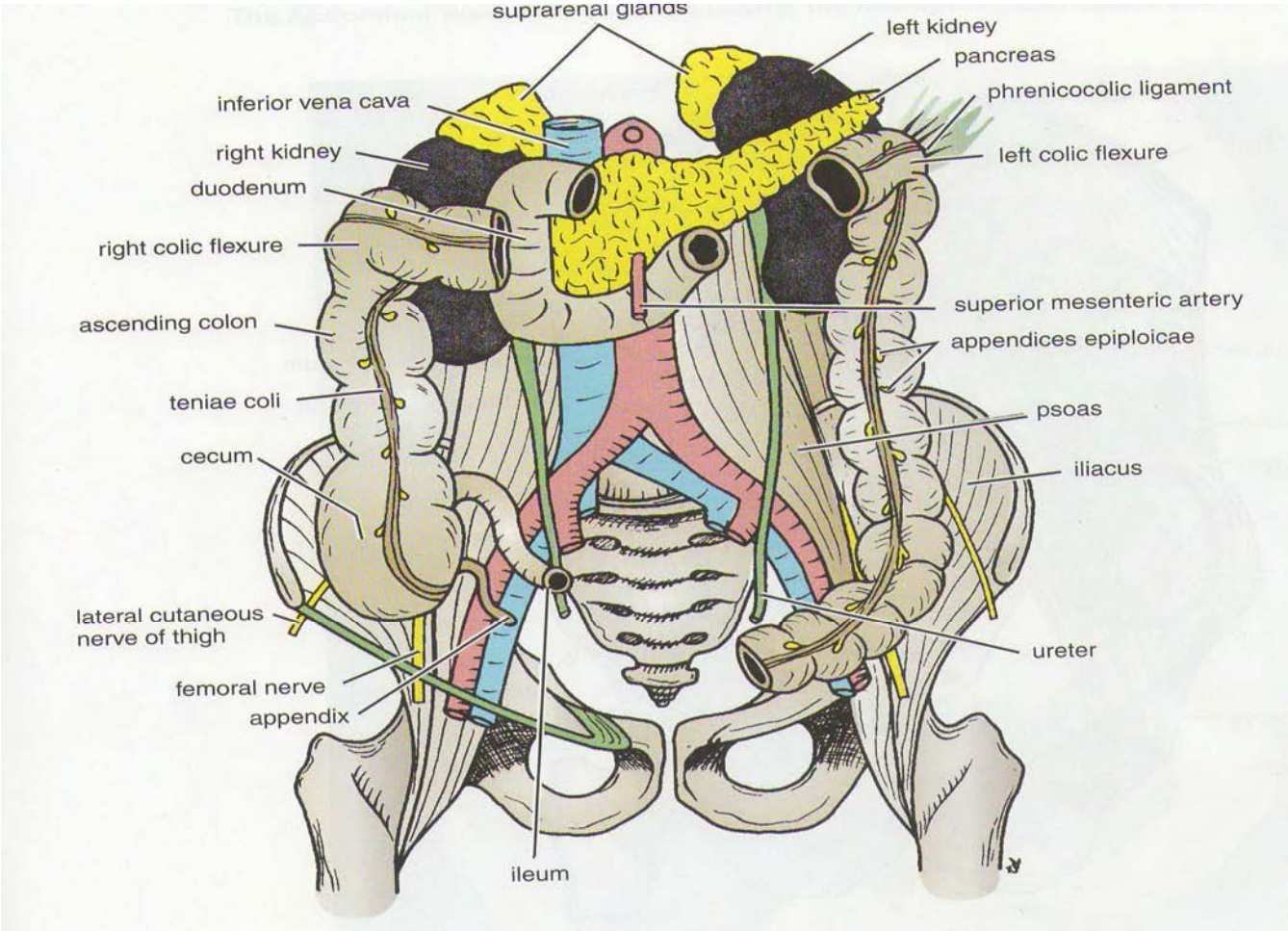
Lecture 3 in Anatomy of GIT

By

Dr. Mohammad Ahmad Abdulla

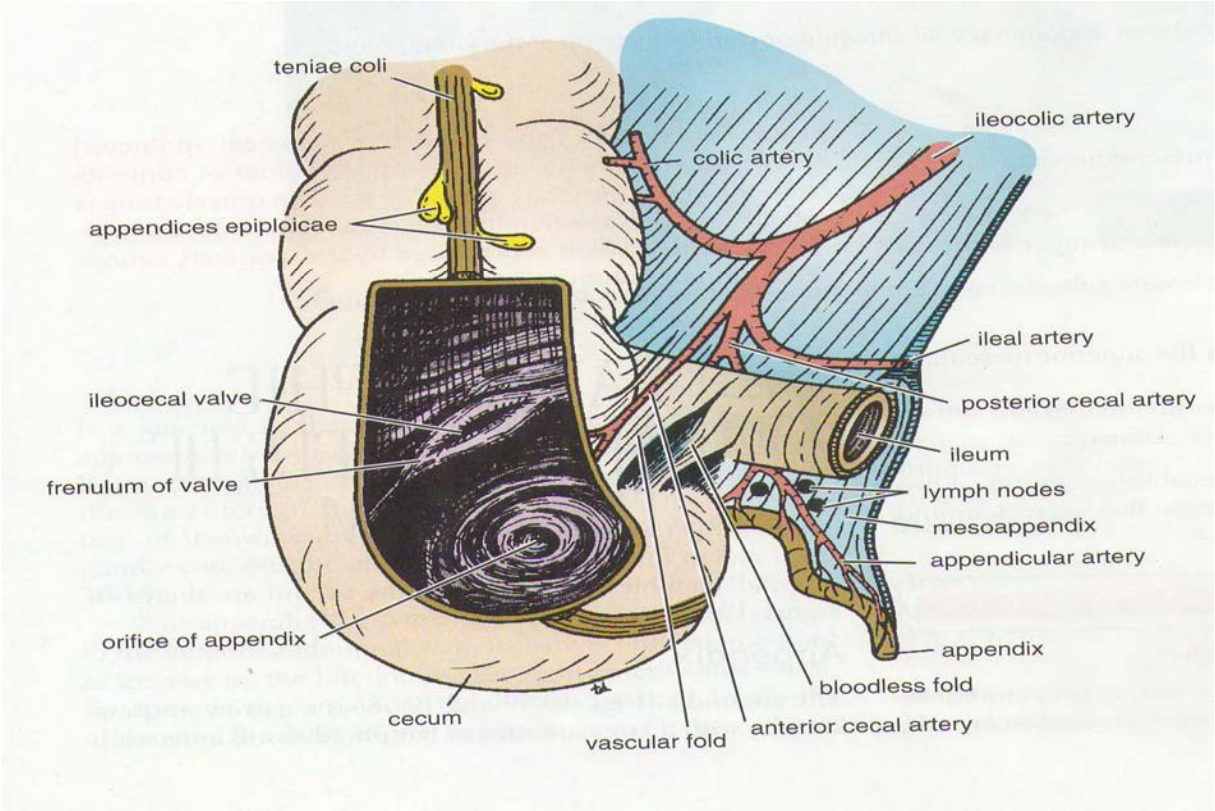
Large Intestine

The large intestine extends from the ileum to the anus. It is divided into the cecum, the appendix, the ascending colon, the transverse colon, the descending colon, the sigmoid colon, the rectum, and the anal canal.



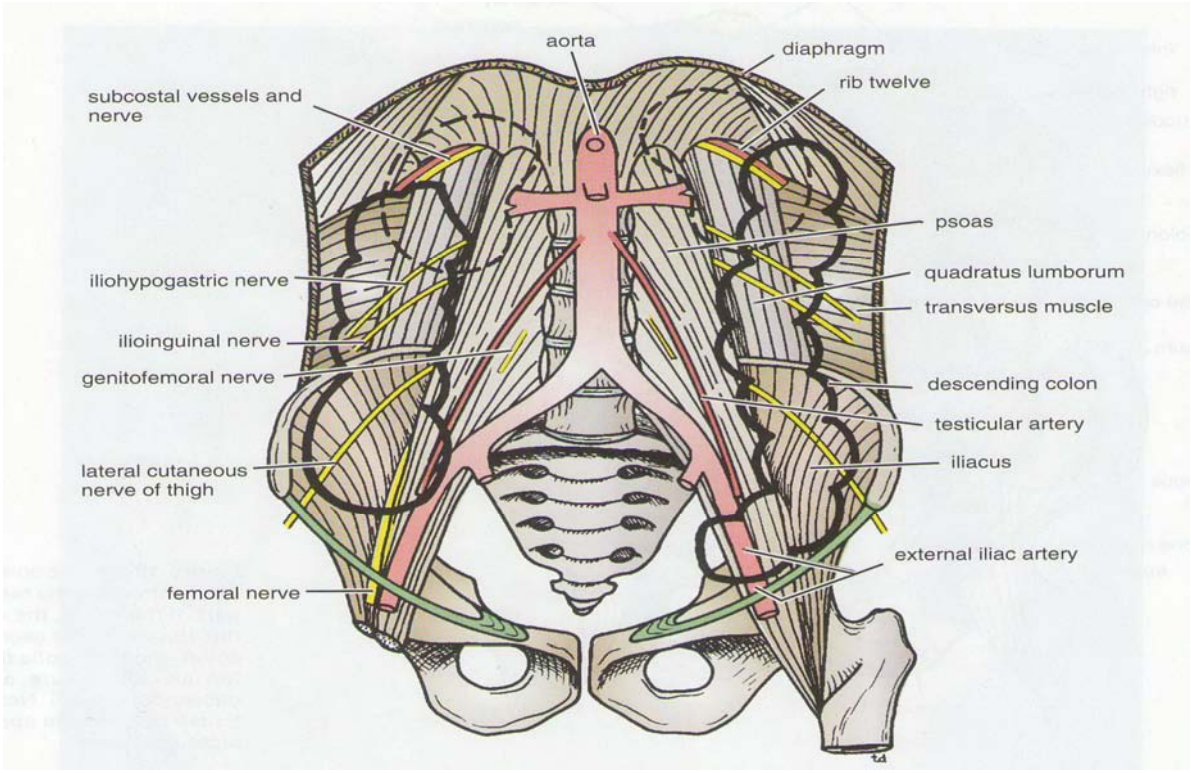
Cecum

The cecum is a blind-ended pouch within the right iliac fossa and is completely covered with peritoneum. At the junction of the cecum and the ascending colon, it is joined on the left side by the terminal part of the ileum. The appendix is attached to its posteromedial surface.



Relations

Anteriorly: Anterior abdominal wall in the right iliac region, coils of small intestine.
Posteriorly: Iliopsoas muscle.



Blood Supply

Arteries:- Anterior and posterior cecal arteries from the ileocolic artery, which is a branch of the superior mesenteric artery.
Veins:- The veins drain into the superior mesenteric vein.

Lymph Drainage

The lymph drains into the mesenteric and superior mesenteric nodes.

Nerve Supply

Sympathetic and vagus nerves, via the superior mesenteric plexus, supply the cecum.

Ileocecal Valve

A rudimentary structure, the ileocecal valve consists of two horizontal folds of mucous membrane that project around the orifice of the ileum.

Appendix

The appendix is a narrow, muscular tube with a large amount of lymphoid tissue in its wall. It is attached to the posteromedial surface of the cecum approximately 1 in. (2.5 cm) below the ileocecal junction. It has a complete peritoneal covering, which is attached to the mesentery of the small intestine by a short mesentery of its own called the ***mesoappendix***. The mesoappendix contains the appendicular vessels and nerves.

The appendix lies in the right iliac fossa, and in relation to the anterior abdominal wall, its base is situated one third of the way up the line joining the right anterior superior iliac spine to the umbilicus **(McBurney's point).** Inside the abdomen, the base of the appendix is easily recognized tracing the teniae coli of the cecum and then following them to the appendix, where they converge to form a continuous muscle coat.

Blood Supply

Arteries:- Appendicular artery is a branch of the posterior cecal artery.
Veins:- The veins drain into the posterior cecal vein.

Lymph Drainage

The lymph drains into nodes in the mesoappendix and eventually into the superior mesenteric lymph nodes.

Nerve Supply

The appendix is supplied by the sympathetic and vagus nerves from the superior mesenteric plexus. Afferent nerve fibers concerned with the conduction of visceral pain from the appendix accompany the sympathetic nerves and enter the spinal cord at the level of the tenth thoracic segment.

Ascending Colon

The ascending colon is approximately 5 in. (13 cm) in length and extends upward from the cecum to the inferior surface of the right lobe of the liver. Here, it turns to the left (forming the right colic flexure) and becomes continuous with the transverse colon. The peritoneum covers the front and the sides of the ascending colon, binding it to the posterior abdominal wall. The ascending colon lies posteriorly on the iliacus, quadratus lumborum, and the lower pole of the right kidney.

Blood Supply

Arteries:- The ascending colon is supplied by the ileocolic and the right colic branches of the superior mesenteric artery.
Veins:- The veins drain into the superior mesenteric vein.

Lymph Drainage

The lymph drains into the colic and superior mesenteric lymph nodes.

Nerve Supply

Sympathetic and vagus nerves from the superior mesenteric plexus supply the ascending colon.

Transverse Colon

The transverse colon is approximately 15 in. (38 cm) in length and passes across the abdomen, occupying the umbilical and the hypogastric regions. It begins at the right colic flexure below the right lobe of the liver and hangs downward, suspended by the transverse mesocolon from the pancreas. It then ascends to the left colic flexure below the spleen. The **left colic flexure** is higher than the right colic flexure and is held in position by the **phrenicocolic ligament**. The **transverse mesocolon** (or mesentery of the transverse colon) is attached to the superior border of the transverse colon and suspends it from the pancreas; the posterior layers of the greater omentum are attached to the inferior border.

Blood Supply

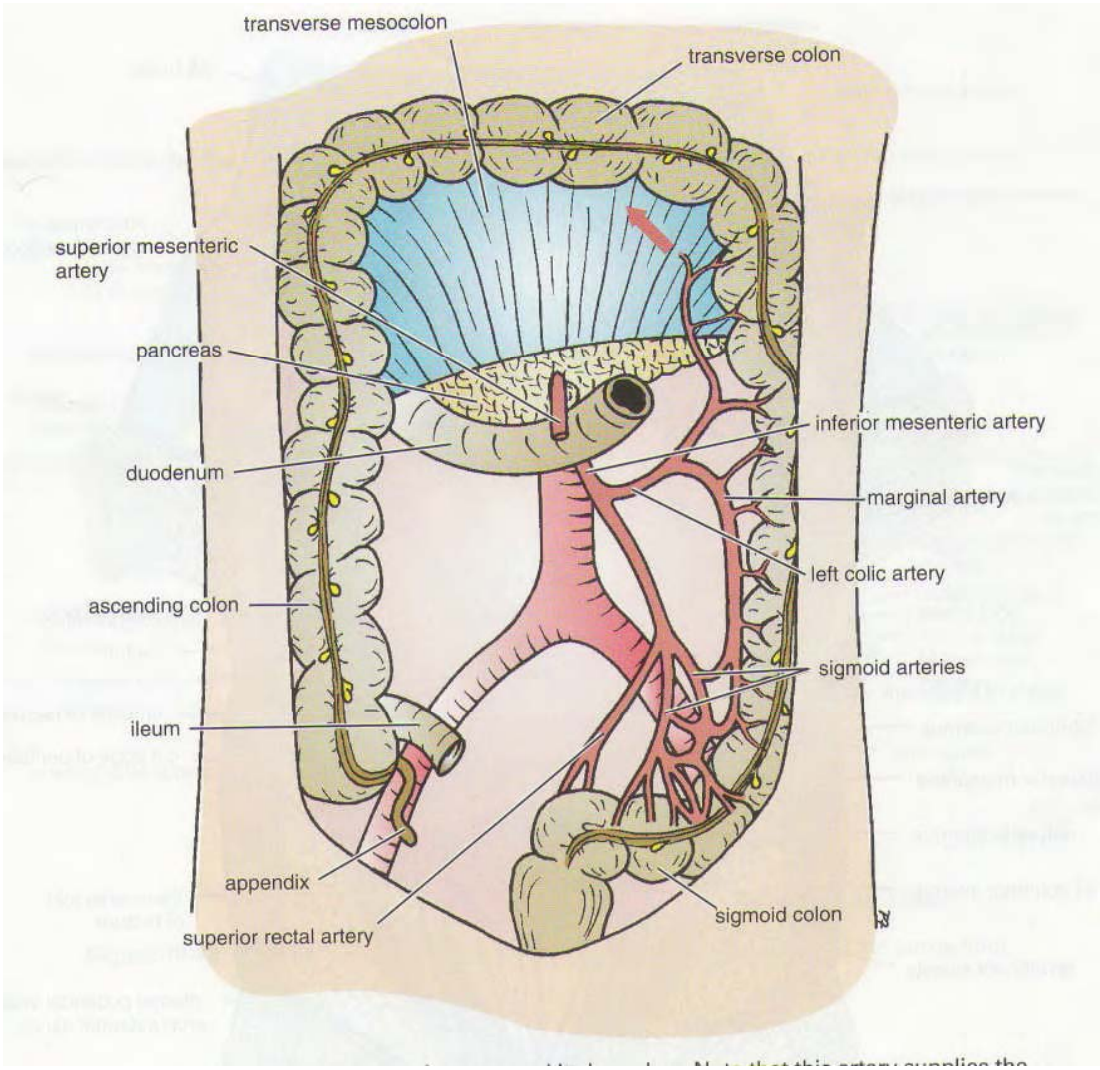
Arteries:-The proximal two thirds of the transverse colon is supplied by the middle colic artery, which is a branch of the superior mesenteric artery. The distal one third is supplied by the left colic artery, which is a branch of the inferior mesenteric artery.
Veins:- The veins drain into the superior and the inferior mesenteric veins.

Lymph Drainage

The proximal two thirds drain into the colic nodes and into the superior mesenteric nodes. The distal one third drains into the colic nodes and then the inferior mesenteric nodes.

Nerve Supply

The proximal two thirds are innervated by the sympathetic and the vagal nerves through the superior mesenteric plexus. The distal one third is innervated by the sympathetic and the parasympathetic pelvic splanchnic nerves through the inferior mesenteric plexus.



Descending Colon

The descending colon is approximately 10 in. (25 cm) in length and extends downward from the left colic flexure to the pelvic brim, where it becomes continuous with the sigmoid colon. The peritoneum covers the front and the sides and also binds it to the posterior abdominal wall. The descending colon lies posteriorly on the left kidney, the quadratus lumborum, and the iliacus muscles.

Blood Supply

Arteries:-The left colic branch and sigmoid branches of the inferior mesenteric artery supply the descending colon.

Veins:- The veins drain into the inferior mesenteric vein.

Lymph Drainage
The lymph passes to the colic and inferior mesenteric nodes.

Nerve Supply
Sympathetic and parasympathetic pelvic splanchnic nerves through the inferior mesenteric plexus supply the descending colon.

Sigmoid Colon

The sigmoid colon is 10 to 15 in. (25 to 38 cm) in length and begins as a continuation of the descending colon in front of the pelvic brim. Below, it becomes continuous with the rectum in front of the **third sacral vertebra**. It hangs down into the pelvic cavity in the form of a loop and is attached to the posterior pelvic wall by the fan-shaped **sigmoid mesocolon**.

Blood Supply
Arteries:-Sigmoid branches of the inferior mesenteric artery supply the sigmoid colon.
Veins:- The veins drain into the inferior mesenteric vein.

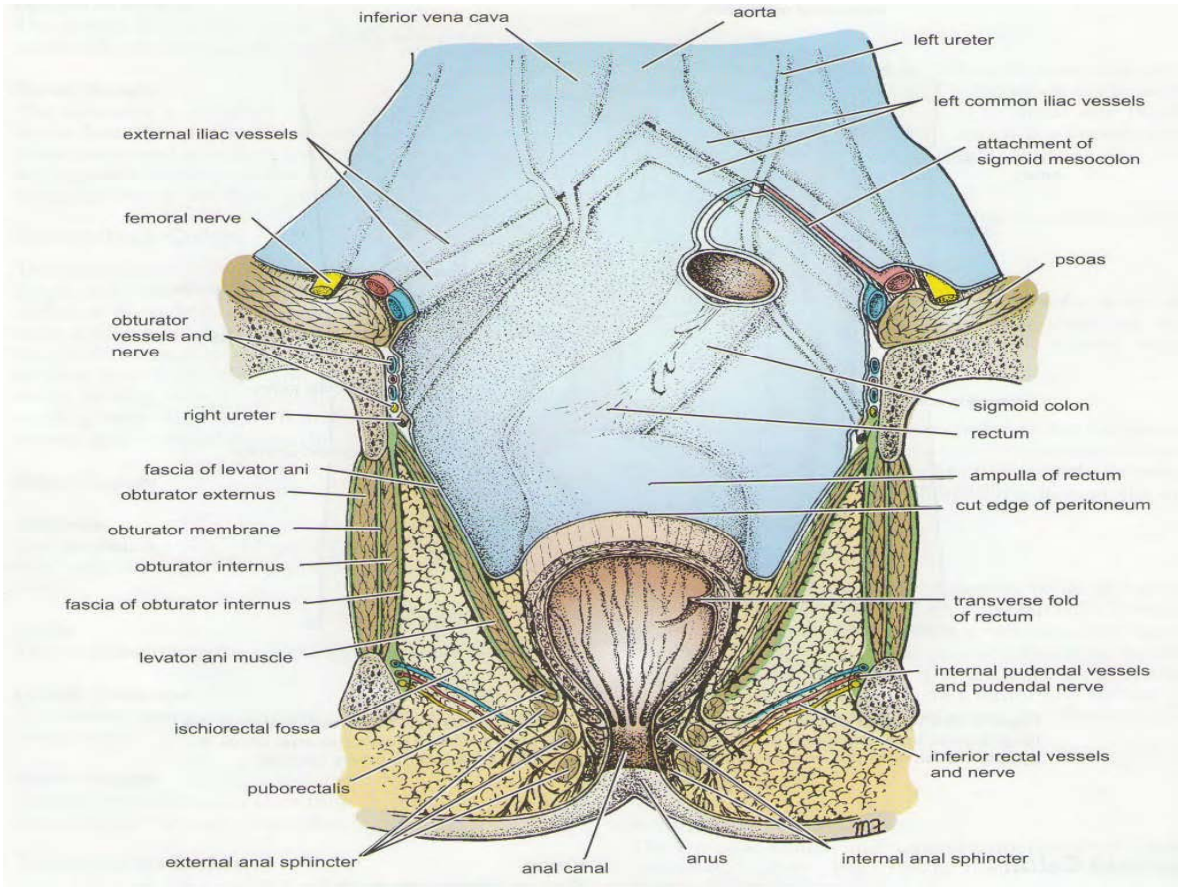
Lymph Drainage
The lymph drains into, the colic and inferior mesenteric nodes.

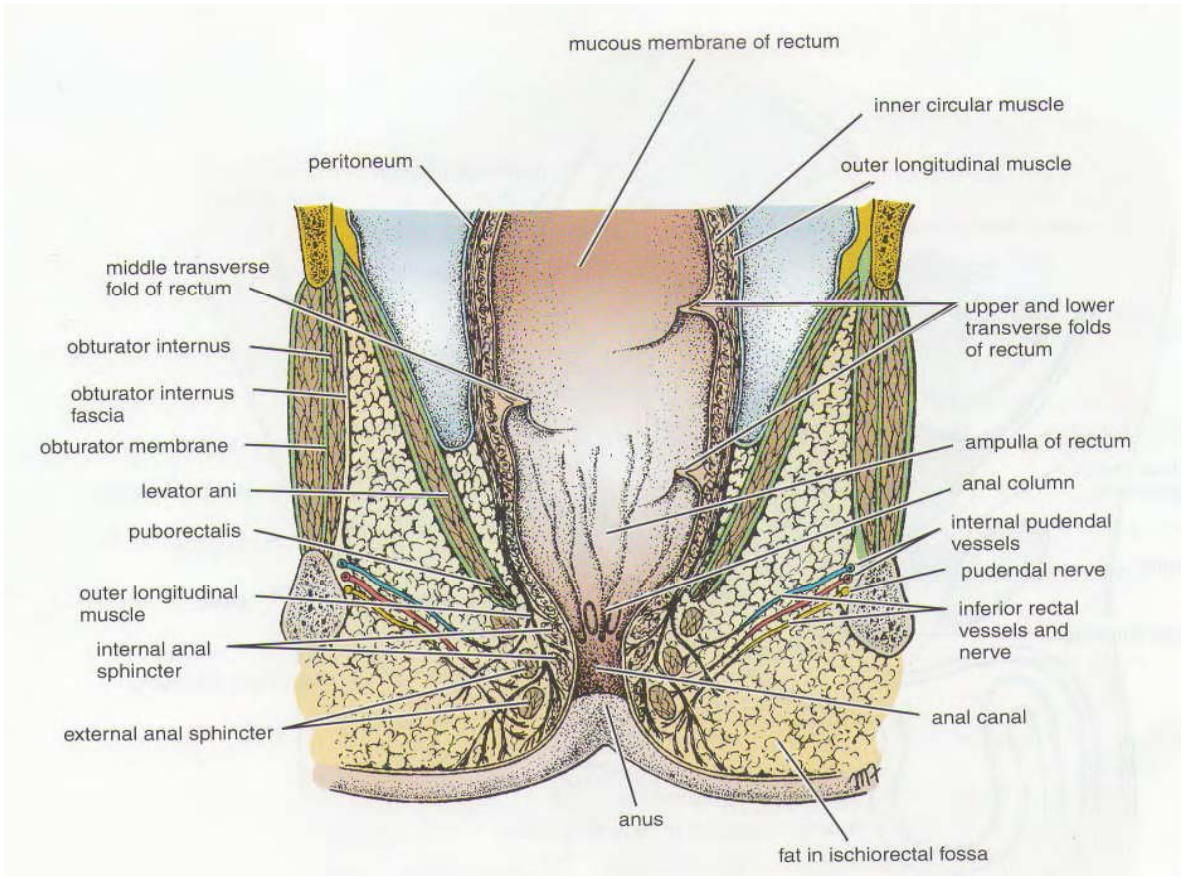
Nerve Supply
Sympathetic and parasympathetic nerves through the inferior hypogastric plexuses supply the sigmoid colon.

Rectum

The rectum is about 5 in. (13 cm) long and begins in front of the third sacral vertebra as a continuation of the sigmoid colon. It passes downward, following the curve of the sacrum and the coccyx, and ends in front of the tip of the coccyx by piercing the pelvic floor and becomes continuous with the anal canal. The lower part of the rectum lies immediately above the pelvic floor and is dilated to form the **rectal ampulla**. The peritoneum covers only the upper two thirds of the rectum. The teniae coli of the sigmoid colon come together, so that the longitudinal muscle fibers form a broad band on the anterior and posterior surfaces of the rectum.

The mucous membrane of the rectum, together with the circular muscle layer, form three semicircular folds; two are placed on the left rectal wall, and one is placed on the right wall. They are called the **transverse folds of the rectum**.


inferior vena cava
aorta
left ureter
left common iliac vessels
external iliac vessels
attachment of sigmoid mesocolon
femoral nerve
psoas
obturator vessels and nerve
sigmoid colon
right ureter
rectum
fascia of levator ani
ampulla of rectum
obturator externus
cut edge of peritoneum
obturator membrane
obturator internus
transverse fold of rectum
fascia of obturator internus
levator ani muscle
internal pudendal vessels and pudendal nerve
ischiorectal fossa
inferior rectal vessels and nerve
puborectalis
external anal sphincter
anal canal
anus
internal anal sphincter

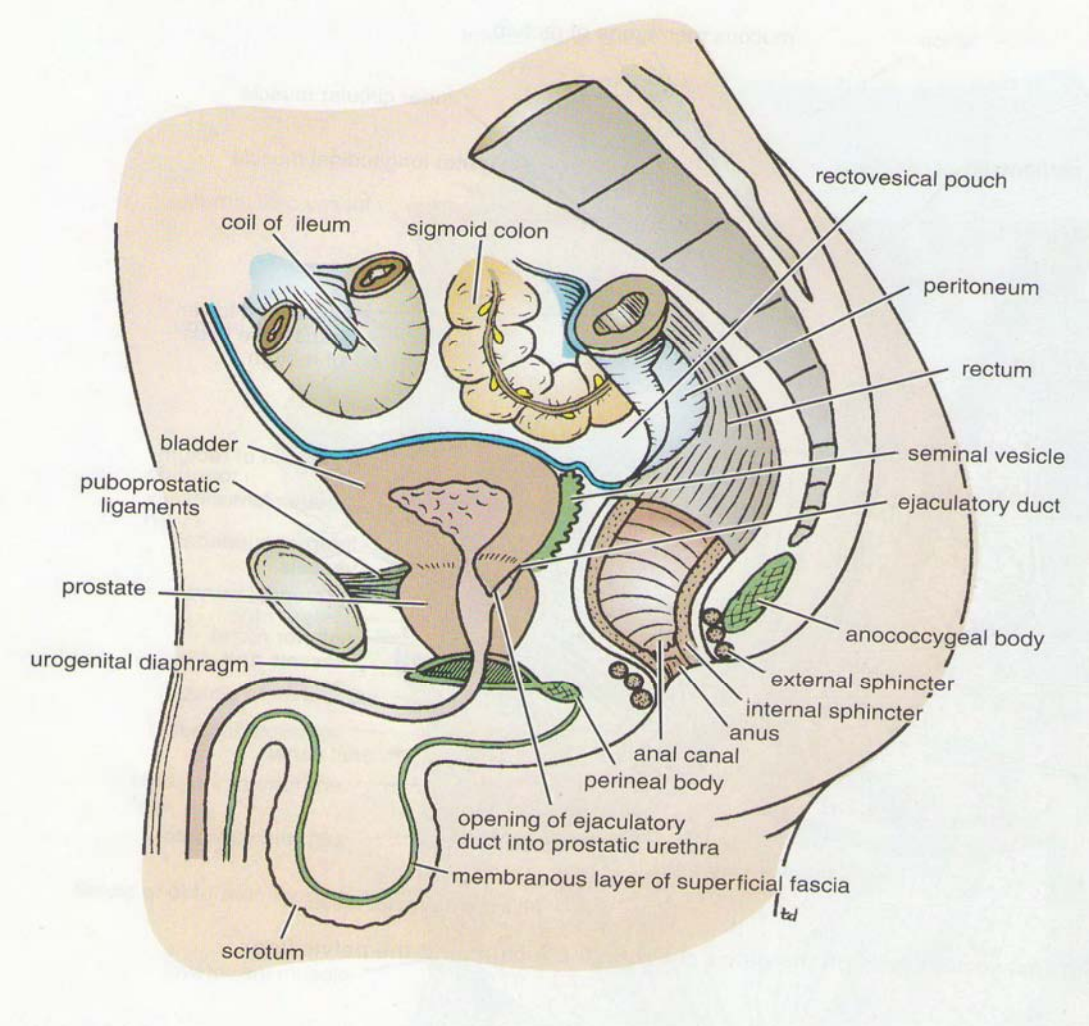

mucous membrane of rectum
inner circular muscle
peritoneum
outer longitudinal muscle
middle transverse fold of rectum
upper and lower transverse folds of rectum
obturator internus
obturator internus fascia
ampulla of rectum
obturator membrane
anal column
levator ani
internal pudendal vessels
puborectalis
pudendal nerve
outer longitudinal muscle
inferior rectal vessels and nerve
internal anal sphincter
anal canal
external anal sphincter
anus
fat in ischiorectal fossa

Relations

Anteriorly in the male: Rectovesical pouch, sigmoid colon, coils of ileum, bladder, vas deferens, seminal vesicles, prostate.

Anteriorly in the female: Rectouterine pouch (pouch of Douglas), vagina.

Posteriorly: Sacrum, coccyx, piriformis, and coccygeus muscles, levatores ani muscles, sacral plexus, sympathetic trunks.



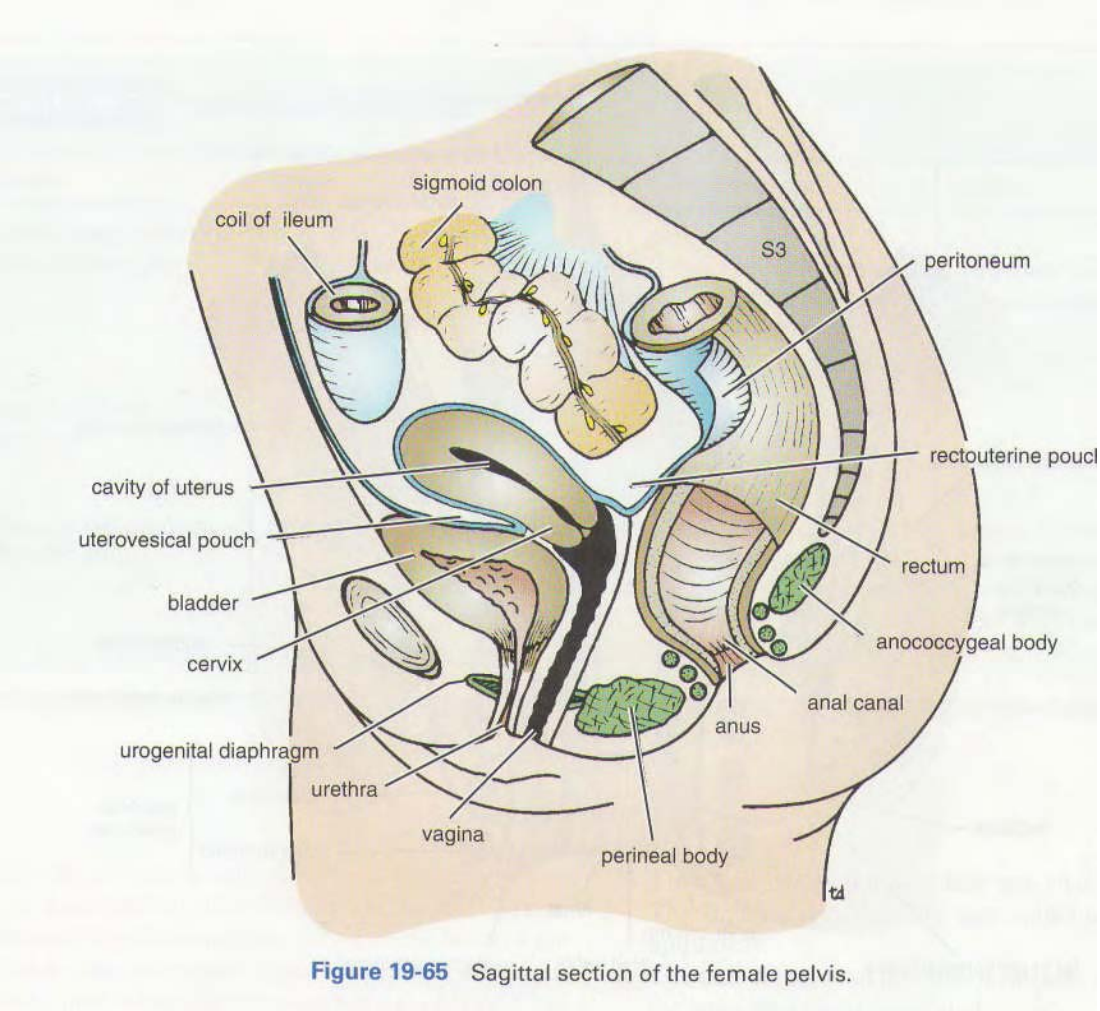


Figure 19-65 Sagittal section of the female pelvis.

Blood Supply

Arteries:- The **superior rectal artery**, a branch of the inferior mesenteric artery, is the chief artery and supplies the mucous membrane; the **middle rectal artery**, a branch of the internal iliac artery, supplies the muscle wall; the **inferior rectal artery**, a branch of the internal pudendal artery, supplies the muscle wall.

Veins:- The **superior rectal vein** drains into the inferior mesenteric vein and is a tributary of the portal circulation. The **middle** and **inferior rectal veins** drain into the internal iliac and internal pudendal veins, respectively. The anastomosis between the rectal veins is an important **portal-systemic anastomosis**.

Lymph Drainage

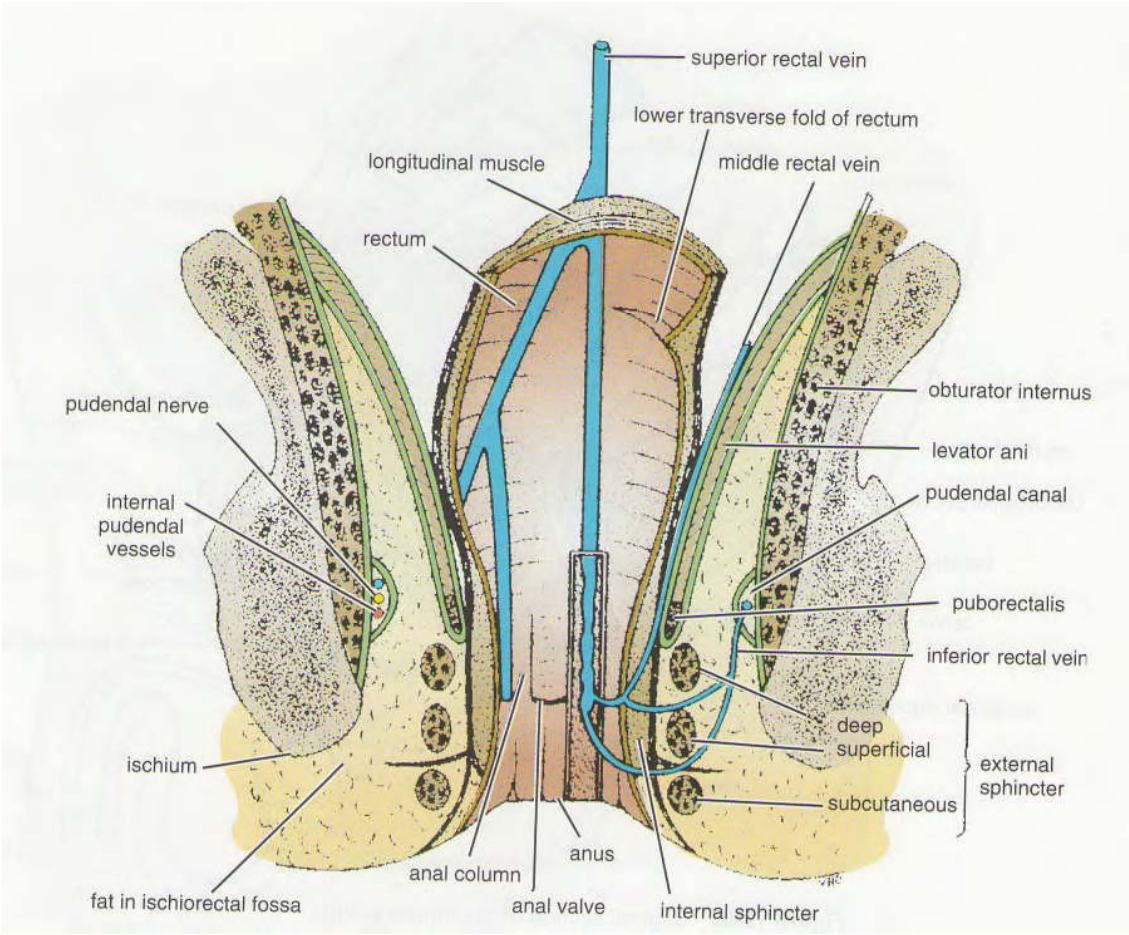
The lymph passes to pararectal nodes and then upward to the inferior mesenteric nodes. Some lymph vessels pass to the internal iliac nodes.

Nerve Supply

Sympathetic and parasympathetic pelvic splanchnic nerves through the hypogastric plexuses.

Anal Canal

The anal canal is about $1^{1}/_{2}$ in. (4 cm) long and passes downward and backward from the rectal ampulla to open on the surface at the anus. Except during defecation, its lateral walls are kept in apposition by the levator ani muscles and the anal sphincters.

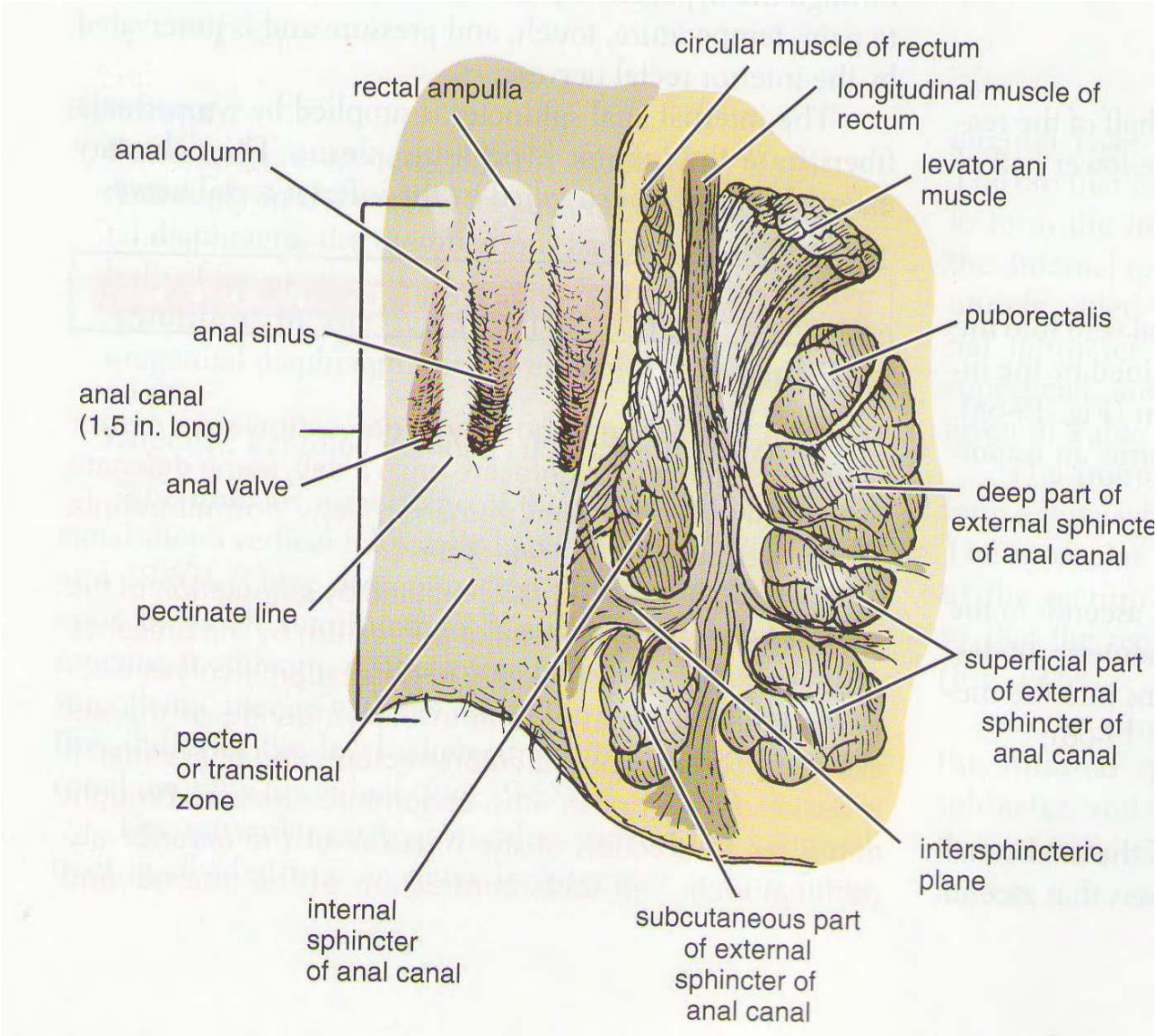


Relations

Posteriorly: Anococcygeal body, coccyx.
Anteriorly in the male: The perineal body, the urogenital diaphragm, the membranous part of the urethra, the bulb of the penis.
Anteriorly in the female: The perineal body, the urogenital diaphragm, the lower part of the vagina.
Laterally: Fat-filled ischiorectal fossa.

The **mucous membrane** of the upper half of the anal canal shows vertical folds called **anal columns**. These are connected together at their lower ends by small semilunar folds called **anal valves**. The mucous membrane of the lower half of the anal canal is smooth and merges with the skin at the anus. The **pectinate line** indicates the level where the upper half of the anal canal joins the lower half.

The **muscular coat**, as in other parts of the intestinal tract, is divided into an outer longitudinal and an inner circular layer of smooth muscle. The circular coat is thickened at the upper end of the canal to form **the involuntary internal sphincter**. Surrounding the internal sphincter of smooth muscle is a collar of striped muscle called **the voluntary external sphincter**.



The **puborectalis** fibers of the levatores ani muscles form a sling, which is attached anteriorly to the pubic bones. The muscular sling passes backward around the junction of the rectum and the anal canal pulling them forward so that the rectum joins the anal canal at an acute angle.

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

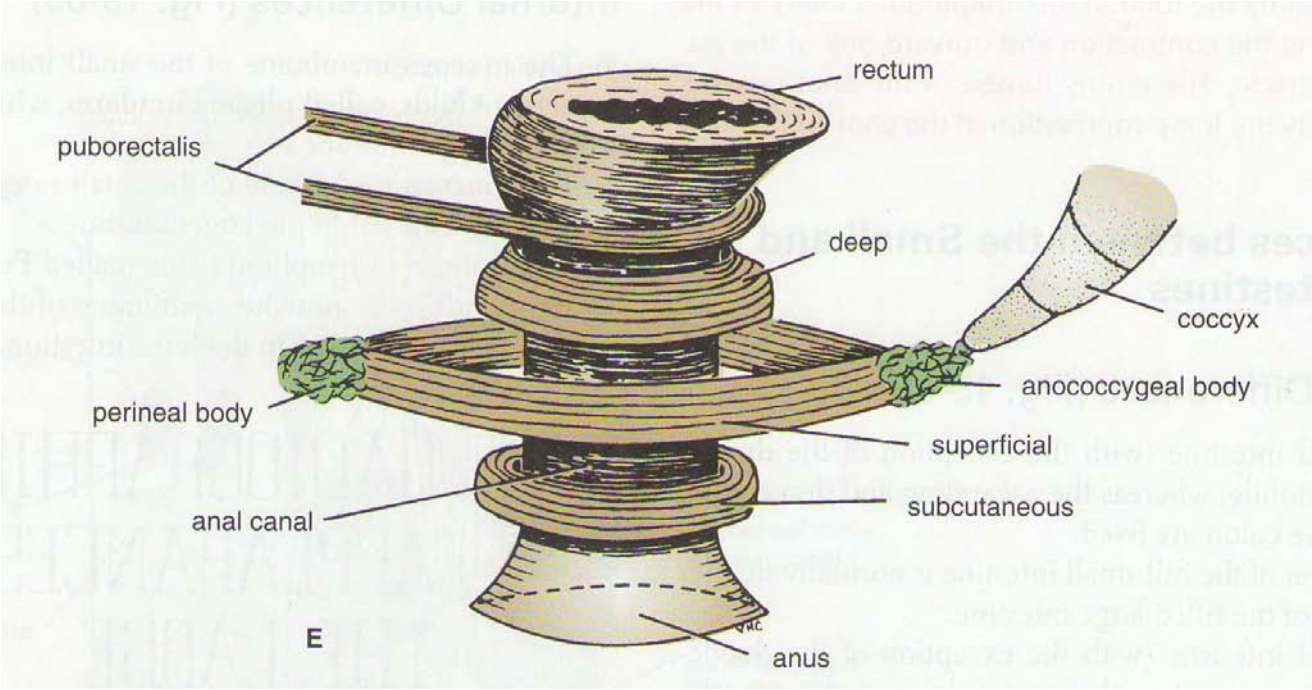


Table 19-2 Sphincters of the Anal Canal

Muscle	Origin	Insertion	Nerve Supply	Action
External anal sphincter				
Subcutaneous part	Encircles anal canal, no bony attachments		Inferior rectal nerve and perineal branch of fourth sacral nerve	Together with puborectalis muscle, forms voluntary sphincter of anal canal
Superficial part	Perineal body	Coccyx		
Deep part	Encircles anal canal, no bony attachments			
Puborectalis (part of levator ani)	Pubic bones	Sling around junction of rectum and anal canal	Perineal branch of fourth sacral nerve and from perineal branch of pudendal nerve	Together with external anal sphincter, forms voluntary sphincter for anal canal

Blood Supply

Arteries:- The superior rectal artery supplies the upper half of the rectum, and the inferior rectal artery supplies the lower half of the rectum.

Veins:- The upper half is drained by the superior rectal vein into the inferior mesenteric vein; the lower half is drained by the inferior rectal vein into the systemic circulation. The anastomosis between the rectal veins forms an important portal-systemic anastomosis.

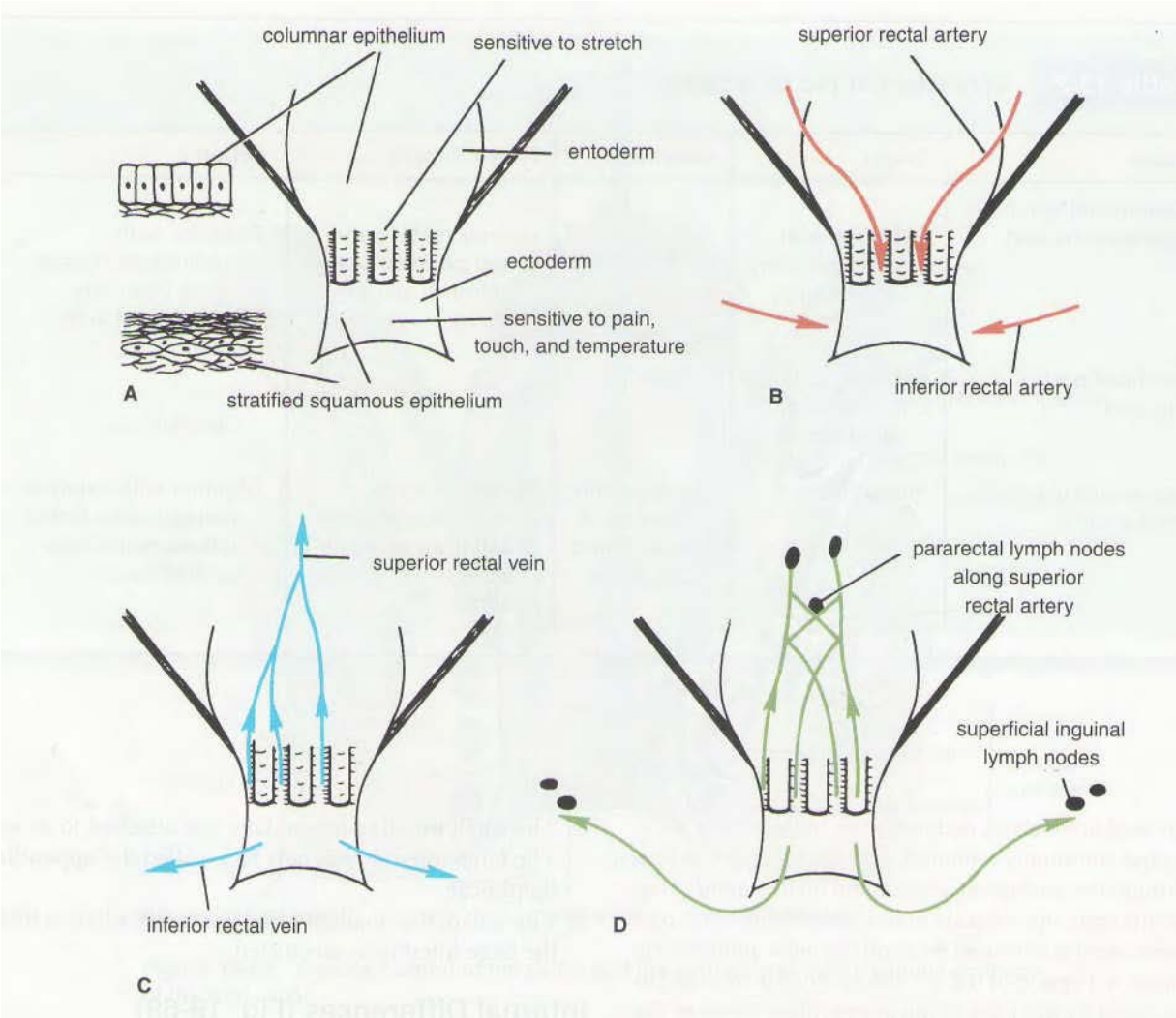
Lymph Drainage

Lymph from the upper half of the anal canal ascends to the pararectal nodes and joins the inferior mesenteric nodes. Lymph from the lower half of the canal drains into the medial group of superficial inguinal nodes.

Nerve Supply

The mucous membrane of the upper half of the anal canal is sensitive to stretch and is innervated by 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.

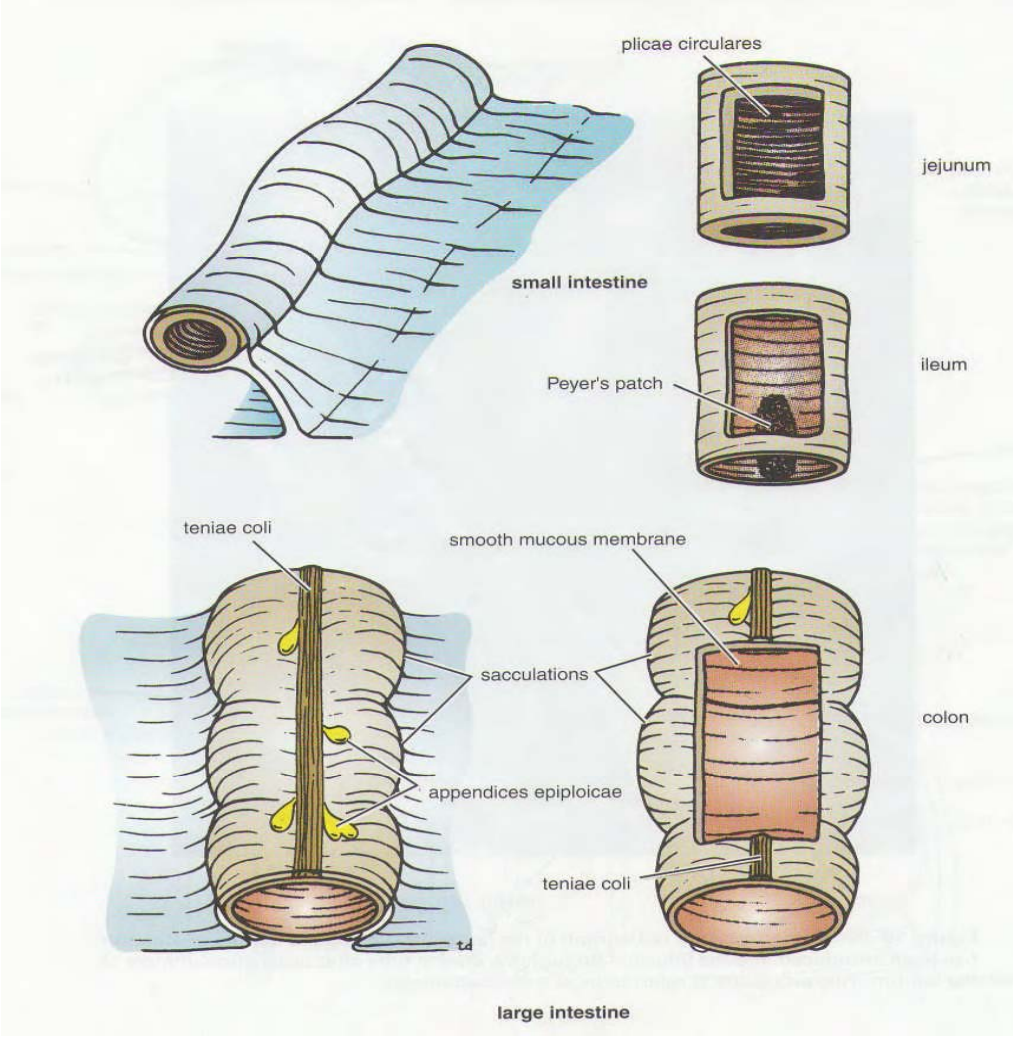
The internal anal sphincter is supplied by sympathetic fibers from the inferior hypogastric plexus. The voluntary external sphincter is supplied by the inferior rectal nerves.



Differences between the Small and Large Intestines

External Differences

1) The small intestine (with the exception of the duodenum) is **mobile**, whereas the ascending and descending parts of the colon are **fixed**.
2) The caliber of the full small intestine is normally **smaller** than that of the filled large intestine.
3) The small intestine (with the exception of the duodenum) has a **mesentery** that passes downward across the midline into the right iliac fossa.
4) The longitudinal muscle of the small intestine forms a continuous layer around the gut. In the large intestine (with the exception of the appendix), the longitudinal muscle is collected into three bands, **the teniae coli**.
5) The small intestine has **no fatty tags** attached to its wall. The large intestine has fatty tags, called **the appendices epiploicae**.
6) The wall of the small intestine is **smooth**, whereas that of the large intestine is **sacculated**.



Internal Differences

1) The mucous membrane of the small intestine has permanent folds, called **plicae circulares**, which are absent in the large intestine.
2) The mucous membrane of the small intestine has **villi,** which are absent in the large intestine.
3) Aggregations of lymphoid tissue, called **Peyer's patches**, are found in the mucous membrane of the small intestine; these are absent in the large intestine.