Nerve Supply / Blood Supply / Lymphatics / Relations

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1) Nerve Supply

— Digestive System in Head & Neck

Lips

- Orbicularis oris muscle: Facial nerve.
- Vermilion zone: packed with nerve terminals → highly sensitive.

Oral Cavity / Tongue

- Anterior 2/3 of tongue:
  - General sensation: Lingual nerve.
  - Taste: Chorda tympani.
- Posterior 1/3 of tongue:
  - General sensation + taste: Glossopharyngeal nerve.
- Circumvallate papillae:
  - Glossopharyngeal nerve.

Parotid Gland

- Sensory: Auriculotemporal nerve.
- Sympathetic vasomotor:
  - Superior cervical sympathetic ganglion.
  - Postganglionic fibers travel with branches of external carotid artery.
  - Function: vasoconstriction.
- Parasympathetic secretomotor:
  - Inferior salivary nucleus.
  - Glossopharyngeal nerve CN IX.
  - Tympanic branch.
  - Lesser petrosal nerve.
  - Otic ganglion.
  - Postganglionic fibers via auriculotemporal nerve.

— Anatomy of the Palate

Tongue

- Motor:
    - All intrinsic and extrinsic muscles: Hypoglossal nerve CN XII.
    - Exception: Palatoglossus → Pharyngeal plexus.
- Sensory:
    - Posterior 1/3: Glossopharyngeal nerve.
    - Circumvallate papillae: Glossopharyngeal nerve.

Hard Palate

- Greater palatine nerve.
- Lesser palatine nerve.
- Nasopalatine nerve supplies anterior hard palate through incisive foramen.

Soft Palate

- All soft palate muscles: Pharyngeal plexus.
- Exception: Tensor veli palatini → Mandibular nerve CN V3.
- Soft palate also receives glossopharyngeal nerve through pharyngeal plexus.

— Anatomy of the Pharynx

Pharyngeal Muscles

- All pharyngeal muscles: Pharyngeal plexus.
- Exception: Stylopharyngeus → Glossopharyngeal nerve.

Sensory Innervation of Pharyngeal Mucosa

- Nasopharynx: Maxillary nerve.
- Oropharynx: Glossopharyngeal nerve.
- Laryngopharynx: Internal laryngeal branch of vagus nerve.
- Internal laryngeal nerve enters between middle and inferior constrictor muscles.

— Esophagus and Stomach

Esophagus

- Esophageal plexus: sympathetic + parasympathetic.
- Sympathetic:
    - From superior cervical sympathetic ganglia.
    - Function: vasoconstriction of esophageal blood vessels.

- Parasympathetic:
  - Vagus nerve.
  - Secretomotor to glands.
  - Motor for peristalsis.
- Vagal rotation:
  - LARP: Left vagus becomes anterior, Right vagus becomes posterior.
- Vagus controls closure of gastroesophageal/cardiac sphincter.

Stomach

- Parasympathetic: Vagus nerve.
  - Motor to gastric wall → increases peristalsis.
  - Inhibitory to pyloric sphincter → opens sphincter and allows emptying.
- Nerve of Latarjet:
  - Branch of vagus to pylorus.
  - Controls gastric drainage/emptying.
- Anterior vagal trunk:
  - Supplies anterior surface of stomach.
  - Gives hepatic branch.
  - Gives anterior nerve of Latarjet.
- Posterior vagal trunk:
  - Supplies posterior wall of stomach.
  - Extends to small intestine and large intestine up to transverse colon.
  - Gives posterior nerve of Latarjet.
- Sympathetic:
  - Inhibitory to gut wall.
  - Motor to sphincters → closes sphincters.

— Small Intestine

Duodenum

- Sympathetic:
  - Superior mesenteric ganglia.
  - Celiac ganglia for upper half.
  - Targets blood vessels and sphincters.
- Parasympathetic:
  - Vagus nerve via plexus.
  - Secretomotor to glands.
  - Stimulates peristalsis.

Jejunum and Ileum

- Sympathetic:
  - Superior mesenteric ganglia around origin of SMA.
  - Postganglionic fibers form mesenteric plexus.
  - Mainly supply blood vessels.
- Parasympathetic:
  - Vagus nerve.
  - Through mesenteric plexus.
  - Stimulates glandular secretion and peristalsis.
- Both sympathetic and parasympathetic act through myenteric plexus.

— Anterior Abdominal Wall

Muscles

- External oblique: lower six thoracic nerves + L1.
- Internal oblique: lower six thoracic nerves + L1.
- Transversus abdominis: lower six thoracic nerves + L1.
- Rectus abdominis: lower six thoracic nerves.
- Pyramidalis: subcostal nerve T12.

Dermatomes

- Skin superior to umbilicus below xiphoid: T7.
- Skin around umbilicus: T10.
- Skin inferior to umbilicus above pubic symphysis: L1 via iliohypogastric nerve.

— Large Intestine

Cecum

- Superior mesenteric plexus around vessels.
- Sympathetic:
  - Targets blood vessels and sphincter.
- Parasympathetic:
  - Targets glands for secretion.
  - Targets smooth muscle for peristalsis.

Ascending Colon

- Autonomic plexus travels with SMA branches.
- Parasympathetic: Vagus nerve.

- Sympathetic: Superior mesenteric ganglion.

Transverse Colon

Proximal 2/3 — Midgut

- Parasympathetic: Vagus nerve.
- Sympathetic: Superior mesenteric ganglion.

Distal 1/3 — Hindgut

- Parasympathetic: S2, S3, S4.
- Sympathetic: Inferior mesenteric ganglion from L1, L2.

Descending Colon

- Inferior mesenteric / hypogastric plexus.
- Parasympathetic: S2, S3, S4.
- Sympathetic: Inferior mesenteric ganglion receiving fibers from L1, L2.

— Inguinal Canal

Ilioinguinal Nerve

- Root: L1.
- Associated with inguinal canal.
- Does not enter through deep ring.
- Pierces posterior wall of inguinal canal.
- Passes through superficial inguinal ring.
- Sensory to scrotal skin.

Genital Branch of Genitofemoral Nerve

- Roots: L1, L2.
- Passes completely through inguinal canal.
- Supplies cremaster muscle.

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2) Blood Supply + Venous Drainage

— Digestive System in Head & Neck

Lips

- Vermilion/red zone is highly rich in blood vessels.

Parotid Gland

- External carotid artery is within the gland.
- Terminal branches of external carotid artery:
    - Maxillary artery.
    - Superficial temporal artery.

— Anatomy of the Palate

Tongue — Arterial Supply

- Lingual artery:
    - Main blood supply.
    - Branch of external carotid artery.
- Facial artery:
    - Tonsillar branch reaches tongue area.
- Ascending pharyngeal artery.

Tongue — Venous Drainage

- Veins run opposite to arteries.
- Ultimately drain into internal jugular vein.

Hard Palate

- Greater palatine artery emerges from greater palatine foramen.
- Lesser palatine artery emerges from lesser palatine foramen.
- Greater palatine artery passes upward through incisive foramen to supply nasal cavity.

Soft Palate

- Greater palatine branch.
- Ascending palatine branch from facial artery.
- Ascending pharyngeal artery.

— Anatomy of the Pharynx

Pharynx — Blood Supply

From external carotid artery branches:

- Ascending pharyngeal artery.
- Tonsillar branch of facial artery.
- Branches from maxillary artery.
- Branches from lingual artery.

Palatine Tonsil — Blood Supply

- Tonsillar branch of facial artery.

Palatine Tonsil — Venous Drainage

- External palatine vein / paratonsillar vein.
- Pierces superior constrictor muscle.
- Drains into pharyngeal plexus of veins.

— Esophagus and Stomach

Esophagus — Blood Supply and Venous Drainage

Upper third

- Artery: inferior thyroid artery.
- Vein: mainly to left brachiocephalic vein.

Middle third

- Arteries:
  - Esophageal arteries from descending thoracic aorta.
  - Bronchoesophageal arteries from descending thoracic aorta.
- Vein: azygos vein.

Lower third

- Artery: left gastric artery from celiac trunk.
- Vein: portal system.

Stomach — Venous Drainage

All drains to portal venous system:

- Left gastric vein → portal vein.
- Right gastric vein → portal vein.
- Short gastric veins → splenic vein.
- Left gastroepiploic vein → splenic vein.
- Right gastroepiploic vein → superior mesenteric vein.
- SMV + splenic vein meet behind neck of pancreas to form portal vein.

— Small Intestine

Duodenum — Blood Supply

- Upper half:
  - Superior pancreaticoduodenal artery from gastroduodenal artery.
- Lower half:
  - Inferior pancreaticoduodenal artery from superior mesenteric artery.

Duodenum — Venous Drainage

- Superior pancreaticoduodenal vein.
- Inferior pancreaticoduodenal vein.
- Drain directly or indirectly into portal vein system.

Jejunum and Ileum — Blood Supply

- Branches of superior mesenteric artery.
- Form arterial arcades.
- Arcades give straight arteries / vasa recta to intestinal wall.

Jejunum and Ileum — Venous Drainage

- Superior mesenteric vein.
- SMV joins splenic vein behind neck of pancreas to form portal vein.

— Anterior Abdominal Wall

Arterial Supply

- Superior epigastric artery.
- Inferior epigastric artery.
- Intercostal arteries.
- Lumbar arteries.

- Deep circumflex iliac artery.

Venous Drainage

- Above umbilicus:
  - Lateral thoracic vein → axillary vein.
- Below umbilicus:
  - Inferior epigastric vein → femoral vein.
- Paraumbilical veins:
  - Along ligamentum teres → portal vein.

— Large Intestine

Cecum — Blood Supply

- Anterior cecal artery.
- Posterior cecal artery.
- Both are branches of SMA.

Cecum — Venous Drainage

- Anterior cecal vein → SMV.
- Posterior cecal vein → SMV.
- SMV joins splenic vein behind neck of pancreas → portal vein.

Appendix — Blood Supply

- Appendicular artery.
- It is an end artery / main supply.
- Thrombosis can cause gangrene.

Appendix — Venous Drainage

- Appendicular vein.

Ascending Colon — Blood Supply

- SMA via:
  - Ileocolic artery.
  - Right colic artery.

Ascending Colon — Venous Drainage

- SMV.

Transverse Colon — Blood Supply and Venous Drainage

Proximal 2/3 — Midgut

- Artery: Middle colic artery from SMA.
- Vein: SMV → portal vein.

Distal 1/3 — Hindgut

- Artery: Left colic artery from IMA.
- Vein: IMV.

Descending Colon — Blood Supply

- IMA branches:
    - Left colic artery.
    - First sigmoidal branch supplies lower part of descending colon.

Descending Colon — Venous Drainage

- IMV → splenic vein.
- Splenic vein + SMV → portal vein.

— Inguinal Canal

Spermatic Cord Contents

- Testicular artery.
- Vein.
- Lymphatics.
- Nerve.
- Vas deferens.

Hernia Relation to Vessels

- Indirect inguinal hernia:
    - Lateral to inferior epigastric vessels.
- Direct inguinal hernia:
    - Medial to inferior epigastric vessels.

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3) Lymphatics

— Digestive System in Head & Neck

Parotid Gland

- Parotid lymph nodes are present inside/with the gland.

— Anatomy of the Palate

Tongue / Oral Cavity

- Submental lymph nodes drain midline structures:
  - Tip of tongue.
  - Philtrum.
  - Middle of lower lip.
  - Tip of nose.
- Submandibular lymph nodes drain:
  - Lateral tongue.
  - Other parts of oral cavity.
- Deep cervical lymph nodes:
  - Final destination.

Soft Palate

- Deep cervical lymph nodes.

— Anatomy of the Pharynx

Pharynx

- Direct drainage:
  - Deep cervical lymph nodes.
- Indirect drainage:
  - Retropharyngeal lymph nodes.
  - Paratracheal lymph nodes.
  - Then deep cervical lymph nodes.

Palatine Tonsil

- Deep cervical lymph nodes.
- Especially upper deep cervical lymph nodes behind angle of mandible.

— Esophagus and Stomach

Esophagus

- Upper third:
  - Deep cervical lymph nodes.
- Middle third:
  - Superior mediastinal lymph nodes.
  - Posterior mediastinal lymph nodes.
- Lower third:
  - Celiac lymph nodes.

Stomach

Lymph follows arteries backward:

- Left gastric nodes.
- Right gastric nodes.
- Left gastroepiploic nodes.
- Right gastroepiploic nodes.
- Short gastric nodes.
- Then converge toward celiac lymph nodes.

— Small Intestine

Duodenum

- Upper half:
  - Gastroduodenal lymph nodes → celiac lymph nodes.
- Lower half:
  - Superior mesenteric lymph nodes.

Jejunum and Ileum

- Lymph vessels follow arteries to superior mesenteric lymph nodes.
- Then to celiac lymph nodes.
- Then cisterna chyli.
- Then thoracic duct.

- Then beginning of left brachiocephalic vein.

— Anterior Abdominal Wall

Lymphatic Drainage

- Above umbilicus:
  - Anterior axillary lymph nodes.
- Below umbilicus:
  - Superficial inguinal lymph nodes.
- Above iliac crest:
  - Posterior axillary lymph nodes.
- Below iliac crest:
  - Superficial inguinal lymph nodes.

— Large Intestine

Cecum

- Superior mesenteric lymph nodes.

Appendix

- Contains large amount of lymphoid tissue.
- Important immune organ especially in children.

Ascending Colon

- Superior mesenteric lymph nodes.

Transverse Colon

Proximal 2/3

- Superior mesenteric lymph nodes.

Distal 1/3

- Inferior mesenteric lymph nodes.

Descending Colon

- Inferior mesenteric lymph nodes.

— Inguinal Canal

Spermatic Cord

- Contains lymphatics.

— Peritoneum

Peritoneum

- Contains many lymph nodes.
- Contains lymphatic vessels.

Greater Omentum

- “Policeman of abdomen” because it surrounds/localizes infection.

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4) Relations

— Digestive System in Head & Neck

Lips

- Outside: skin or modified skin.
- Inside: oral mucosa.
- Deep core: Orbicularis oris muscle.

Oropharyngeal Isthmus / Fauces

- Superior: uvula, part of soft palate.
- Inferior: posterior third of tongue.
- Lateral: palatine tonsils.
- Palatine tonsils lie between:

    - Palatoglossal fold anteriorly.
    - Palatopharyngeal fold posteriorly.

Vestibule

- Anterior: lips.
- Lateral/external: mucosa of cheeks.
- Internal: closed teeth.
- Parotid duct opens in vestibule opposite upper second molar.
- Parotid duct overlies ramus of mandible.

Mouth Proper

- Roof: hard palate + soft palate.
- Floor: dorsum of tongue when tongue is resting.
- Lateral boundaries: teeth + gums/gingiva.
- Under tongue:
    - Lingual frenulum.
    - Sublingual papillae with openings of submandibular duct.
    - 8–12 small ducts from sublingual gland.

Parotid Gland

- Anterior to ear.
- Overlies ramus of mandible.
- Overlies masseter muscle.
- Parotid duct:
    - Arises from anterior border of gland.
    - Crosses masseter.
    - Pierces buccinator.
    - Opens into vestibule opposite upper second molar.

Contents of Parotid Gland — Superficial to Deep

1. Facial nerve.
2. Retromandibular vein.
3. External carotid artery.
4. Auriculotemporal nerve.
5. Parotid lymph nodes.

— Anatomy of the Palate

Hard Palate

- Dense mucosa tightly adherent to periosteum.
- Skeletal formation:
    - Palatine process of maxilla.
    - Horizontal plate of palatine bone.
- Greater and lesser palatine foramina are present on palatine bone.

Soft Palate

- Loose connective tissue.
- Uvula hangs in midline.
- Main structure is muscular, covered by mucosa.
- Palatine aponeurosis forms internal skeleton.

— Anatomy of the Pharynx

Pharynx General Relations

- Extends from base of skull to lower border of C6.
- At C6 continues as esophagus.
- Nasopharynx opens into nasal cavity through choana.
- Oropharynx opens into oral cavity through oropharyngeal isthmus.
- Laryngopharynx opens into larynx through inlet of larynx.
- Larynx and trachea are anterior to pharynx and esophagus.

Pharyngeal Muscles

- Constrictor muscles insert posteriorly into pharyngeal raphe.
- Cricopharyngeus is the lower part of inferior constrictor and acts as a sphincter.

Palatine Tonsil

- Located on lateral wall of oropharyngeal isthmus.
- Between:
    - Palatoglossal arch anteriorly.
    - Palatopharyngeal arch posteriorly.
- Medial surface:
    - Covered by mucous membrane.
    - Has crypts.
- Lateral surface:
    - Loose areolar connective tissue.
    - Fibrous capsule separates it from superior constrictor muscle.
    - Neurovascular supply enters from lateral side.
- Close to:

    - Common carotid artery.
    - Tonsillar branch of facial artery.
- Post-tonsillectomy bleeding:
    - Usually from external palatine/paratonsillar vein.
    - The vein pierces superior constrictor muscle and can be pulled during swallowing.

— Esophagus and Stomach

Esophagus Relations

Anterior Relations

- Trachea.
- Left recurrent laryngeal nerve in groove between trachea and esophagus.
- Left principal bronchus.
- Pericardium.
- Left atrium lies anterior to esophagus, separated by oblique sinus.

Posterior Relations

- Thoracic vertebrae.
- Thoracic duct, lower part.
- Azygos vein, lower part.
- Right posterior intercostal arteries.
- Lower end of descending thoracic aorta.

Right-sided Relations

- Right mediastinal pleura.
- Right lung.
- Azygos vein.

Left-sided Relations

- Left pleura and left lung.
- Thoracic duct, upper part.
- Subclavian artery.

Esophageal Constrictions

- Beginning: pharyngoesophageal junction.
- End: diaphragmatic opening.
- At left main bronchus.

- At arch of aorta.

Stomach Relations

Anterior Relations

- Anterior abdominal wall.
- Left pleura and left lung.
- Left lobe of liver.

Posterior Relations / Stomach Bed

- Lesser sac.
- Left crus of diaphragm.
- Other posterior structures are grouped as stomach bed in the lecture.

Peritoneal Relations

- Lesser curvature attached to liver by lesser omentum.
- Lesser omentum contains:
    - Vessels.
    - Nerves.
    - Lymph nodes.
    - Lymphatic vessels.
- Free edge of lesser omentum contains:

1. Common bile duct.
2. Hepatic artery.
3. Portal vein.

- Foramen of Winslow is accessed under the free edge.

— Small Intestine

Duodenum General Relations

- C-shaped.
- Wraps around head of pancreas.
- Concavity directed left and backward.
- Common bile duct + pancreatic duct open into second part through ampulla of Vater / major duodenal papilla.
- Generally retroperitoneal except:

    - First inch: intraperitoneal.
    - Last inch: intraperitoneal.

First Part of Duodenum

- Anterior:
    - Liver.
    - Gallbladder.
- Superior:
    - Epiploic foramen / free edge of lesser omentum.
- Posterior:
    - Lesser sac.
    - Bile duct.
    - Portal vein.
    - Inferior vena cava.
    - Gastroduodenal artery.
- Medial/left:
    - Head of pancreas.
- Clinical:
    - Posterior peptic ulcer can injure gastroduodenal artery → severe internal bleeding.

Second Part of Duodenum

- Anterior:
    - Gallbladder.
    - Right lobe of liver.
    - Transverse colon.
    - Coils of small intestine/ileum.
- Posterior:
    - Right kidney.
    - Hilum of kidney.
    - Right ureter.
- Lateral/right:
    - Ascending colon.
    - Right colic flexure.
    - Right lobe of liver.
- Medial:
    - Head of pancreas.
    - Bile duct.
    - Pancreatic duct.

Third Part of Duodenum

- Superior:
    - Head of pancreas.

- Anterior:
  - Superior mesenteric artery.
  - Superior mesenteric vein.
  - Root of mesentery.
- Posterior:
  - Right ureter.
  - Right psoas major.
  - Inferior vena cava.
  - Abdominal aorta.
- Inferior:
  - Coils of jejunum.

Fourth Part of Duodenum

- Anterior:
  - Beginning of root of mesentery.
  - Coils of jejunum.
- Posterior:
  - Left psoas major.
  - Sympathetic chain.
  - Left margin of aorta.
- Superior:
  - Uncinate process of pancreas.
  - End of head of pancreas.
- Ligament of Treitz:
  - Attaches to duodenojejunal junction and right crus of diaphragm.

Jejunum and Ileum Relations

- Attached to posterior abdominal wall by mesentery.
- Mesentery is fan-shaped double layer of peritoneum.
- Root of mesentery:
  - Begins at L2 on left side.
  - Runs obliquely downward.
  - Ends in front of right sacroiliac joint.
- Mesentery contains:
  - Branches of SMA.
  - Tributaries of SMV.
  - Lymph nodes.
  - Lymphatic vessels.
  - Autonomic nerves.

— Anterior Abdominal Wall

General Relations

- Abdomen lies directly below diaphragm.
- Inferiorly, abdomen is continuous with pelvis.
- Posterior abdominal wall:
  - Kidneys lie directly on it.
- Anterior abdominal wall:
  - Surgical access to abdominal organs.

Nine Regions and Contents

- Epigastric region:
  - Stomach.
- Right hypochondriac region:
  - Liver.
  - Gallbladder.
- Left hypochondriac region:
  - Spleen.
- Umbilical region:
  - Small intestine.
  - Pancreas.
- Right lumbar/flank:
  - Right kidney.
  - Right ureter.
  - Ascending colon.
- Left lumbar/flank:
  - Left kidney.
  - Left ureter.
  - Descending colon.
- Suprapubic/hypogastric:
  - Urinary bladder.
  - Reproductive organs.
- Right iliac/inguinal:
  - Appendix.
  - Cecum.
  - Right ovary in females.
- Left iliac/inguinal:
  - Left ovary in females.

Layers of Anterior Abdominal Wall

From superficial to deep:

1. Skin.
2. Superficial fascia:
    - Above umbilicus: one layer.
    - Below umbilicus:
        - Camper's fascia.
        - Scarpa's fascia.
3. Deep fascia:
    - Absent in females.
    - Very thin if present in males.
4. Muscular layer:
    - External oblique.
    - Internal oblique.
    - Transversus abdominis.
    - Rectus abdominis.
5. Transversalis fascia.
6. Extraperitoneal fat.
7. Parietal peritoneum.

Downward Continuations in Males

- Camper's fascia → Dartos muscle.
- Scarpa's fascia → Colles' fascia.

Linea Alba

- Midline fibrous line.
- No major nerves or vessels.
- Poor blood supply → slow healing.

— Large Intestine

Cecum Relations

- Blind pouch in right iliac fossa.
- Above lateral half of inguinal ligament.
- Intraperitoneal but fixed.
- Peritoneal recesses:
    - Superior ileocecal recess.
    - Inferior ileocecal recess.
    - Retrocecal recess.
- Retrocecal recess is the most common site of appendix.
- Posteromedial relation:
    - Appendix.

- Medial relation:
    - Coils of small intestine/ileum.

Appendix Relations

- Narrow muscular tube from cecum.
- Opening is 1 inch below ileocecal opening.
- Common site:
    - Retrocecal recess.

Ascending Colon Relations

Peritoneal Relations

- Retroperitoneal.
- Peritoneum covers anterior surface.
- Fixed to posterior abdominal wall.
- Medial and lateral paracolic gutters form along it.

Anterior Relations

- Small intestine.
- Greater omentum.
- Anterior abdominal wall.

Posterior Relations

- Iliacus muscle.
- Quadratus lumborum.
- Origin of transversus abdominis.
- Iliac crest.
- Lower pole of right kidney.
- Iliohypogastric nerve.
- Ilioinguinal nerve.

Transverse Colon Relations

Peritoneal Relations

- Intraperitoneal.
- Suspended by transverse mesocolon.
- Transverse mesocolon attaches posteriorly to anterior border of pancreas.

Anterior Relations

- Greater omentum.
- Anterior abdominal wall.

Posterior Relations

- Second part of duodenum.
- Head of pancreas.
- Coils of small intestine.

Descending Colon Relations

Peritoneal Relations

- Retroperitoneal.
- Peritoneum covers it anteriorly.
- Fixed to posterior abdominal wall.
- Medial and lateral paracolic gutters.

Anterior Relations

- Small intestine.
- Greater omentum.
- Anterior abdominal wall.

Posterior Relations

- Iliacus.
- Quadratus lumborum.
- Origin of transversus abdominis.
- Ilioinguinal nerve.
- Iliohypogastric nerve.
- Psoas major.
- Lateral cutaneous nerve.
- Femoral nerve.

— Inguinal Canal

General Relations

- Oblique passage in lower anterior abdominal wall.
- Between deep inguinal ring and superficial inguinal ring.
- Parallel to medial half of inguinal ligament.
- Length: 4 cm / 1.5 inches.

- Inguinal ligament:
    - ASIS → pubic tubercle.

Contents

- Male:
    - Spermatic cord.
- Female:
    - Round ligament of uterus.

Deep Inguinal Ring

- Opening in transversalis fascia.
- 0.5 inch / 1.3 cm above inguinal ligament.
- Clinically located above femoral artery pulsation.
- Weak point → indirect inguinal hernia enters here.

Superficial Inguinal Ring

- Defect in external oblique aponeurosis.
- Above and medial to pubic tubercle.
- Has:
    - Medial crus.
    - Lateral crus.
- Spermatic cord exits through it to scrotum.

Spermatic Cord Fasciae

- Internal spermatic fascia:
    - From transversalis fascia/deep ring.
- Cremasteric fascia + muscle:
    - From internal oblique.
- External spermatic fascia:
    - From external oblique aponeurosis/superficial ring.

Boundaries of Inguinal Canal

Anterior wall

- External oblique aponeurosis.
- Reinforced laterally by internal oblique fibers.

Posterior wall

- Transversalis fascia.
- Deep ring is in transversalis fascia.

Roof

- Arching fibers of internal oblique.
- Arching fibers of transversus abdominis.

Floor

- Inguinal ligament.

Hernia Relations

Indirect inguinal hernia

- Enters deep inguinal ring.
- Travels through inguinal canal.
- May exit superficial ring.
- Lateral to inferior epigastric vessels.

Direct inguinal hernia

- Pushes through Hesselbach triangle.
- Does not travel through inguinal canal.
- Medial to inferior epigastric vessels.

— Peritoneum

Peritoneal Classification Relations

Intraperitoneal organs

- Stomach.
- First inch and last inch of duodenum.
- Jejunum and ileum.
- Cecum and appendix.
- Transverse colon.
- Sigmoid colon.
- Spleen.
- Ovary.

Retroperitoneal organs

- Kidneys.
- Suprarenal glands.

- Pancreas.
- Ascending colon.
- Descending colon.
- Upper third of rectum.
- Duodenum except first and last inch.
- Ureters.
- Abdominal aorta.
- IVC.

Interperitoneal / partially covered organs

- Urinary bladder.
- Uterus.
- Gallbladder.
- Liver because it has bare area.

Greater Sac Relations

- Around liver.
- Anterior to stomach.
- Anterior to greater omentum.
- Anterior to small intestines.
- Above pelvic organs:
    - Rectum.
    - Uterus.
    - Bladder.

Lesser Sac Relations

- Posterior to stomach.
- Anterior to pancreas and duodenum.
- Anterior to transverse colon.
- Between descending and ascending layers of greater omentum.
- Inferior to liver and diaphragm.
- Left lateral edge reaches spleen.

Epiploic Foramen / Foramen of Winslow

- Connects greater sac to lesser sac.
- Directly below free edge of lesser omentum.
- Free edge contains:
    - Bile duct.
    - Hepatic artery.
    - Portal vein.

Greater Omentum + Mesocolon Relations

- Greater omentum begins as two peritoneal layers around anterior/posterior stomach.
- Descends over intestines.
- Ascends again.
- Splits around transverse colon.
- Forms transverse mesocolon.
- Transverse mesocolon ends at anterior border of pancreas.

Peritoneal Pouches / Recesses

Male

- Rectovesical pouch:
    - Between rectum and urinary bladder.
    - May contain loops of small intestine or sigmoid colon.

Female

- Rectouterine pouch / Douglas pouch:
    - Between rectum and uterus.
    - Clinically important.

Hepatorenal recess / Morrison's pouch

- Between liver and right kidney.
- Ruptured appendix infection can migrate here → abscess.
- Can continue upward → subdiaphragmatic abscess.