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Assignment

Discuss the Anal canal

Anal Canal

The anal canal is the terminal segment of the large intestine between the rectum and anus, located below the level of the pelvic diaphragm. It is located within the anal triangle of perineum, between the right and left ischioanal fossa. The aperture at the terminal portion of the anal canal is known as the anus.

The anal canal is approximately 2.5 to 4 long, from the anorectal junction to the anus. It is directed downwards and backwards. It is surrounded by inner involuntary and outer voluntary sphincters which keep the lumen closed in the form of an anteroposterior slit.

The anal canal is differentiated from the rectum by a transition along the internal surface from endodermal to skin-like ectodermal tissue.

Anal canal is traditionally divided into two segments, upper and lower, separated by the pectinate line (also known as the dentate line):

Upper zone (Zona columnaris)

- mucosa is lined by simple columnar epithelium
- features longitudinal folds or elevations of tunica mucosa which are joined together inferiorly by folds of mucous membrane known as anal valves
- supplied by the superior rectal artery (a branch of the inferior mesenteric artery)

Lower zone

- divided into two smaller zones, separated by a white line known Hilton's line:
  - Zona hemorrhagica - lined by stratified squamous non-keratinized epithelium
  - Zona cutanea - lined stratified squamous keratinized epithelium, which blends with the surrounding perianal skin
- supplied by the inferior rectal artery (a branch of the internal pudendal artery)

The *anal verge* refers to the distal end of the anal canal, a transitional zone between the epithelium of the anal canal and the perianal skin. It should not be confused with the pectinate line between the upper and lower zones within the anal canal.

- Anal gland secretes lymphal discharge and built up fecal matter from the colon lining. In some animals this gland expungement can be done routinely every 24 – 36 months to prevent infection and fistula formation. upper zone (Zona columnaris)
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The pigmented, keratinized perianal skin of the buttocks has skin appendages (eg, hair, sweat glands, and sebaceous glands)

The demarcation between the rectum above and the anal canal below is the anorectal ring or anorectal flexure, where the puborectalis muscle forms a sling around the posterior aspect of the anorectal junction, kinking it anteriorly.

The anal canal is completely extraperitoneal.

The epithelium of the anal canal between the anal verge below and the pectinate line above is variously described as anal mucosa or anal skin.

The pectinate line is the site of transition of the proctodeum below and the postallantoic gut above. It is a scalloped demarcation formed by the anal valves (transverse folds of mucosa) at the inferior-most ends of the anal columns. Anal glands open above the anal valves into the anal sinuses. 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.

The anal canal just above the pectinate line for about 1-2 cm is called the anal pecten or transitional zone. Above this transitional zone, the anal canal is lined with columnar epithelium. Anal columns mucosal folds in the upper part of the anal canal.

At the bottom of these columns are anal sinuses or crypts, into which open the anal glands and anal papillae. Infection of the anal glands is

likely the initial event in causation of perianal abscess and fistula-in-ano. Three of these columns (left lateral, right posterior, and right anterior, at 3-, 7-, and 11-o'clock positions in supine position) are prominent; they are called anal cushions and contain branches and tributaries of superior rectal (hemorrhoidal) artery and vein. When prominent, veins in these cushions form the internal hemorrhoids .The epithelium of the anal canal between the anal verge below and the pectinate line above is variously described as anal mucosa or anal skin.

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The anal canal just above the pectinate line for about 1-2 cm is called the anal pecten or transitional zone. Above this transitional zone, the anal canal is lined with columnar epithelium (which is insensitive to cutting). Anal columns (of Morgagni) are 6-10 longitudinal (vertical) mucosal folds in the upper part of the anal canal.

The anorectal junction or anorectal ring is situated about 5 cm from the anus. At the anorectal flexure or angle, the anorectal junction is

pulled anterosuperiorly by the puborectal sling to continue below as the anal canal.

Levator ani and coccygeus muscles form the pelvic diaphragm. Lateral to the anal canal are the pyramidal ischioanal (ischiorectal) fossae, below the pelvic diaphragm and above the perianal skin. The paired ischioanal fossae communicate with each other behind the anal canal. The anterior relations of the anal canal are, in males, the seminal vesicles, prostate, and urethra, and, in females, the cervix and vagina with perineal body in between. In front of (anterior to) the anal canal is the rectovesical fascia (of Denonvilliers), and behind (posterior) is the presacral endopelvic fascia (of Waldeyer), under which lie a rich presacral plexus of veins. Posterior to the anal canal lie the tip of the coccyx (joined to it by the anococcygeal ligament) and lower sacrum.

The anal canal is surrounded by several perianal spaces: subcutaneous, submucosal, intersphincteric, ischioanal (rectal) and pelvirectal.

Blood supply and lymphatics

The anal canal above the pectinate line is supplied by the terminal branches of the superior rectal (hemorrhoidal) artery, which is the terminal branch of the inferior mesenteric artery. The middle rectal artery (a branch of the internal iliac artery) and the inferior rectal

artery (a branch of the internal pudendal artery) supply the lower anal canal.

Beneath the anal canal skin (below the pectinate line) lays the external hemorrhoidal plexus of veins, which drains into systemic veins. Beneath the anal canal mucosa, above the pectinate line lays the internal hemorrhoidal plexus of veins, which drains into the portal system of veins. The anal canal is, therefore, an important area of portosystemic venous connection (the other being the esophagogastric junction). Lymphatics from the anal canal drain into the superficial inguinal group of lymph nodes.

Anorectal sphincter tone can be assessed during digital rectal examination when the patient is asked to squeeze the examining finger. Anorectal manometry measures the pressures: resting and squeezing.

The anal canal below the pectinate line develops from the proctodeum (ectoderm), while that above the pectinate line develops from the endoderm of the hindgut.

Muscle

The anorectal flexure is formed by the puborectalis (the innermost fibers of levator ani muscle, which extends from the pubic bone, obturator fascia, and ischial spine to the coccyx and anococcygeal ligament) and the upper ends of the external and internal anal

sphincters. Puborectalis plays a much more important role in continence than the internal and external sphincters. The involuntary autonomous internal anal sphincter is the lowermost continuation of the inner, circular smooth muscle layer of the rectum. The external longitudinal muscle layer continues as the corrugators-cutis-ani. The external anal sphincter has 3 parts: subcutaneous, superficial, and deep. The external anal sphincter is composed of skeletal muscle, is under voluntary control, and is supplied by pudendal nerves (S2-S4).

Pathophysiologic Variants

Pathophysiologic anal variants include the following:

- Anal atresia
- Ectopic Anus
- Persistent Cloaca

Anal atresia also known as mperforate anus is a low anorectal malformation in which the anus is either atretic (absent) or narrowed and the colon and rectum are normal. If the proctodeum and the postallantoic gut fail to unite, an imperforate anus results.

Ectopic anus, the anus is misplaced, usually anteriorly in the perineum (in males) or in the vagina (in females).

Persistent cloaca is a common passage in which the lower GI tract (rectum), lower urinary tract (bladder or urethra), and lower genital tract in females (vagina) are open.

Perianal Lesions

The location of perianal lesions is described in relation to a clock (as seen in the supine position), eg, 2 o'clock, 7 o'clock. Sites of perianal lesions include the following:

- Perianal skin – Abscess, hematoma (erroneously called thrombosed external hemorrhoids), external opening of fistula-in-ano, skin tag (in chronic fissure-in-ano)
- Anal canal skin (anoderm, below dentate line) – Fissure-in-ano, external hemorrhoids, cancer
- Anal canal mucosa (above pectinate line) - Internal hemorrhoids, cancer.

The pectinate line cannot be felt on rectal examination but is seen on anoproctoscopy; under anesthesia, the pectinate line can be seen on retraction of the perianal skin. The anorectal flexure can be palpated on rectal examination (but not under anesthesia when the muscles relax).

Infection of an anal gland is considered the initial event in the formation of a perianal abscess and then fistula-in-ano. Fissure-in-ano is an ulcer in the sensitive anal canal skin and is a very painful condition. Fistula-in-ano can be intersphincteric, trans-sphincteric, or suprasphincteric. The internal opening of fistula-in-ano can be in the anal canal or rectum.

External hemorrhoids are in located below the pectinate line on sensitive anal canal skin and are painful, while internal hemorrhoids are located above the pectinate line in insensitive anal canal mucosa and are painless (unless complicated). For the same reason, internal hemorrhoids can be intervened without anesthesia.

During posterior or lateral sphincterotomy for fissure in ano, it is only the internal sphincter that is divided.

A cruciate incision in the perianal skin lateral to the anal verge provides easy and direct access to ischioanal fossae for drainage of an abscess.