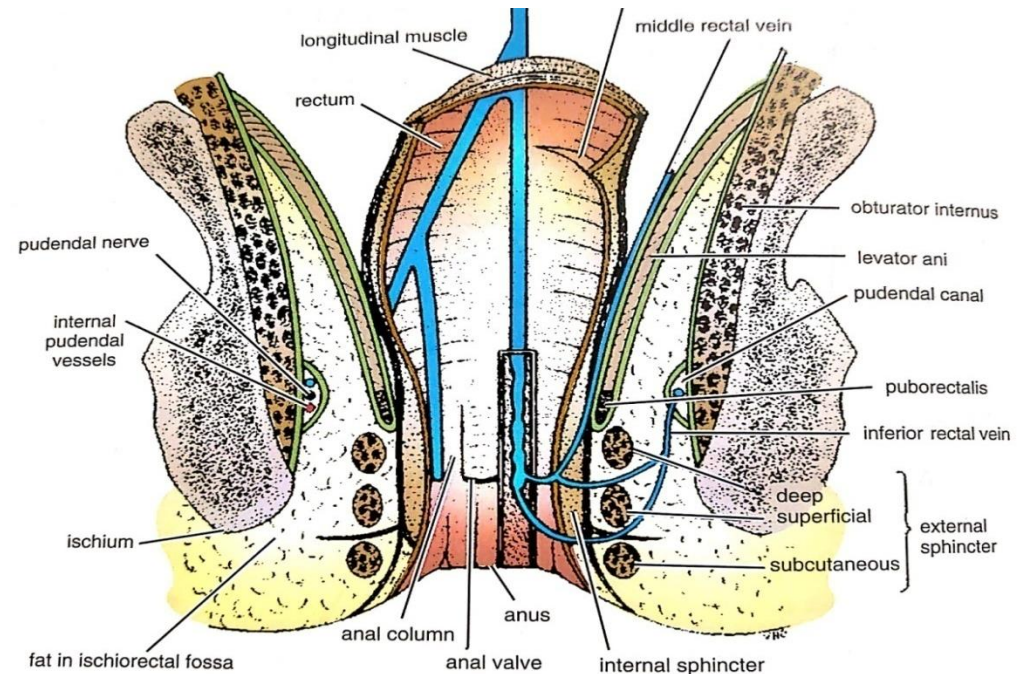
**Tip of coccyx**

**LATERALLY –**

**Ischioanal fossa**

**ALL AROUND –**

**Sphincter muscles**



**Coronal section of pelvis & perineum**

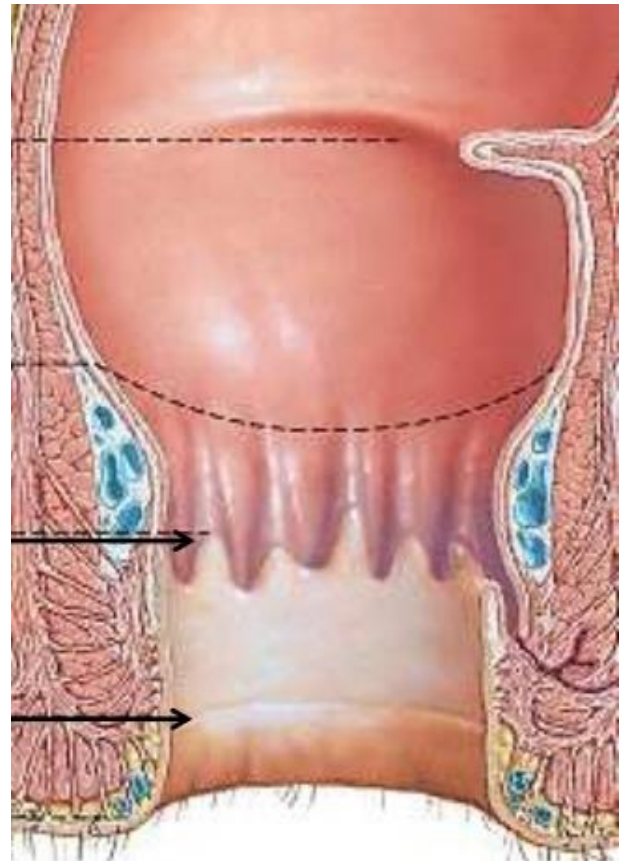
# Interior of Anal Canal (Subdivisions)

Subdivided into 3 parts:

Upper part- 15mm

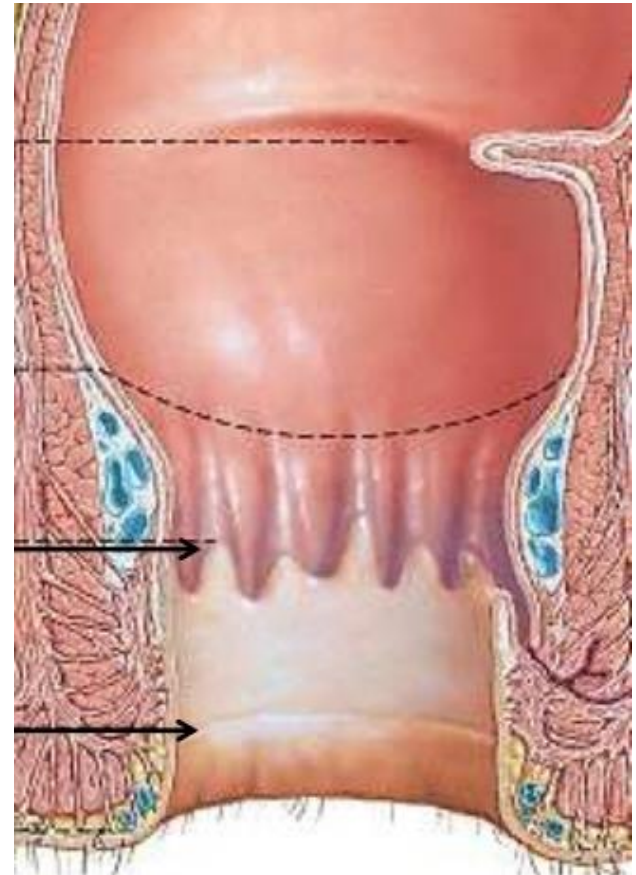
Middle part- 15 mm

Lower part – 8 mm



# Upper part

- 15 mm long
- Endodermal in origin- primitive anorectal canal
- Lining – mucus membrane
- Epithelium – simple/ stratified columnar
- Colour - Plum red
- Special features –
  - Anal columns
  - Anal valves
  - Pectinate / dentate line
  - Anal papillae





# Special features of upper part

## ANAL COLUMNS

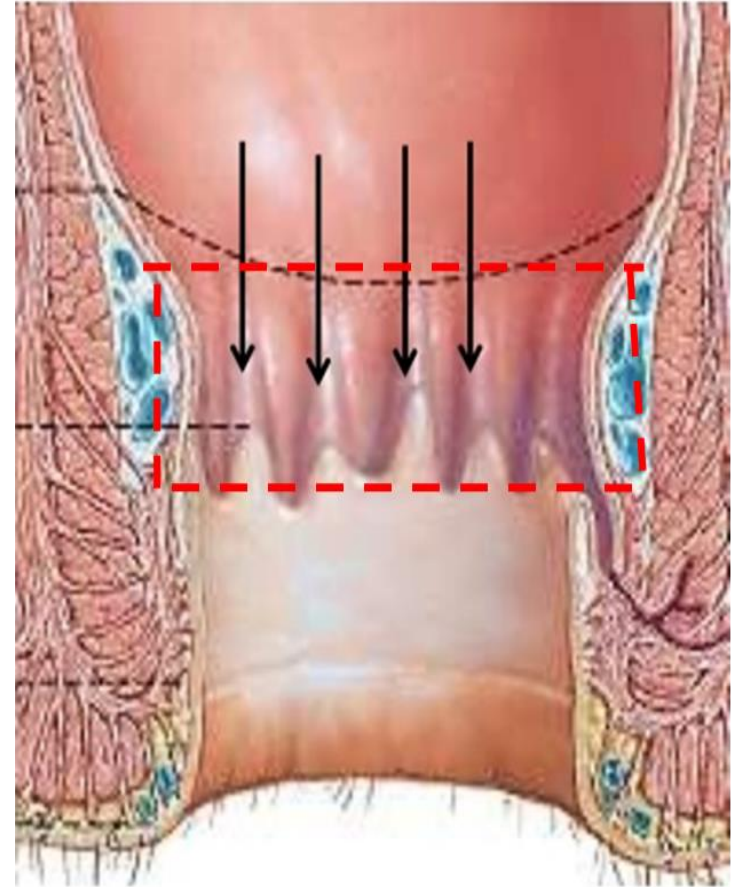
- 6-10 vertical mucosal ridges
- Permanent mucosal folds
- Contain radicals of superior rectal vein

## ANAL VALVES

- Semilunar mucosal folds uniting lower end of anal column
- Form – PECTINATE LINE

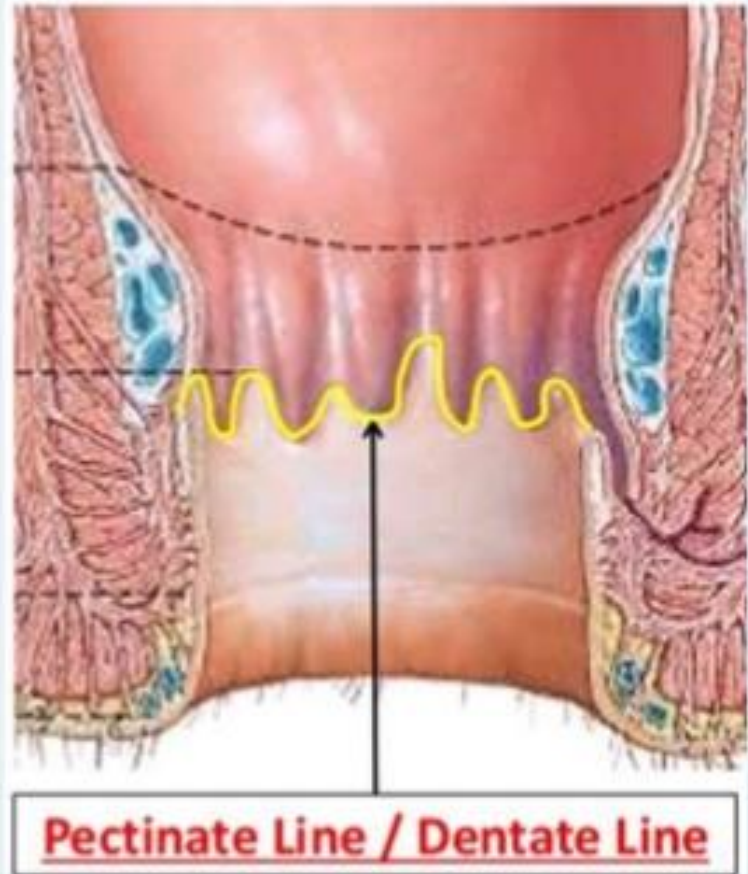
## ANAL SINUS

- Depression above anal valve
- Floor contains openings of anal glands



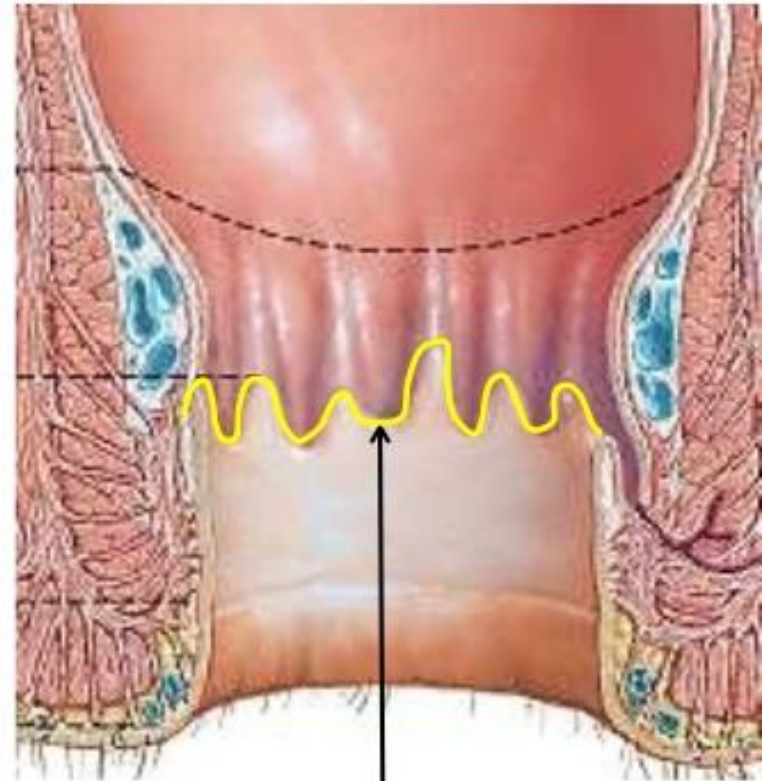
# The pectinate line

- The pectinate line is **not seen** on inspection in **clinical practice**, **but under anesthesia** the anal canal descends down, and the pectinate line can be seen on slight retraction of the anal canal skin.



# Importance of pectinate line

- Divides canal into 2 parts that are different:
  - In **development**
  - In **arterial supply**
  - In **venous drainage**
  - In **lymphatic drainage**
  - In **nerve supply**



**Pectinate Line / Dentate Line**

# Middle part/ Pecten

Length -15 mm

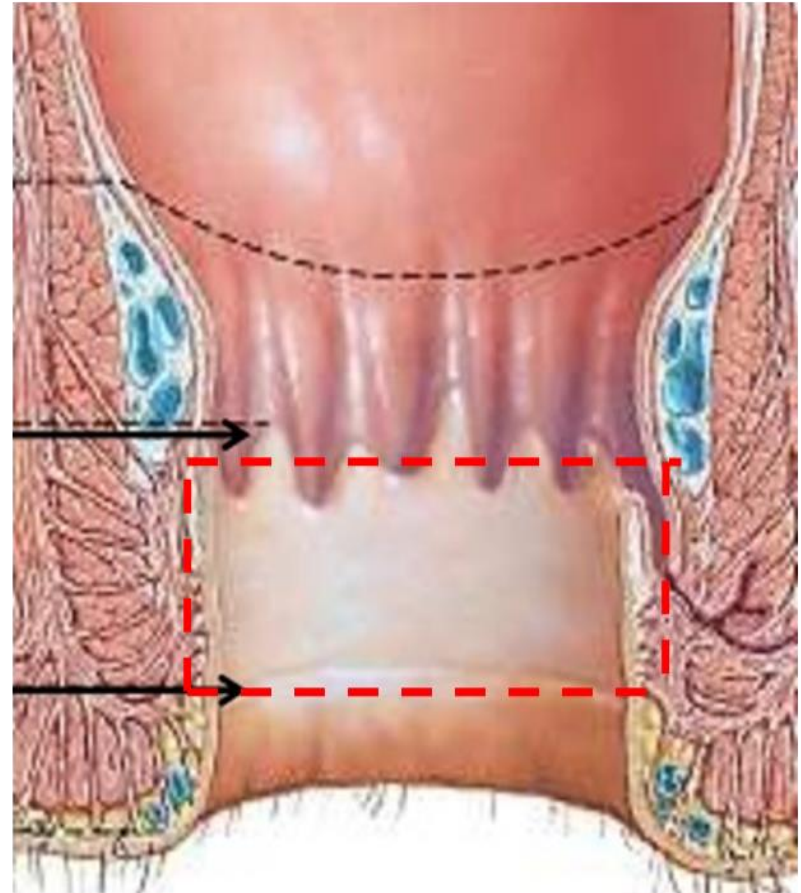
Ectodermal origin- proctodeum

Epithelium- stratified squamous

Bluish pink in appearance

- Due to presence of dense venous plexus between mucosa and muscle coat

No glands – sweat/ sebaceous





# Lower part

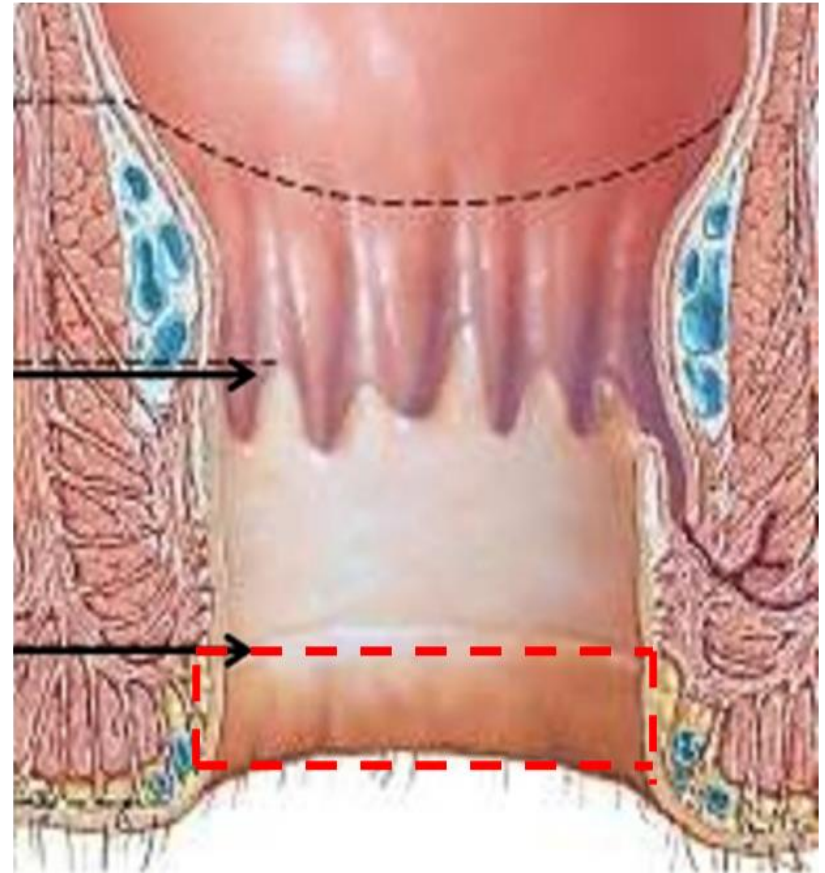
Length -8 mm

Ectodermal origin-  
proctodeum

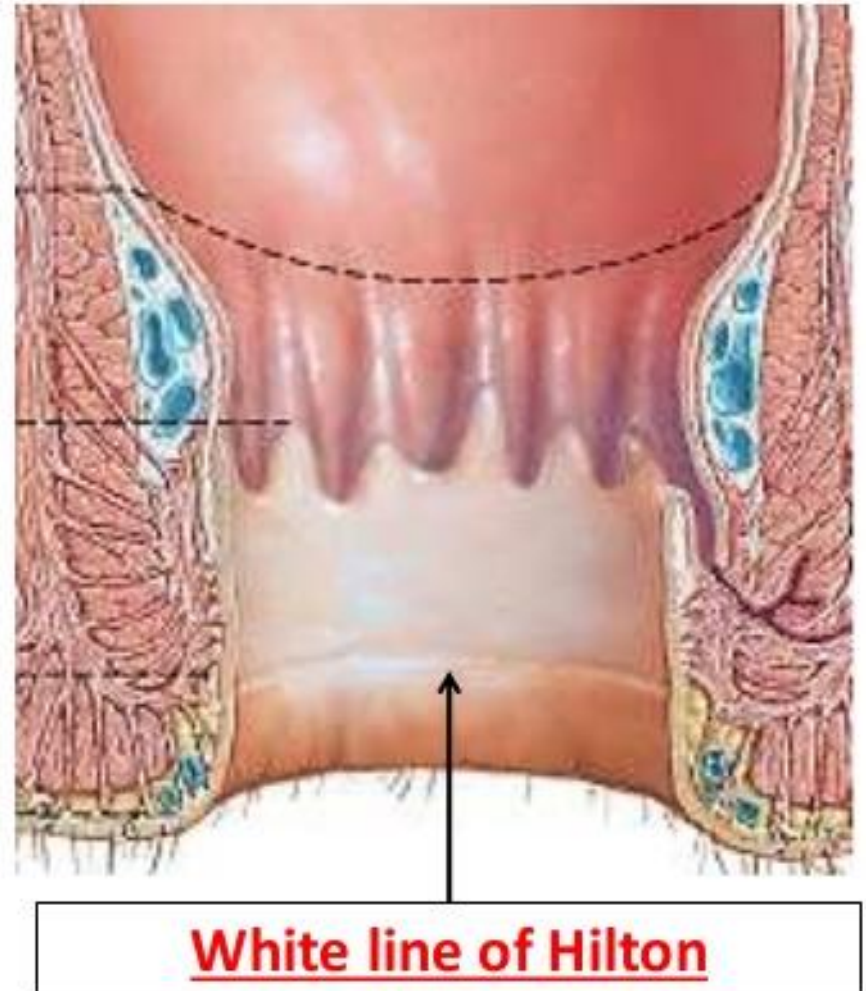
Epithelium- stratified  
squamous keratinized  
(true skin)

Pigmented skin

Glands present – sweat/  
sebaceous & hair



- **Contrast between bluish pink mucosa and black skin**
- **WHITE LINE OF HILTON**
- **At the level of lower end of internal anal sphincter/  
intersphincteric groove**

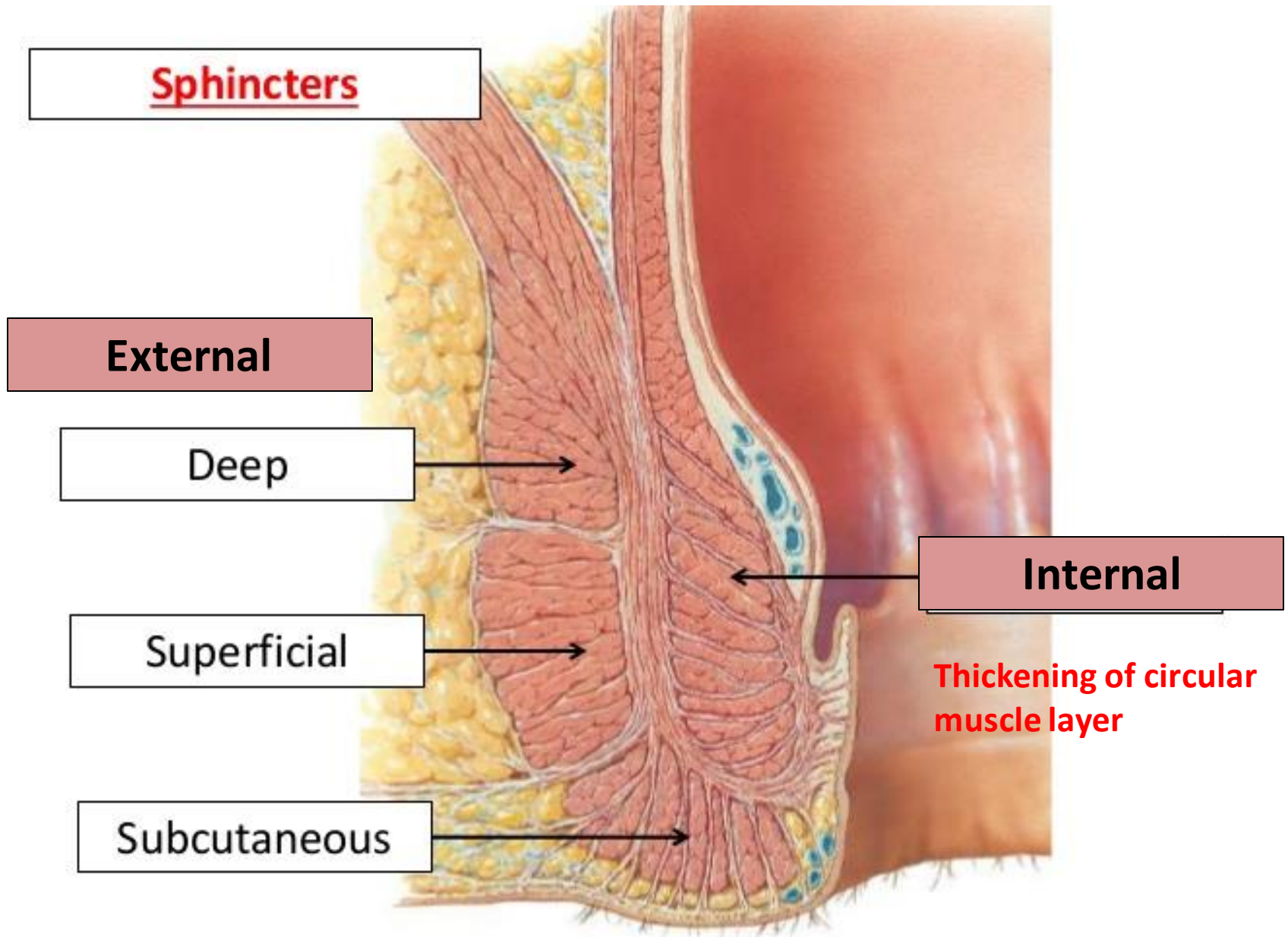


# Musculature of Anal Canal

- **Anal Sphincters**
- **Conjoint longitudinal coat**
- **What is the Anorectal ring ?**

**Circular layer &  
Longitudnal layer**

# Anal Sphincters



# Anal Sphincters

## Internal anal sphincter

- Smooth muscle- Thickened circular muscle layer
- Involuntary
- Surrounds upper 3/4<sup>th</sup> of canal
- Ends at white line of Hilton
- Intersphincteric groove between it and subcutaneous part of external sphincter

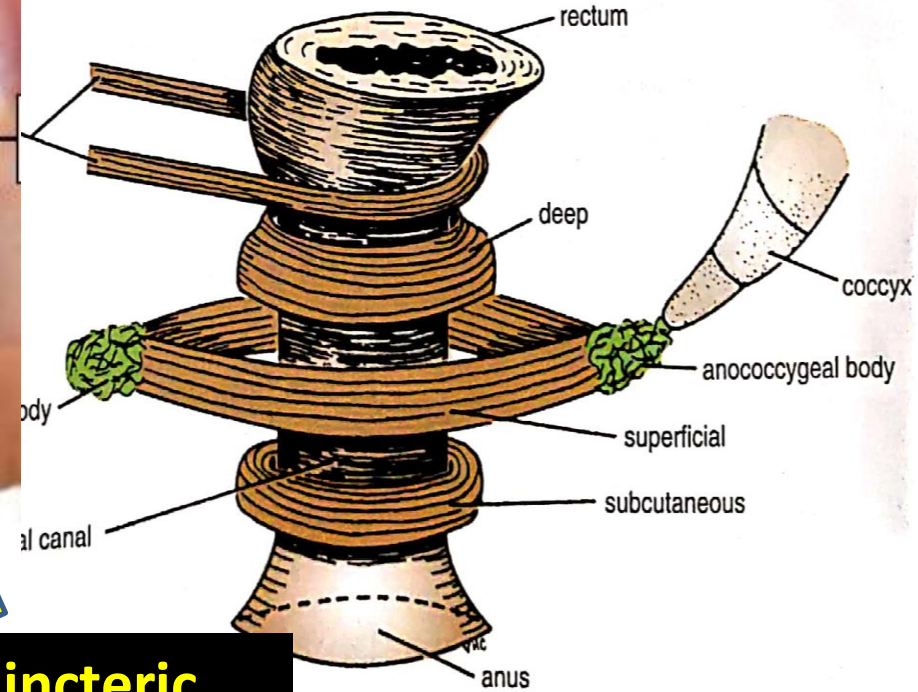
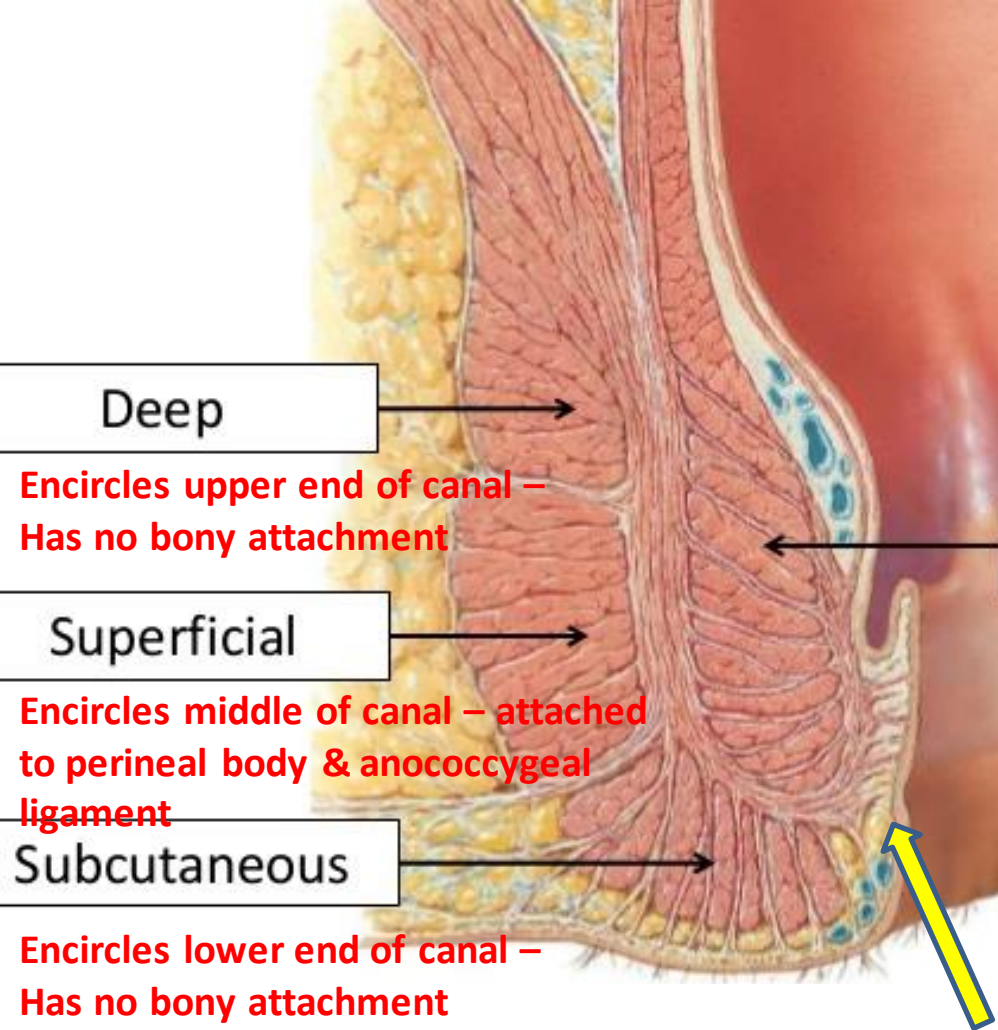
## External anal sphincter

- Skeletal muscle
- Voluntary
- Surrounds whole length of canal
- 3 parts-
  - Deep
  - Superficial
  - Subcutaneous

Sphincters allow defecation & maintain continence



# External Anal Sphincter

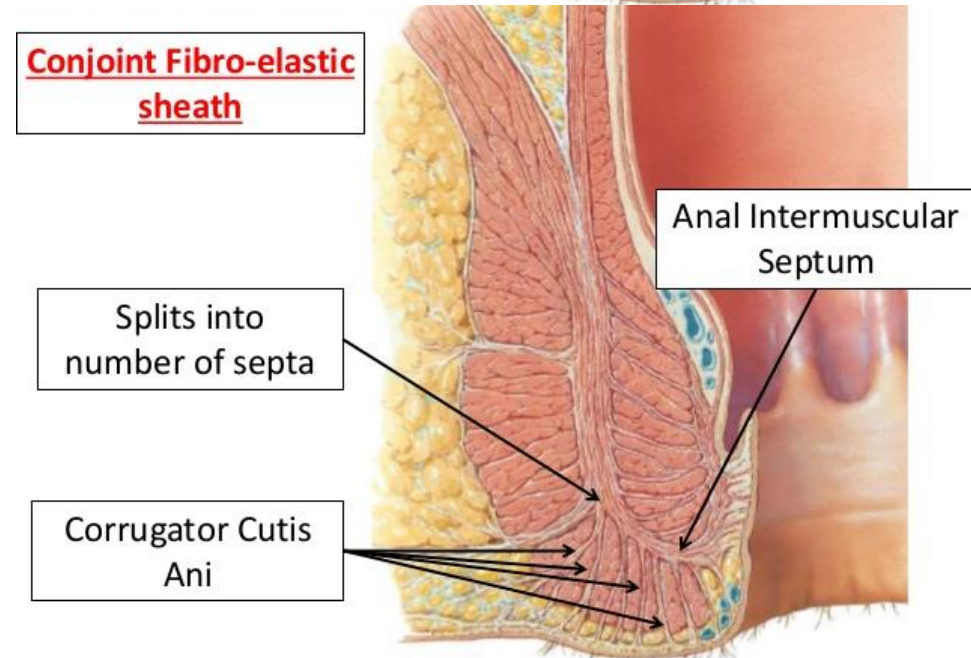
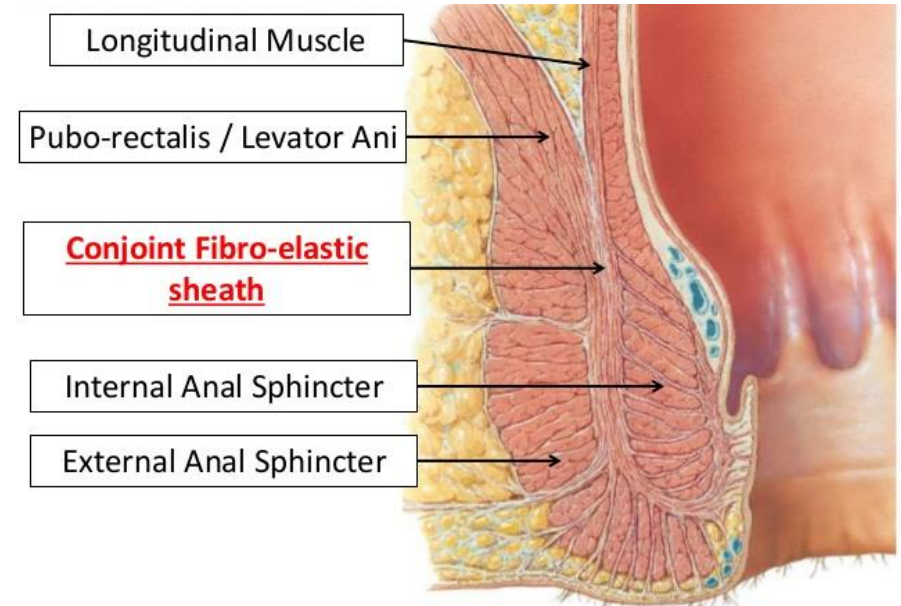


Single  
Functional & Anatomic  
entity

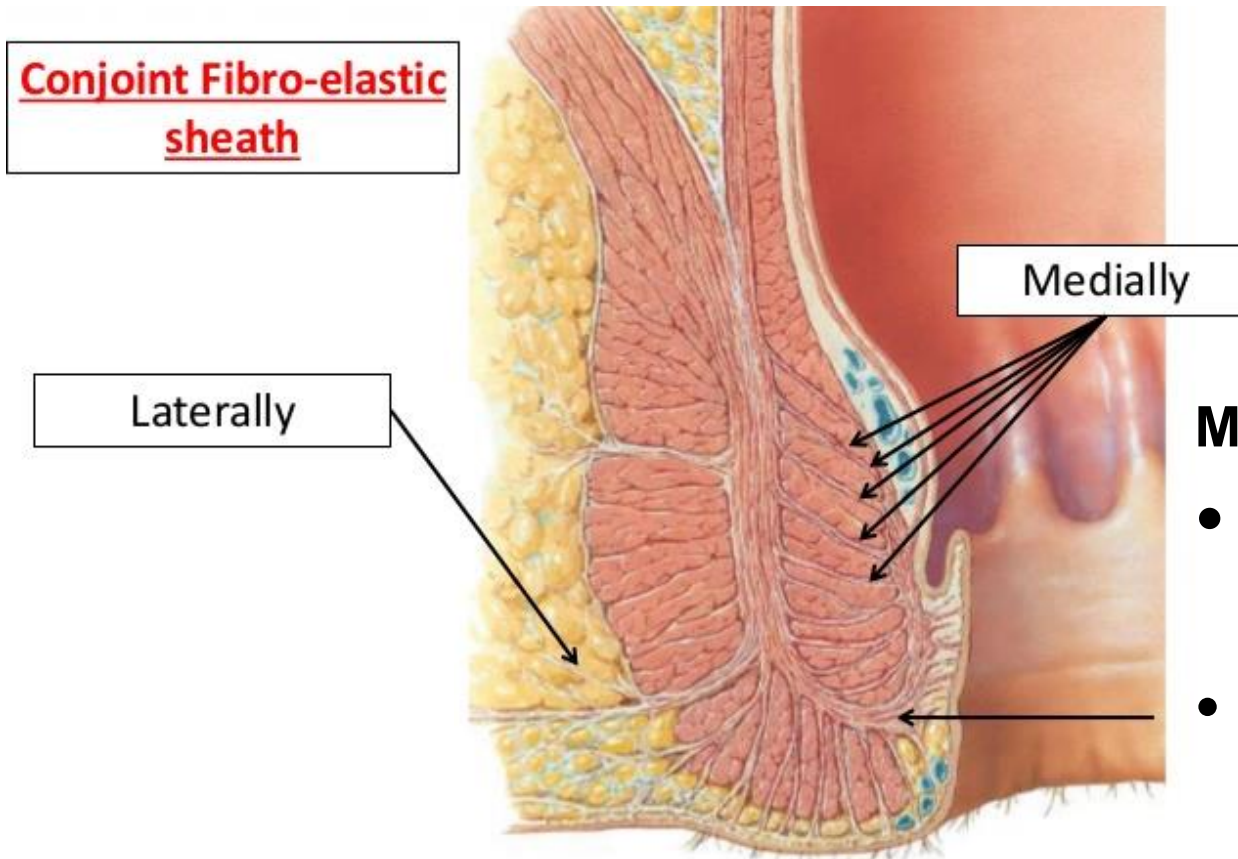
Intersphincteric  
groove

# Conjoint Longitudnal coat

- Formed by fusion of puborectalis with longitudinal muscle of rectum
- Lies between Internal & external sphincter
- Forms a fibroelstic sheath that breaks lower down into septa in a fanwise manner



# Conjoint Longitudnal coat



Conjoint Fibro-elastic sheath

Laterally

Medially

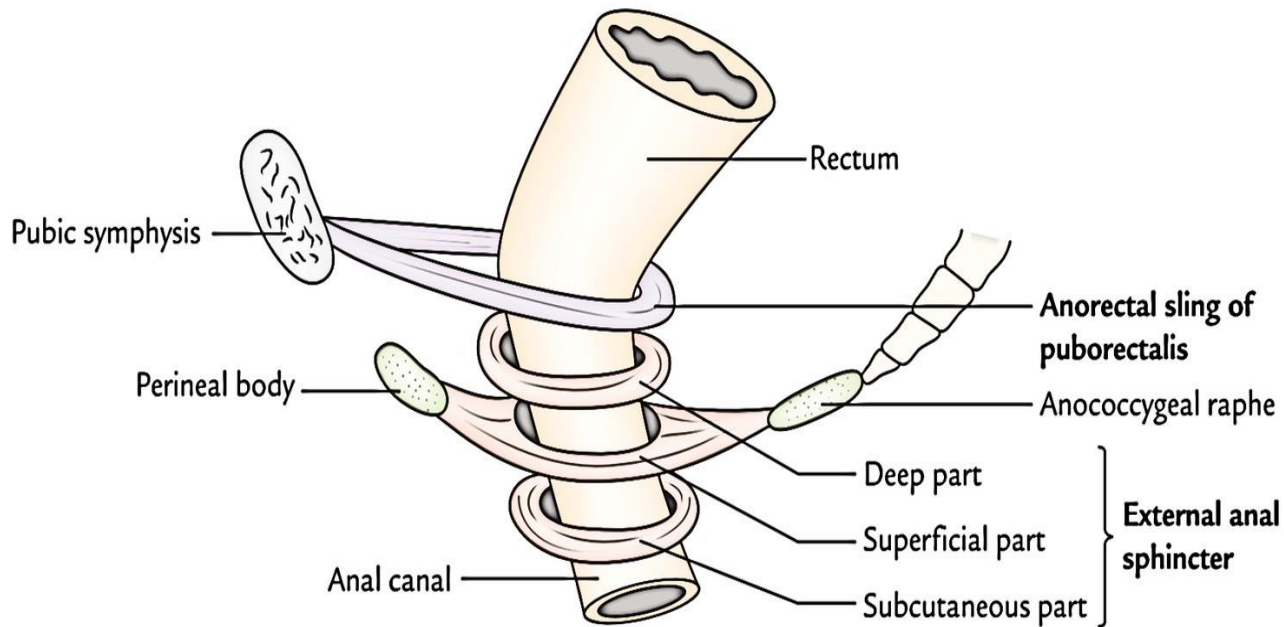
**Medially –**

- Forms **anal intermuscular septum**
- Some pass through internal sphincter and end in submucosa

- **Laterally –** most lateral forms **perianal fascia**
- **Inferiorly –** pierce subcutaneous External sphincter attached to skin – forms **corrugator cutis ani**



# Anorectal ring

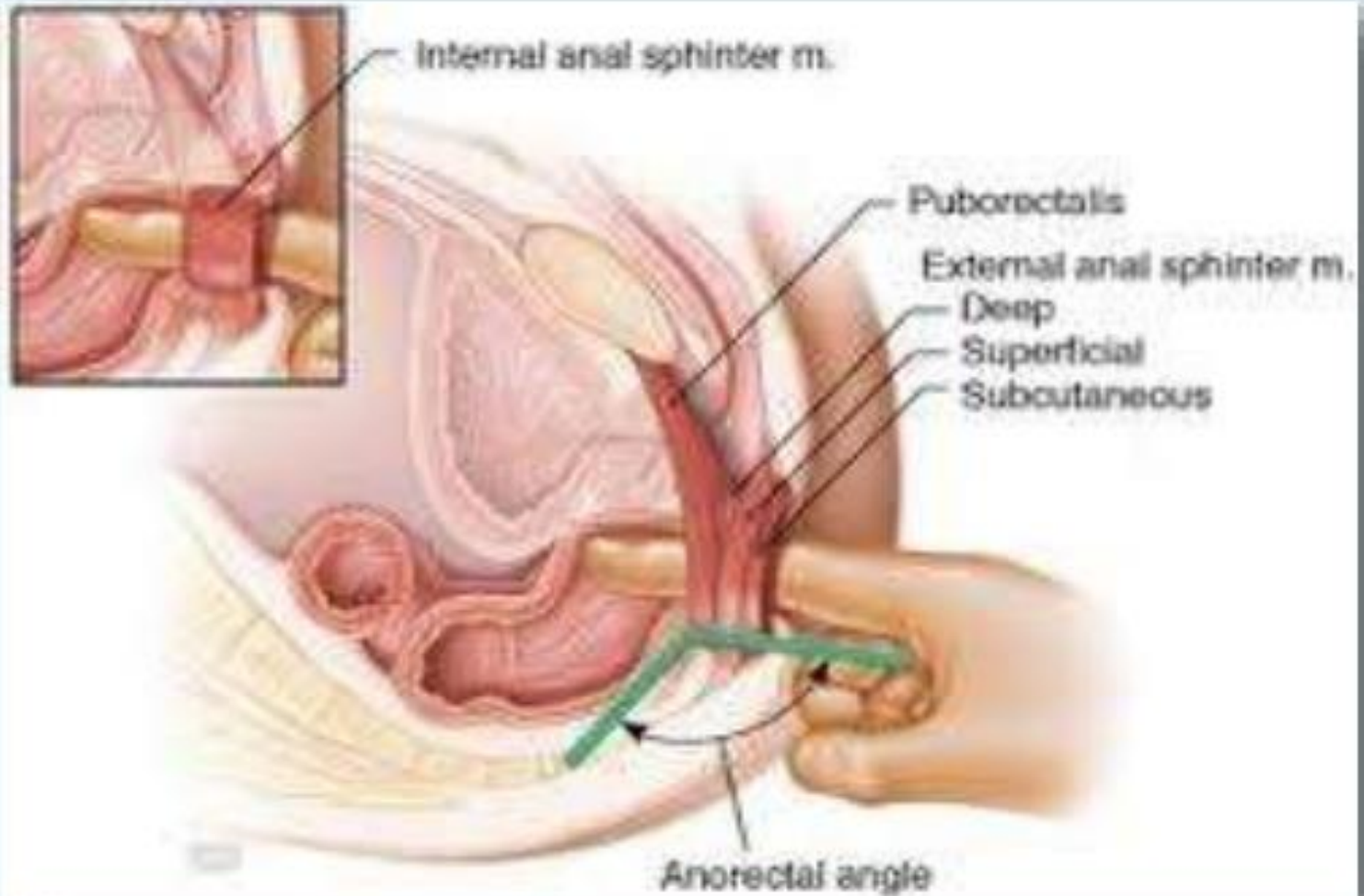


## It is formed by the joining of :

- the puborectalis muscle
- the deep external sphincter,
- conjoined longitudinal muscle
- the highest part of the internal sphincter

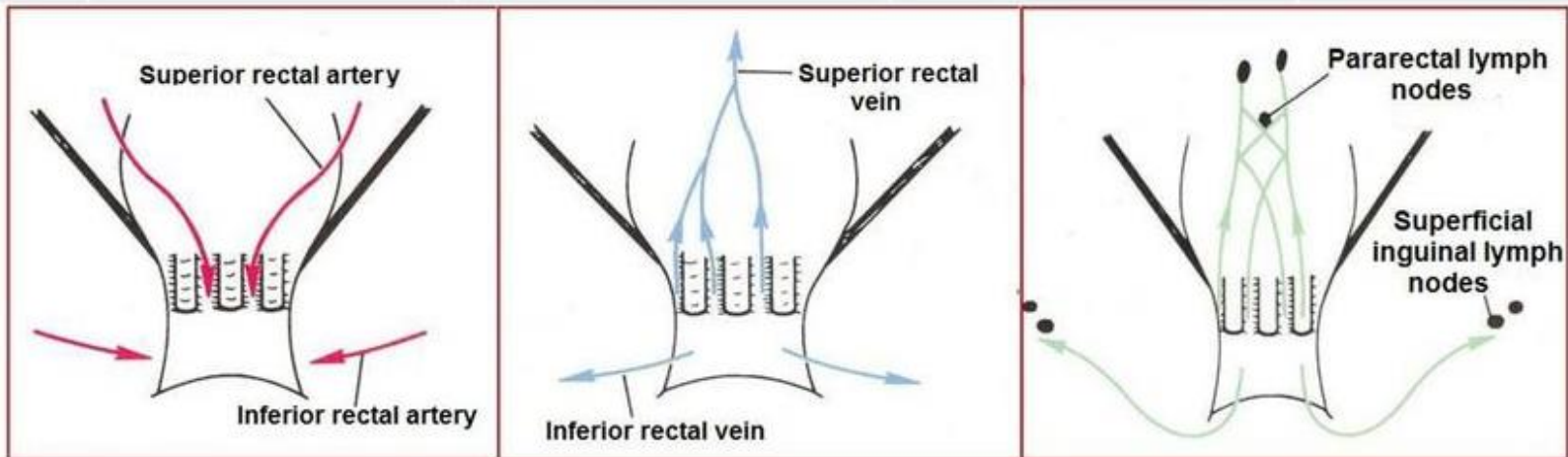
**Damage of the ring  
results in  
Incontinence**

- The anorectal ring



- The anorectal ring can be clearly **felt digitally**, as a **thickened ridge** , especially on its posterior and lateral aspects.

Anal canal	Arterial supply	Venous drainage	Lymphatic drainage	Nerves
Upper half	Superior rectal artery (continuation of the inferior mesenteric artery)	Superior rectal vein drained into the inferior mesenteric vein (portal circulation)	Para-rectal nodes drained into inferior mesenteric lymph nodes	Visceral motor (sympathetic & parasympathetic) & sensory nerves <b>Through inferior hypogastric plexus</b>
Lower half	Inferior rectal a. (branch of internal pudendal artery)	Inferior rectal vein drained into the internal pudendal vein (Systemic circulation) (site of portal-systemic anastomosis)	Superficial inguinal lymph nodes	Somatic motor & sensory nerves <b>Through inferior rectal nerve</b>



# Clinical & surgical anatomy

- **Hemorrhoids**
  - **Internal**
  - **External**
- **Anal Fissure**
- **Anal Fistula**
- **Anal / Perianal abscess**



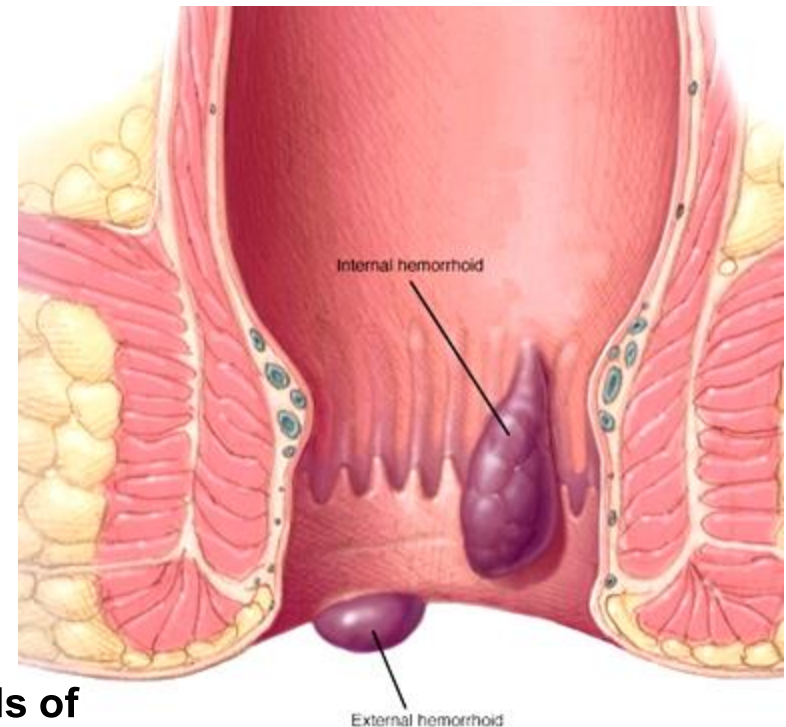
# Hemorrhoids

- **Fold of mucous membrane and submucosa with varicosed venous tributary**

**INTERNAL**

**EXTERNAL**

caused by increased straining or intra-abdominal pressure (e.g., due to constipation, pregnancy or extended periods of sitting).

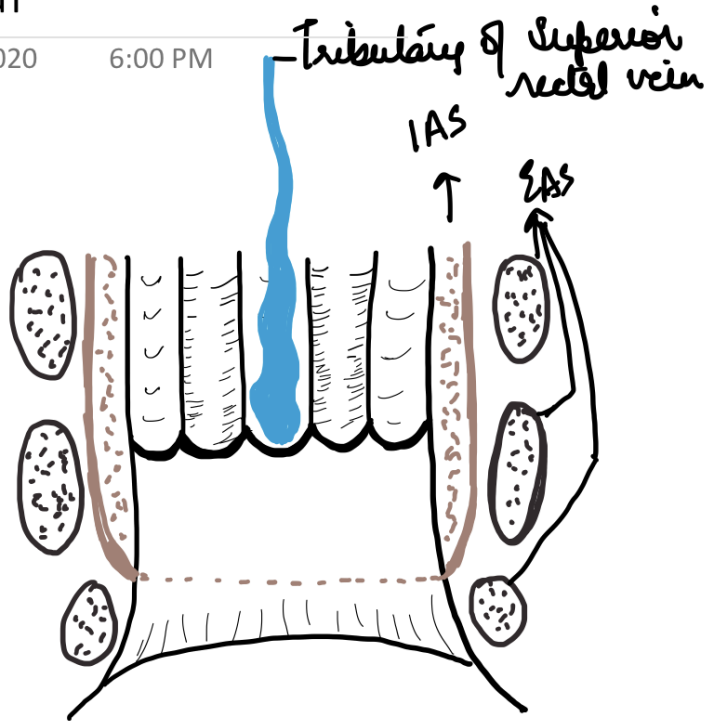


**Patients may present with prolapse, rectal bleeding, pain, and pruritus.**

# Internal Hemorrhoids

11

120 6:00 PM



First degree



Second degree



Third degree

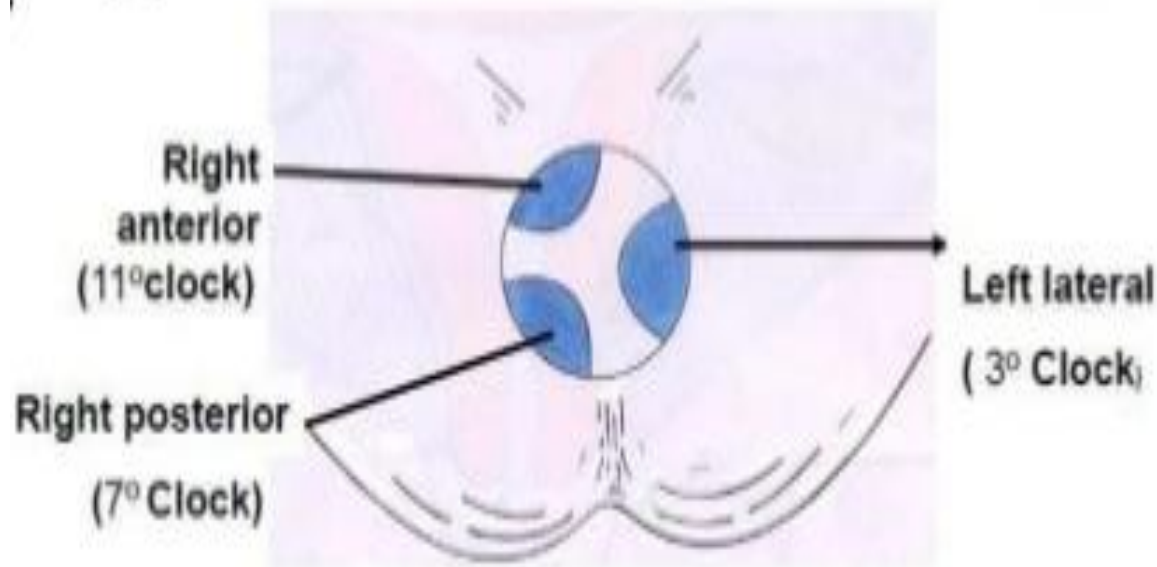


- Tributaries of superior rectal vein, covered by mucosa
- Protrusion from anal columns in upper half of canal
- Commoner is certain specific locations
- Sensitive only to stretch so may cause non specific aching pain/ painless

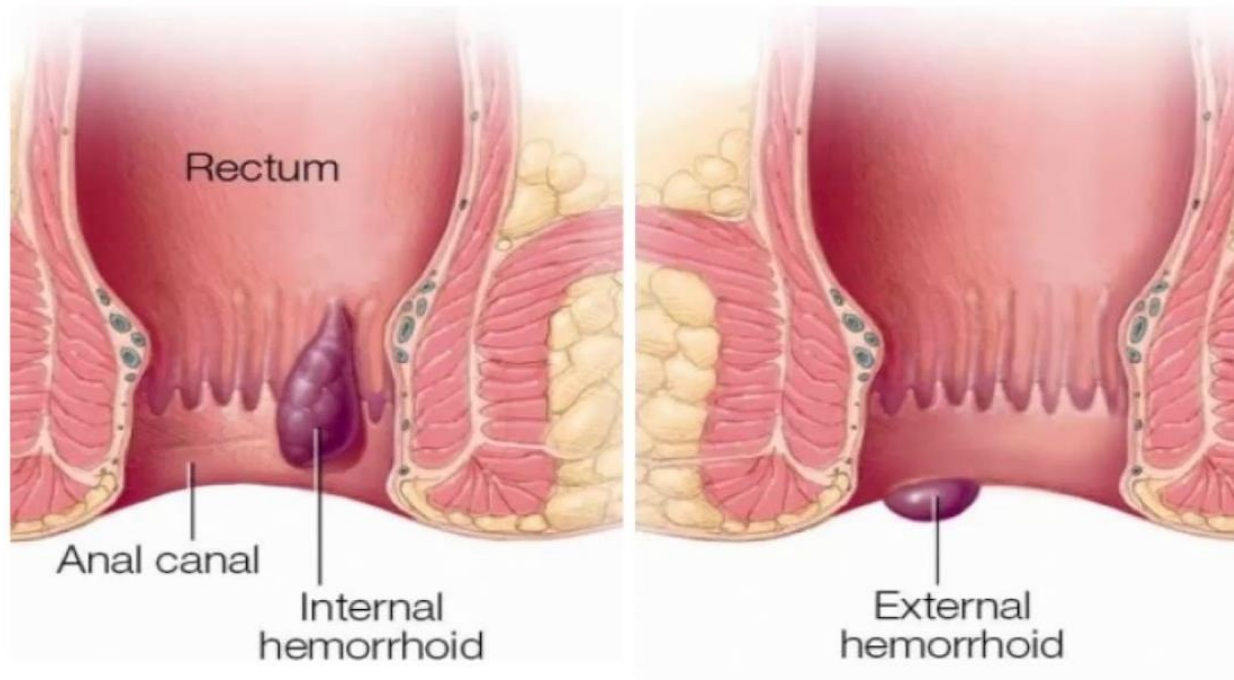
## PRIMARY PILES

- Enlargement of 3 main radicles of superior rectal veins in anal columns
- usually occur at 3(left lateral), 7 (right posterior) & 11 o clock (right anterior) position

**SECONDARY PILES-** any other location



# External hemorrhoids



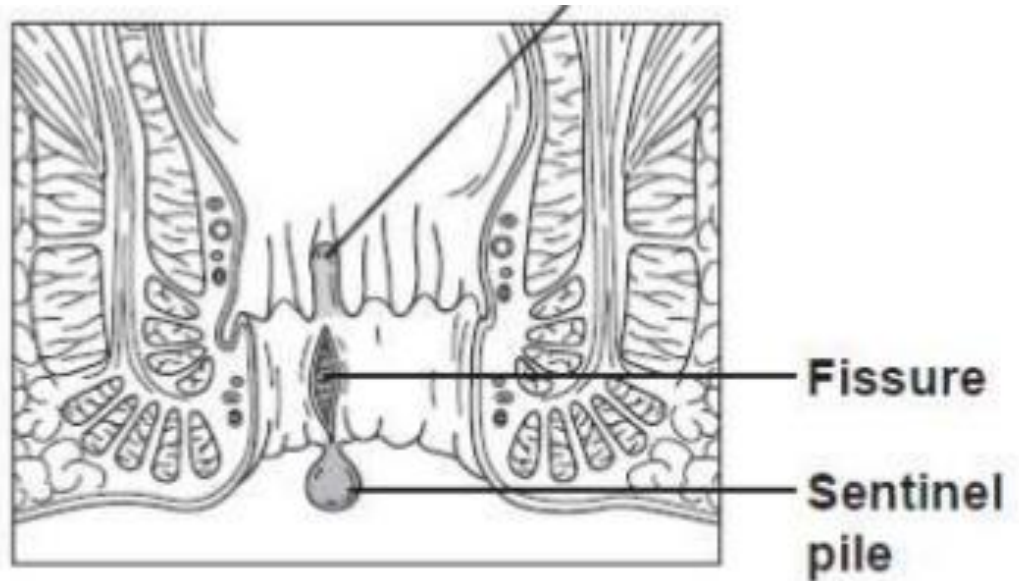
- **Tributaries of inferior rectal vein**
- **At the anal margin**
- **Covered by skin**
- **Painful**



# Anatomical basis of engorgement of anal cushions

- **P**ressure over veins at sites where they pierce the muscular coat, during muscle contraction
- **I**ncreased portal pressure is directly transmitted at portosystemic communications due to absence of valves
- **L**oose connective tissue around veins forms a poor support
- **E**xcessive straining associated with chronic constipation
- **S**ome may have congenital weakness in vein walls

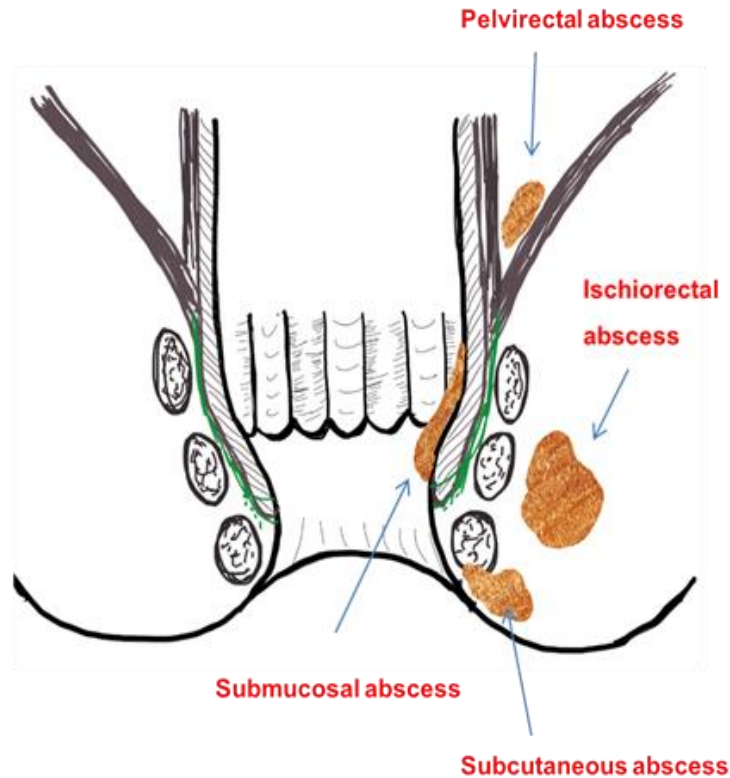
# Anal Fissure



- Elongated ulcer in mucosa due to tearing of anal valves
- In people suffering from chronic constipation
- Extremely painful (lower part of canal)
- Mostly posterior midline, may occur in anterior midline ( superficial external sphincter does not encircle anteriorly & posteriorly)

# Anal Abscess

- **Due to fecal trauma to anal mucosa**
  - Infection in submucosa following fissure
  - Complication of fissure
  - Infected anal mucosal glands
- **On the basis of location**
  - Submucosal abscess
  - Subcutaneous abscess
  - Ischiorectal abscess
  - Pelvirectal abscess



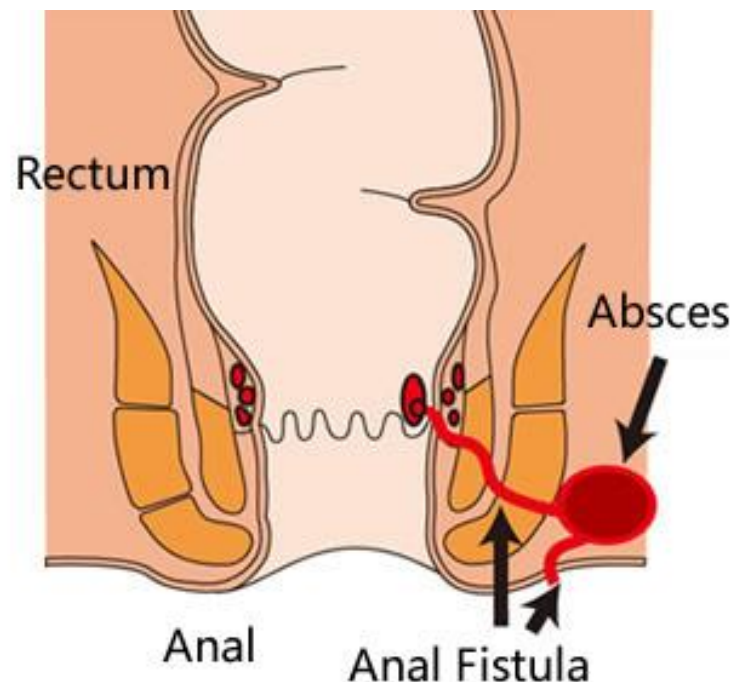
is a painful condition in which a collection of pus develops near the anus. This often appears as a painful boil-like swelling near the anus. It may be red in color and warm to the touch.

Anal abscesses located in deeper tissue are less common and may be less visible.

# Anal Fistula

## CAUSE:

- Due to spread of infection from anal abscess
- Due to improper treatment of anal abscess
- Abscess opens at two places
  - In the lumen of anal canal or lower rectum
  - On the skin of perianal region



An anal fistula is a small tunnel that develops between the end of the bowel and the skin near the anus

# Digital Rectal Examination-by gloved index finger

- **Anteriorly:**

- **Opposite Terminal phalanx**

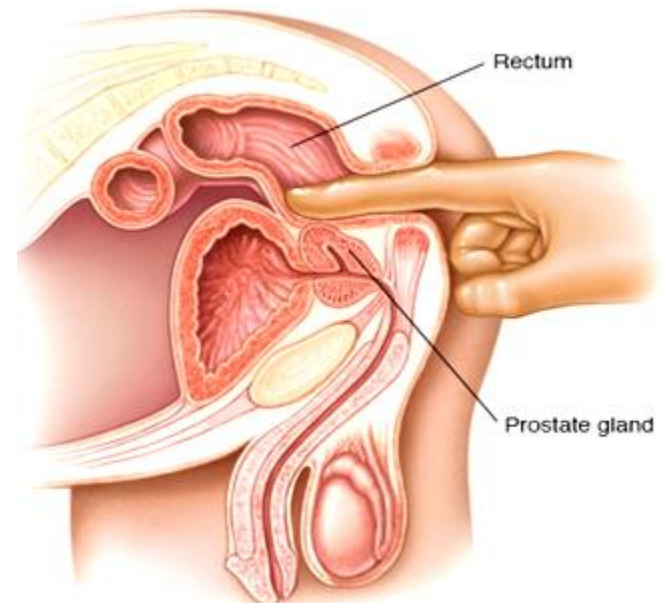
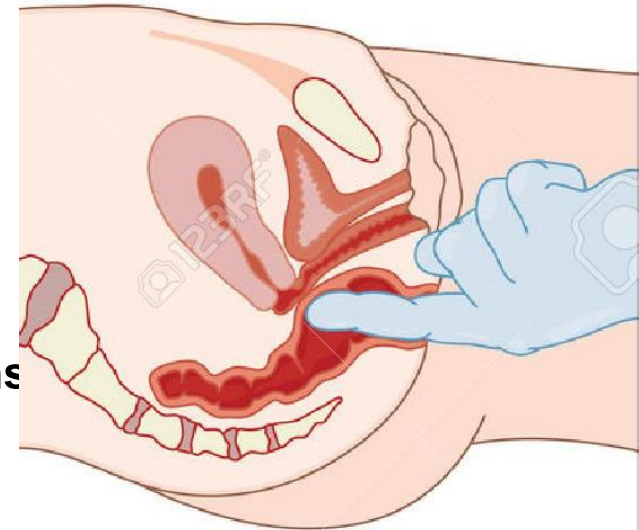
- In males- rectovesical pouch, posterior surface of bladder, seminal vesicles, vas deferens
- In females – rectouterine pouch, vagina, cervix

- **Opposite Middle phalanx**

- In males – prostate
- In females – vagina

- **Opposite Proximal phalanx**

- In males- perineal body, bulb of penis
- In females – perineal body, lower vagina



THANKYOU