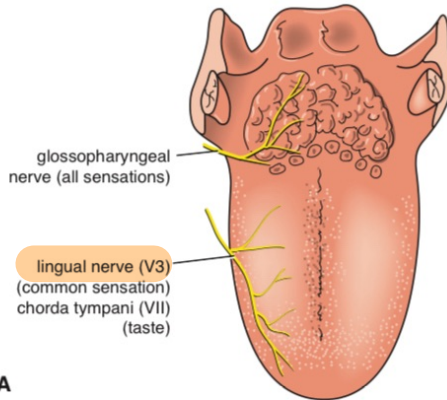


Sensory Innervation of the Mouth

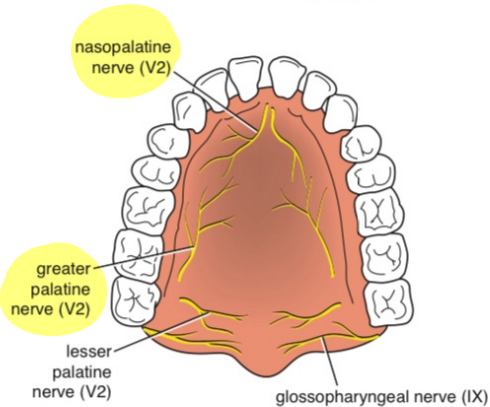
Roof: The greater palatine and nasopalatine nerves (Fig. 11.74) from the maxillary division of the trigeminal nerve

Floor: The lingual nerve (common sensation), a branch of the mandibular division of the trigeminal nerve. The taste fibers travel in the chorda tympani nerve, a branch of the facial nerve.

Cheek: The buccal nerve, a branch of the mandibular division of the trigeminal nerve (the buccinator muscle is innervated by the buccal branch of the facial nerve)



A



B

FIGURE 11.74 **A.** Sensory nerve supply to the mucous membrane of the tongue. **B.** Sensory nerve supply to the mucous membrane of the hard and soft palate; taste fibers run with branches of the maxillary nerve (V2) and join the greater petrosal branch of the facial nerve.

blood supply by
facial & lingual artery



Muscles of the Tongue

The muscles of the tongue are divided into two types: intrinsic and extrinsic.

Intrinsic Muscles

These muscles are confined to the tongue and are not attached to bone. They consist of longitudinal, transverse, and vertical fibers.

Nerve supply: Hypoglossal nerve

Action: Alter the shape of the tongue

Extrinsic Muscles

These muscles are attached to bones and the soft palate. They are the genioglossus, the hyoglossus, the styloglossus, and the palatoglossus.

Nerve supply: Hypoglossal nerve

Except Palatoglossus !! → cranial accessory of vagus nerve

The origin, insertion, nerve supply, and action of the tongue muscles are summarized in Table 11.8.

Pharyngeal Plexus

Blood Supply

The lingual artery, the tonsillar branch of the facial artery, and the ascending pharyngeal artery supply the tongue. The veins drain into the internal jugular vein.

Lymph Drainage

Tip: Submental lymph nodes

Sides of the anterior two thirds: Submandibular and deep cervical lymph nodes

Posterior third: Deep cervical lymph nodes

Movements of the Tongue

Protrusion: The genioglossus muscles on both sides acting together (Fig. 11.78)

Retraction: Styloglossus and hyoglossus muscles on both sides acting together

Depression: Hyoglossus muscles on both sides acting together

Retraction and elevation of the posterior third: Styloglossus and palatoglossus muscles on both sides acting together

Shape changes: Intrinsic muscles

Sensory Innervation of tongue

Anterior two thirds: Lingual nerve branch of mandibular division of trigeminal nerve (general sensation) and chorda tympani branch of the facial nerve (taste)

Posterior third: Glossopharyngeal nerve (general sensation and taste)

also innervates circumvallate

innervates filiform & fungiform papillae

Salivary Gland	Duct	Parasympathetic (Secretomotor)	Sympathetic
Parotid	Stensen's duct	CN IX (Glossopharyngeal) via otic ganglion → auriculotemporal nerve (V3)	From superior cervical ganglion via external carotid plexus
Submandibular	Wharton's duct	CN VII (Facial) via chorda tympani → submandibular ganglion	From superior cervical ganglion via facial artery plexus
Sublingual	Small sublingual ducts (of Rivinus or Bartholin)	CN VII (Facial) via chorda tympani → submandibular ganglion	From superior cervical ganglion via lingual artery plexus

TABLE 11.10 Muscles of the Pharynx

Muscle	Origin	Insertion	Nerve Supply	Action
Superior constrictor	Medial pterygoid plate, pterygoid hamulus, pterygomandibular ligament, mylohyoid line of mandible	Pharyngeal tubercle of occipital bone, raphe in midline posteriorly	Pharyngeal plexus	Aids soft palate in closing off nasal pharynx, <u>propels bolus downward</u> *
Middle constrictor	Lower part of stylohyoid ligament, lesser and greater cornu of hyoid bone X	Pharyngeal raphe	Pharyngeal plexus	Propels bolus downward
Inferior constrictor	Lamina of thyroid cartilage, cricoid cartilage	Pharyngeal raphe	Pharyngeal plexus	Propels bolus downward
Cricopharyngeus	Lowest fibers of inferior constrictor muscle			Sphincter at lower end of pharynx
Stylopharyngeus	Styloid process of temporal bone	Posterior border of thyroid cartilage	Glossopharyngeal nerve	Elevates larynx during swallowing *
Salpingopharyngeus	Auditory tube	Blends with palatopharyngeus	Pharyngeal plexus	Elevates pharynx
Palatopharyngeus	Palatine aponeurosis	Posterior border of thyroid cartilage	Pharyngeal plexus	Elevates wall of pharynx, pulls palatopharyngeal arch medially

-- → Vagus, accessory & glossopharyngeal

Laryngeal Pharynx

This lies behind the opening into the larynx (Fig. 11.87). The lateral wall is formed by the thyroid cartilage and the thyrohyoid membrane. The **piriform fossa** is a depression in the mucous membrane on each side of the laryngeal inlet (Fig. 11.88).

Sensory Nerve Supply of the Pharyngeal Mucous Membrane

Nasal pharynx: The maxillary nerve (V2)
Oral pharynx: The glossopharyngeal nerve

Laryngeal pharynx (around the entrance into the larynx):
 The internal laryngeal branch of the vagus nerve

between middle & inferior constrictor muscles of pharynx

Blood Supply of the Pharynx

Ascending pharyngeal, tonsillar branches of facial arteries, and branches of maxillary and lingual arteries

FCA

Lymph Drainage of the Pharynx

Directly into the deep cervical lymph nodes or indirectly via the retropharyngeal or paratracheal nodes into the deep cervical nodes

Blood Supply

The tonsillar branch of the facial artery. The veins pierce the superior constrictor muscle and join the external palatine, the pharyngeal, or the facial veins. to go to Pharyngeal plexus

Lymph Drainage of the Tonsil

The upper deep cervical lymph nodes, just below and behind the angle of the mandible.

of
Palatine
Tonsils

Nerve supply of Palate

- * Nasopalatine (branch of maxillary) → enters hard Palate through incisive foramen
- * Glossopharyngeal supplies soft Palate → through Pharyngeal Plexus

Blood supply

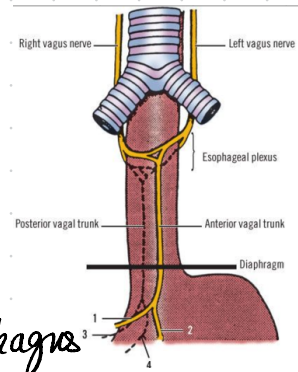
- greater Palatine branch of maxillary
- Palatine branch of Facial Artery^{A.}
- ascending pharyngeal artery

lymph drainage → deep cervical LN

Esophagus

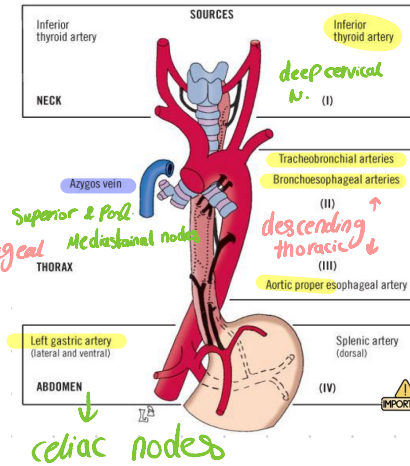
after diaphragm

- * left vagus nerve $\rightarrow$ anterior to esophagus
- * Right Vagus nerve $\rightarrow$ posterior to esophagus



Blood Supply of the Esophagus

The upper third of the esophagus is supplied by the inferior thyroid artery, the middle third by branches from the descending thoracic aorta, and the lower third by branches from the left gastric artery. The veins from the upper third drain into the inferior thyroid veins, from the middle third into the azygos veins, and from the lower third into the left gastric vein, a tributary of the portal vein.



Lymph Drainage of the Esophagus

Lymph vessels from the upper third of the esophagus drain into the deep cervical nodes, from the middle third into the superior and posterior mediastinal nodes, and from the lower third into nodes along the left gastric blood vessels and the celiac nodes (see Fig. 3.26).

Nerve Supply of the Esophagus

The esophagus is supplied by parasympathetic and sympathetic efferent and afferent fibers via the vagi and sympathetic trunks. In the lower part of its thoracic course, the esophagus is surrounded by the esophageal nerve plexus.

PS: Vagus

S: superior cervical sympathetic ganglia

Pyloric Sphincter receives $\rightarrow$ inhibitory from vagus
 $\rightarrow$ Motor from sympathetic

Relations of Stomach

- Anteriorly:** The anterior abdominal wall, the left costal margin, the left pleura and lung, the diaphragm, and the left lobe of the liver (Figs. 5.2 and 5.6)
- Posteriorly:** The lesser sac, the diaphragm, the spleen, the left suprarenal gland, the upper part of the left kidney, the splenic artery, the pancreas, the transverse mesocolon, and the transverse colon (Figs. 5.4, 5.6, and 5.11)

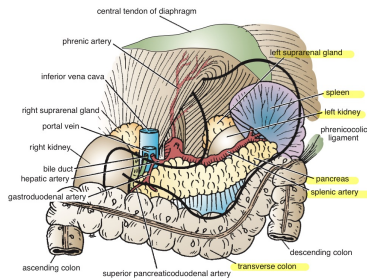
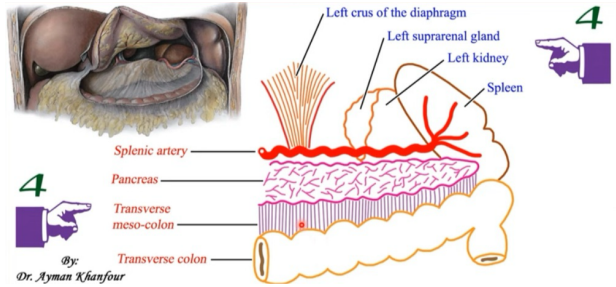
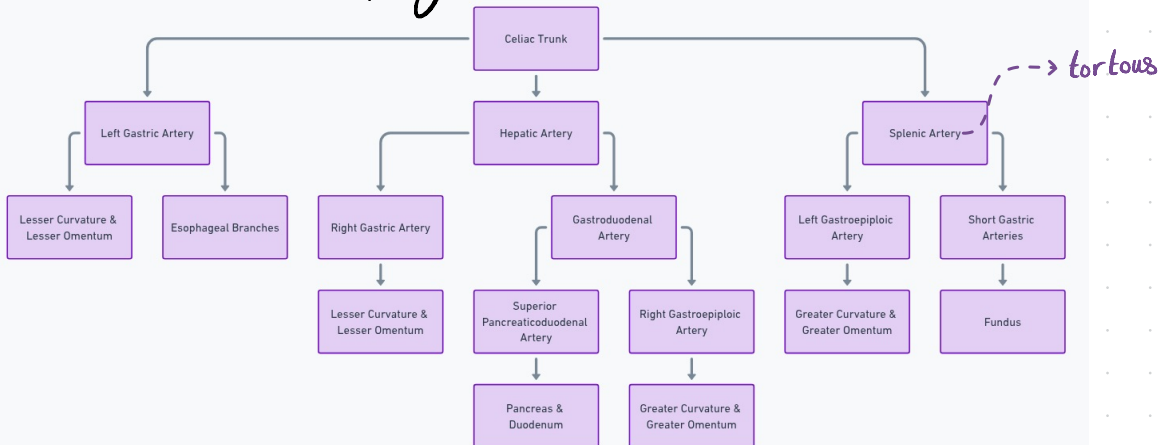


FIGURE 5.4 Structures situated on the posterior abdominal wall behind the stomach.



Arterial blood supply of Stomach



venous drainage follows reverse path

Lymph Drainage of Stomach

The lymph vessels (Fig. 5.23) follow the arteries into the left and right gastric nodes, the left and right gastroepiploic nodes, and the short gastric nodes. All lymph from the stomach eventually passes to the celiac nodes located around the root of the celiac artery on the posterior abdominal wall.

→ celiac trunk → thoracic duct

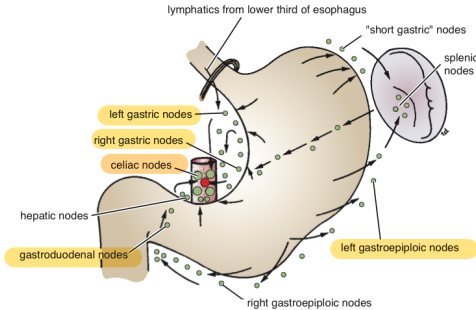


FIGURE 5.23 Lymph drainage of the stomach. Note that all the lymph eventually passes through the celiac lymph nodes.

innervation

SNS : T5 - T9 → Preganglionic fibers Pass through sympathetic chain ganglia without synapsing

they form greater splanchnic which descends into abdomen
 → they synapse in celiac ganglia
 Post ganglionic fibers follow celiac artery branches to reach organs like stomach

PSNS : Vagus

Vagal fiber Pass through celiac & superior Mesenteric plexus

travels all the way to the organ (synapse in wall)

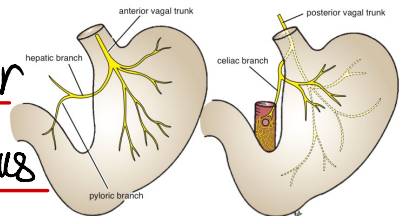
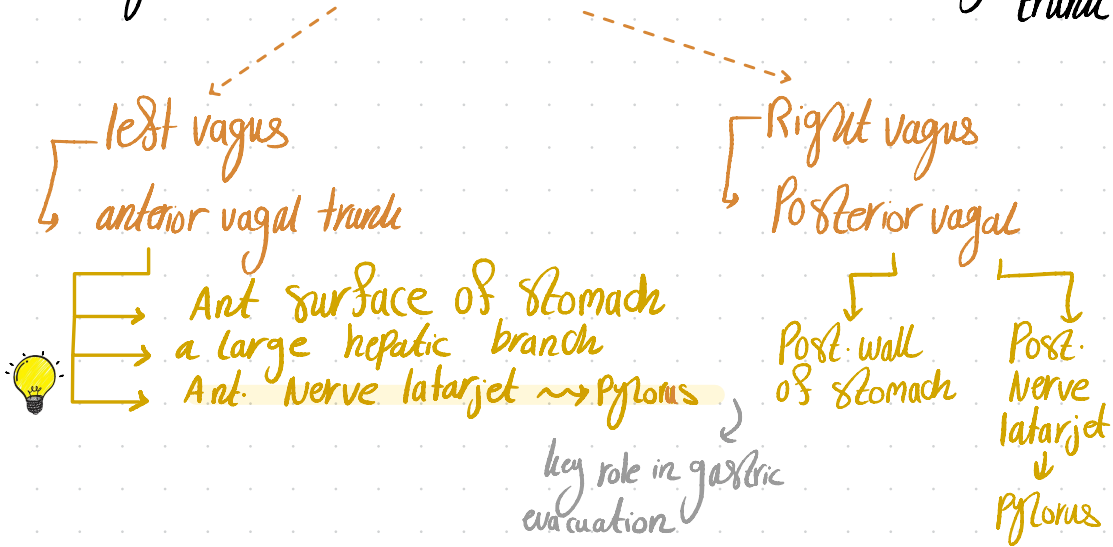


FIGURE 5.24 Distribution of the anterior and posterior vagal trunks within the abdomen. Note that the celiac branch of the posterior vagal trunk is distributed with the sympathetic nerves as far down the intestinal tract as the left colic flexure.

Vagus nerve descends in form of a vagal trunk



Blood Supply of duodenum

- upper half: Made by foregut → Celiac plexus
- lower half: Made by Midgut → superior mesenteric plexus

upper half: Supplied by superior Pancreaticoduodenal a branch of gastroduodenal

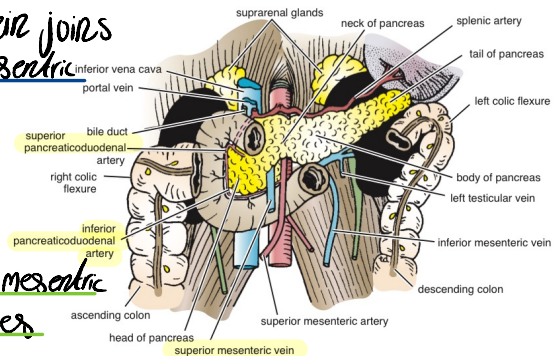
lower half: Supplied by inferior Pancreaticoduodenal a branch of superior Mesenteric

Veins

- upper half: superior Pancreaticoduodenal drains into portal vein
- lower half: inferior vein joins superior Mesenteric

lymph drainage

- upper half: celiac nodes
- lower half: superior mesenteric nodes



Nerve supply of duodenum

Sympathetic

origin: spinal cord at T vertebra
descends & Penetrates diaphragm

upper duodenum → celiac ganglion

lower duodenum → superior mesenteric ganglion

Post ganglionic → fibers of Celiac plexus
(Greater & lesser splanchnic)
from plexus around BVs

Parasympathetic

Vagus nerve

Synapse: Enteric plexus
Myenteric & Submucosal plexus
in duodenal wall

Short Post ganglionic
arise & innervate structures
in duodenal wall

Jejunum & ileum

Arcades in mesentery

Arcades are branches from superior mesenteric artery that connect forming window like structures, these arcades give rise to the Vasa Recta

- simple, only one or two arcades
- with long infrequent branches
- Long vasa recta

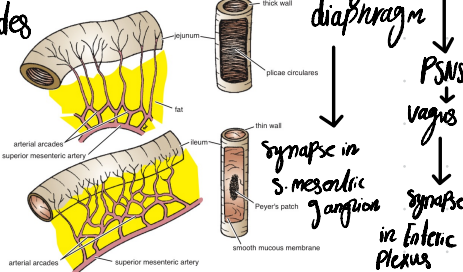
- numerous short terminal vessels arise from a series of three or four or even more
- Complex Arcades
- Short vasa recta

credits to DST

Arteries : superior mesenteric → forms arcades
→ Vasa Recta

Veins : Drain into superior mesenteric vein

Lymph : superior mesenteric nodes



Nerve supply

SNS

Preganglionic descends through diaphragm

PSNS

vagus

synapse in enteric plexus

TABLE 4.1

Muscles of the Anterior Abdominal Wall

Name of Muscle	Origin	Insertion	Nerve Supply
External oblique	Lower eight ribs	Xiphoid process, linea alba, pubic crest, pubic tubercle, iliac crest	Lower six thoracic nerves and iliohypogastric and ilioinguinal nerves (L1)

downward
& medially

Apotheosis of Ext. Oblique

* superficial inguinal ring

* inguinal ligament

* Rectus sheath

* lacunar ligament

* pectineal ligament

→ continuation of lacunar ligament

opening for passing of spermatic cord or ligament of uterus

Internal oblique	Lumbar fascia, iliac crest, lateral two thirds of inguinal ligament	Lower three ribs and costal cartilages, xiphoid process, linea alba, symphysis pubis	Lower six thoracic nerves and iliohypogastric and ilioinguinal nerves (L1)
------------------	---	--	--

upward & medially

Int. Oblique content

conjoint tendon



* lowest tendinous fibers of internal oblique X transversus abdominis

* attached medially to linea alba

* support inguinal canal / has lateral free border

cremasteric fascia



* lower border arches over spermatic cord & ligament of uterus

* assist in formation of roof of inguinal canal

Transversus

Lower six costal cartilages, lumbar fascia, iliac crest, lateral third of inguinal ligament

Xiphoid process, linea alba, symphysis pubis

Lower six thoracic nerves and iliohypogastric and ilioinguinal nerves (L1)

conjoint tendon

Rectus sheath

Rectus abdominis	Symphysis pubis and pubic crest	5th, 6th and 7th costal cartilages and xiphoid process	Lower six thoracic nerves	Compresses abdominal contents and flexes vertebral column; accessory muscle of expiration
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linea alba, linea semilunaris
tendinous intersection

note that L1
doesn't pass the
rectus sheath

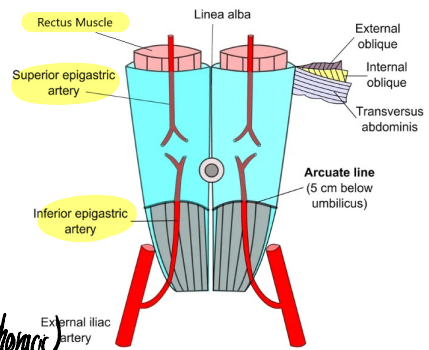
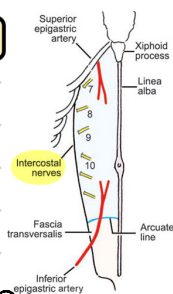
Pyramidalis (if present)	Anterior surface of pubis	Linea alba	12th thoracic nerve	Tenses the linea alba
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it lies in front
of lower part of
rectus abdominis

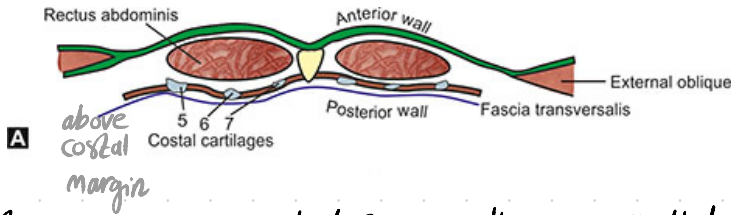
Rectus sheath



- * Rectus abdominis muscle
- * Pyramidalis muscle
- * intercostal nerves (Ant rami of lower 6 thoracic)
- * superior & inferior epigastric vessels
- * lymphatics

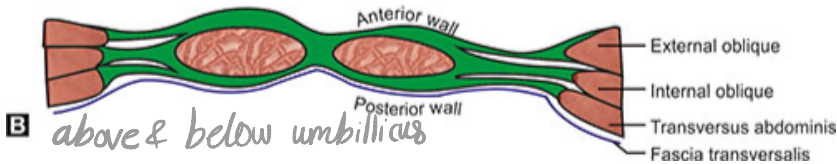


3 levels of rectus sheath



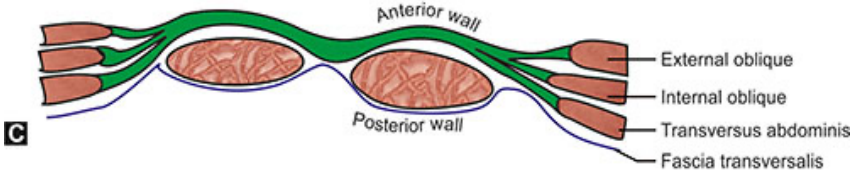
anterior wall →
skin → superficial fascia
deep fascia → Pectoralis
→ aponeurosis of Ext. oblique

Posterior wall → xiphoid Process, thoracic wall that is 5th, 6th & 7th costal cartilage & intercostal spaces



Anterior wall : Skin →
superficial fascia →
aponeurosis of Ext. oblique
→ ant. layer of internal oblique

Posterior : Post. layer of internal oblique → transversus abdominis
→ transversalis fascia → Extraperitoneal fat
→ Parietal peritoneum



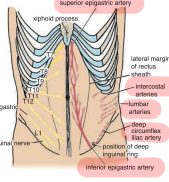
Anterior → skin, superficial fascia → aponeurosis of all 3 muscles

Posterior → absent → transversalis fascia → Extraperitoneal fat →
Parietal peritoneum

Blood supply of Ant. abdominal wall

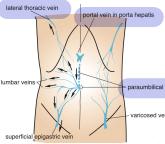
Arteries

- superior epigastric & inferior epigastric
- intercostal
- lumbar
- deep cervical circumflex



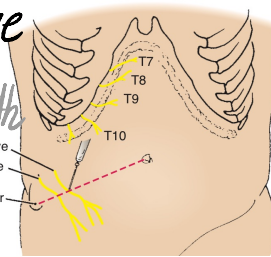
Veins

- above umbilicus → lateral thoracic → Axillary v.
- Below umbilicus → inf. epigastric → Femoral vein
- Paraumbilical Veins → ligamentum teres → Portal Vein



Nerve supply

Thoracoabdominal nerve
lower 6 thoracic & 12th
subcostal



Dermatomes

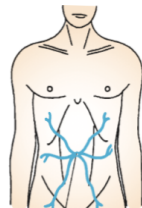
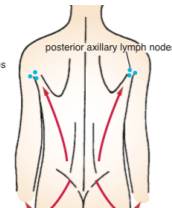
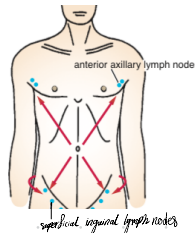
- T7: Skin superior to umbilicus
- T10: Skin surrounding umbilicus
- L1: Skin inferior to umbilicus above symphysis pubis

L1 nerve

- iliohypogastric nerve
- ilioinguinal nerve

Lymphatic drainage

- * above umbilicus → Ant. axillary LN
- * Below " → sup. inguinal LN
- * above iliac crest → Post. axillary LN
- * below " → sup. inguinal LN



Contents of inguinal canal

Structure	Present In	Entry / Path	Function / Details
Spermatic cord	Male	Enters at deep ring , exits at superficial ring	Contains vas deferens, testicular artery, pampiniform plexus, etc.
Round ligament of uterus	Female	Enters at deep ring , exits at superficial ring	Remnant of gubernaculum, ends in labia majora
Genital branch of genitofemoral nerve	Both sexes	Enters at deep ring , travels in canal	Innervates cremaster muscle (male) or sensory to labia majora (female)
Ilioinguinal nerve	Both sexes	Pierces posterior wall , not via deep ring 	Travels in canal, exits through superficial ring; supplies skin of genital area & thigh

indirect^① & direct hernia^②

↳ Most common form of hernia

Note: ① can be congenital in origin
↳ remains of Processus Vaginalis

① through deep inguinal ring → **lateral** to inferior epigastric vessels
→ follows pathway of spermatic cord

② inguinal triangle (Hesselbach's) → **Medial** to inferior epigastric
→ pushed directly through posterior wall of inguinal canal

Common in old men with weak abdominal muscle, rare in women

XXX hernia doesn't appear in deep ring test

① young, unilateral, oval

can reach scrotum, feel impulse on tip of finger

descends downward, forward & Medial

✓✓✓ Hernia appears in deep ring test

② Old, Hemispherical, NEVER reaches

scrotum
descends forward, feel impulse of superficial ring or side finger

Aspect	Testicular Artery	Testicular Veins
Origin	Abdominal aorta (level L2)	From pampiniform plexus (surrounding testis and epididymis)
Course	Descends on posterior abdominal wall → enters inguinal canal	Ascends from testis → through inguinal canal → forms single vein near deep ring
Destination	Supplies testis and epididymis	Left: drains to left renal vein (perpendicular)
	Right: to IVC (oblique)	
Special Feature	Long, slender artery	Has pampiniform plexus — cools arterial blood to protect spermatogenesis

if enlarged

Varicocoele

more common in left side than right

Testicular lymph vessels → reach the lumbar Para-aortic LN at each side of aorta at level of L1

ANS & Genital branch of genitoSerratal

↓
sympathetic (mainly)

these sympathetic fibers travel with testicular artery from renal/aortic sympathetic plexuses



they carry afferent sensory fibers

* L1 & L2

* supplies cremaster muscle