Anatomy of Anal Canal

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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
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 fissure
- Anal fistula
- Perianal abscess
Learning objectives

At the end of this teaching session on anatomy of Anal canal all the MBBS 1st 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 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 am 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 - 15mm
- Lower part - 8mm
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
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?
Anal Sphincters

Sphincters

External

Deep

Superficial

Subcutaneous

Internal

Thickening of circular muscle layer
**Anal Sphincters**

**Internal anal sphincter**
- Smooth muscle - Thickened circular muscle layer
- Involuntary
- Surrounds upper $\frac{3}{4}$th 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

**Deep**
- Encircles upper end of canal – Has no bony attachment

**Superficial**
- Encircles middle of canal – attached to perineal body & anococcygeal ligament

**Subcutaneous**
- Encircles lower end of canal – Has no bony attachment

**Intersphincteric groove**
Single Functional & Anatomic entity
Conjoint Longitudinal coat

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

- **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*
Damage of the ring results in Incontinence

- It is formed by the joining of:
  - the puborectalis muscle
  - the deep external sphincter,
  - conjoined longitudinal muscle
  - the highest part of the internal sphincter
The anorectal ring can be clearly felt digitally, as a thickened ridge, especially on its posterior and lateral aspects.
<table>
<thead>
<tr>
<th>Anal canal</th>
<th>Arterial supply</th>
<th>Venous drainage</th>
<th>Lymphatic drainage</th>
<th>Nerves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper half</td>
<td>Superior rectal artery (continuation of the inferior mesenteric artery)</td>
<td>Superior rectal vein drained into the inferior mesenteric vein (portal circulation)</td>
<td>Para-rectal nodes drained into inferior mesenteric lymph nodes</td>
<td>Visceral motor (sympathetic &amp; parasympathetic) &amp; sensory nerves Through inferior hypogastric plexus</td>
</tr>
<tr>
<td>Lower half</td>
<td>Inferior rectal a. (branch of internal pudendal artery)</td>
<td>Inferior rectal vein drained into the internal pudendal vein (Systemic circulation) (site of portal-systemic anastomosis)</td>
<td>Superficial inguinal lymph nodes</td>
<td>Somatic motor &amp; sensory nerves Through inferior rectal nerve</td>
</tr>
</tbody>
</table>

![Diagram](image_url)
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**

causd 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

- 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

- Pressure over veins at sites where they pierce the muscular coat, during muscle contraction
- Increased portal pressure is directly transmitted at portosystemic communications due to absence of valves
- Loose connective tissue around veins forms a poor support
- Excessive straining associated with chronic constipation
- Some 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