

Anal Canal

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- The anal canal is the terminal part of the large intestine. It is situated between the rectum and anus, below the level of the pelvic diaphragm. In humans it is approximately 2.5 to 4 cm (0.98-1.58 in) 38mm long. It lies in the anal triangle of perineum in between the right and left ischioanal fossa.
- The anal canal is the short terminal portion of the rectum through which wastes from the large intestine are excreted from the body. The ring at the terminal portion of the anal canal is called the anus.

PERINEAL BODY

-How is the perineal body formed?

 The perineal body is formed by fusion of the levator ani, transverse perineii, and the external sphincter muscles. Together with the anococcygeal ligament, they act as anchors to give the funnel shape of the pelvic diaphragm





In humans it is approximately 38mm long, extending from the anorectal junction to the <u>anus</u>. It is directed downwards and backwards. It is surrounded by inner involuntary and outer voluntary sphincters which keep the <u>lumen</u> closed in the form of an anteroposterior slit.

- The external anal sphincter muscle is the voluntary muscle that surrounds and adheres to the anus at the lower margin of the anal canal. This muscle is in a state of tonic contraction, but during defecation, it relaxes to allow the release of feces.
- Movement of the feces is also controlled by the involuntarily controlled internal anal sphincter which an extension of the circular muscle surrounding the anal canal. It relaxes to expel feces from the rectum and anal canal.

- Anal canal is divided into three parts.
- The zona columnaris is the upper half of the canal • and is lined by simple columnar epithelium. The middle half of the anal canal is also called as pectin or transitional zone, extends below the pectinate line, separated by <u>Hilton's white line</u> from lower half.it is lined by stratified squamous non-keratinized. The lower half also called as cutaneous zone is lined stratified squamous keratinized epithelium, by respectively.

- Behind this lies the <u>anal gland</u> which secretes lymphal discharge and built up fecal matter from the colon lining.
- It is differentiated from the rectum by the transition of the internal surface from <u>endodermal</u> to skin like ectodermal tissue.

Relations

- The ischioanal fossa lies on each side of the anal canal.
- The <u>perianal space</u> surrounds the anal canal below the white line.
- The submucous space of the canal lies above the white line between the mucous membrane and <u>internal anal sphincter muscle</u>.

RELATIONS

Relations

- Posteriorly: The anococcygeal body, which is a mass of fibrous tissue lying between the anal canal and the coccyx.
- **Laterally:** The fat-filled ischiorectal fossae.
- Anteriorly: In the male, the perineal body, the urogenital diaphragm, the membranous part of the urethra, and the bulb of the penis. In the female, the perineal body, the urogenital diaphragm, and the lower part of the vagina.

ANORECTAL RING

-. At the junction of the rectum and anal canal , the internal sphincter, the deep part of the external sphincter, and the puborectalis muscles form a distinct ring, called the **anorectal ring,** which can be felt on rectal examination.



BLOOD SUPPLY & LYMPH DRAINAGE & NERVE SUPPLY

Blood Supply

Arteries

The superior artery supplies the upper half and the inferior artery supplies the lower half.

Veins:- The upper half is drained by the superior rectal vein into the inferior mesenteric vein, and the lower half is drained by the inferior rectal vein into the internal pudendal vein.

Lymph Drainage

The upper half of the anal canal drains into the pararectal nodes and then the inferior mesenteric nodes. The lower half drains into the medial group of superficial inguinal nodes.

Nerve Supply

The mucous membrane of the upper half is sensitive to stretch and is innervated by sensory fibers that ascend through the hypogastric plexuses. The lower half is sensitive to pain, temperature, touch, and pressure and is innervated by the inferior rectal nerves. The involuntary internal sphincter is supplied by sympathetic fibers from









Anal Canal – Extent & Course

Terminal part of Large Intestine

Begins at ano-rectal jn

At a point 2-3cm in front & little below tip of coccyx

Downwards & Backwards

Opens at anal orifice – 4cm below & in front of tip of coccyx



Anal Canal- Measurements

- Length = 3.8cm
- Breadth
 - When empty laterall wall approximated

Antero-posterior slit



Relations

- Anteriorly: Perineal body

 Males: membranous urethra
 bulb of penis
 Females: lower end of vagina
- Posteriorly: Anococcygeal ligament Tip of coccyx
- Laterally: Ischiorectal fossae
- <u>All round:</u> Sphincteric muscles, tone of which keeps the anal closed...



STRUCTURE

- The mucous membrane of the upper half of the anal canal
- is derived from hindgut endoderm. It has the following important anatomic features:
- **I**t is lined by columnar epithelium.
- It is thrown into vertical folds called **anal columns**, which are joined together at their lower ends by small semilunar folds called **anal valves** (remains of proctodeal membrane).
- The nerve supply is the same as that for the rectal mucosa and is derived from the autonomic hypogastric plexuses. It is sensitive only to stretch.
- The arterial supply is that of the hindgut—namely, the superior rectal artery, a branch of the inferior mesenteric artery. The venous drainage ismainly

STRUCTURE

by the superior rectal vein, a tributary of the inferior mesenteric vein, and the portal vein.

The lymphatic drainage is mainly
upward along the superior rectal artery
to the pararectal nodes and then
eventually to the inferior mesenteric
nodes.

Cont,,,,,

- The mucous membrane of the lower half of the anal canal is derived from ectoderm of the ectoderm. It has the following important features:
- It is lined by stratified squamous epithelium, which gradually merges at the anus with the perianal epidermis.
- There are no analcolumns.
- The nerve supply is from the somatic inferior rectal nerve; it is thus sensitive to pain, temperature, touch, and pressure.
- The arterial supply is the inferior rectal artery, a branch of the internal pudendal artery. The venous drainage is by the inferior rectal vein, a tributary of the internal pudendal vein, which drains into the internal iliac vein.
- The lymph drainage is downward to the medial group of superficial inguinal nodes.
- The **pectinate line** indicates the level where the upper half of the anal canal joins the lower half .

Structure

- The anal canal is divided into two unequal sections, upper and lower.
- The upper 2/3 has longitudinal folds or elevations of tunica mucosa. Its mucosa is lined by <u>simple columnar epithelium</u>. Its lower ends are joined together by folds of <u>mucous</u> <u>membrane</u> called anal valves. The upper 2/3 of the anal canal is supplied by the <u>superior rectal artery</u> which is a branch of the <u>inferior mesenteric artery</u>.
- The lower 1/3 of the anal canal is lined by <u>stratified</u> <u>squamous epithelium</u> that blends with the skin. The lower third of the anal canal is supplied by the <u>inferior rectal</u> <u>artery</u> which is a branch of the <u>internal pudendal artery</u>.

Structure Contd

 A whitish line called <u>Hilton's white</u> <u>line</u> indicates the junction between keratinized stratified squamous epithelium and non-keratinized stratified squamous epithelium.



Upper Muscular part

- 15 mm
- Endodermal origin
- Lined by semitransparent mucous membrane
 - Simple columnar /
 Stratified columnar or
 squamous
- <u>Plum red</u> due to?



Upper Muscular part - Features

<u>Anal Columns /</u> <u>Columns of Morgagni</u>

Permanent longitudinal mucosal folds

Reduplication of mucous membrane

Contains Radicals of Sup rectal veins



Upper Muscular part - Features

Injury – <u>Anal Fissure</u>

Anal Valves / Valves of Ball

Crescentic mucosal folds

Connect lower ends of anal columns

Upper surface

Lower surface



Pectinate Line / Dentate Line

Importance of Pectinate Line

Divide canal in to Upper & Lower Areas

Development

Arterial Supply

Venous Drainage

Lymphatic Drainage

Nerve Supply

85% diseases starts here



Pectinate Line / Dentate Line



Anal Papillae

Epithelial processes

Remnant of anal membrane





Upper Muscular part - Features

Anal Glands

Open in floor of sinuses

Infection - Fistula



Intermediate area / Area of Pectane

- 15 mm
- Ectodermal origin
- Anal column: Absent
- Bluish pink appearance of mucosa
- St sq epithelium
- No sweat / Sebaceous gland



Lower area / Anal Verge

- 8 mm
- Ectodermal origin
- True skin with pigmentation
- Corrugation due to corrugator cutis ani
- Course hairs



Intermediate area / Area of Pectane

Color contrast between
 Bluish pink mucosa above

& black skin below

 Lies at lower end of internal anal sphincter



White line of Hilton









STRUCTURE

Muscle Coat

- As in the upper parts of the intestinal tract, it is divided into an outer longitudinal and an inner circular layer of smooth muscle Anal Sphincters The anal canal has an involuntary internal sphincter and a voluntary external sphincter. The internal sphincter is formed from a thickening of the smooth muscle of the circular coat at the upper end of the anal canal. The internal sphincter is enclosed by a sheath of striped muscle that forms the voluntary external sphincter The external sphincter can be divided into three parts:
- A subcutaneous part, which encircles the lower end of the anal canal and has no bony attachments
- A superficial part, which is attached to the coccyx behind and the perineal body in front

STRUCTURE

- A **deep part**, which encircles the upper end of the anal canal and has no bony attachments
- The **puborectalis** fibers of the two levatores ani muscles blend with the deep part of the external sphincter. The puborectalis fibers of the two sides form a sling, which is attached in front to the pubic bones and passes around the junction of the rectum and the anal canal, pulling the two forward at an acute angle.
- The longitudinal smooth muscle of the anal canal is continuous above with that of the rectum. It forms a continuous coat around the anal canal and descends in the interval between the internal and external anal sphincters. Some of the longitudinal fibers are attached to the mucous membrane of the anal canal, whereas others pass laterally into the ischiorectal fossa or are attached to the perianal skin

Musculature Anal Canal

- Anal Sphincters:
- Internal:
 - Thickened lower circular muscle of rectum
 - Involuntary
- External:
 - Striated muscles
 - Voluntary,
 - 3 parts:
 - 1) Subcutaneous
 - 2) Superficial
 - 3) Deep













Incomplete/Mucosal

Complete/Procidentia

Prolapsed rectum

ADAM.

Hemorrhoids / Piles

Internal hemorrhoids:

- Tributary of sup rectal
- Above white line
- Generally painless

External hemorrhoids:

- Tributary of inf rectal
- Below white line
- Generally painful





External hemorrhoid



Origin below dentate line (external rectal plexus)

Internal hemorrhoid



Origin above dentate line (internal rectal plexus)

Mized hemorrhoid



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





Anal Fissure

Rupture of anal valves

Painful



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Anal Fissure





Fistula in Ano

A fistula-in-ano is a hollow tract lined with granulation tissue connecting a primary opening inside the anal canal to a secondary opening in the perianal skin. Secondary tracts may be multiple and from the same primary

opening.



