

Posterior Abdominal Wall

Posterior Abdominal Wall – Introduction

The **posterior abdominal wall** consists of:

- **Abdominal aorta**
- **Inferior vena cava**
- **Abdominal parts of azygos and hemiazygos veins**
- **Lymph nodes and cisterna chyli**
- **Muscles and thoracolumbar fascia**
- **Nerves** including the **lumbar plexus** and **abdominal part of the autonomic nervous system**.

These structures together form the **deep framework** supporting abdominal viscera and serve as a major conduit for blood vessels and nerves.

Abdominal Aorta

Beginning, Course, and Termination

- Begins at **T12**, at the **aortic opening of the diaphragm**.
- Descends **anterior to lumbar vertebrae**, slightly to the **left of the midline**.

- Ends at the **lower border of L4**, by dividing into **right and left common iliac arteries**.
 - Aortic pulsations can often be felt near the **umbilicus**, especially in slender individuals.
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Relations of the Abdominal Aorta

Anteriorly

From above downward, the aorta is related to:

1. **Coeliac and aortic plexuses**
2. **Body of pancreas** (posterior surface of pancreas overlies the aorta; splenic vein runs along it)
3. **Third part of duodenum**

Posteriorly

1. Bodies of **upper four lumbar vertebrae**
2. **Anterior longitudinal ligament**

Right Side

1. **Inferior vena cava**
2. **Right crus of diaphragm**
3. **Cisterna chyli** and **azygos vein** (in upper part)

Left Side

1. **Left crus of diaphragm**
 2. **Pancreas**
 3. **Fourth part of duodenum**
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Branches of the Abdominal Aorta

(A) Visceral Branches

(a) Unpaired

- **Coeliac trunk** (T12) – supplies foregut derivatives.
- **Superior mesenteric artery (SMA)** (L1) – supplies midgut.
- **Inferior mesenteric artery (IMA)** (L3) – supplies hindgut.

(b) Paired

- **Middle suprarenal arteries**
 - **Renal arteries**
 - **Gonadal arteries** (testicular or ovarian).
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(B) Parietal Branches

(a) Paired

- **Inferior phrenic arteries** – supply diaphragm.
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- **Four lumbar arteries** – one on each side from L1–L4.
- **Median sacral artery** – small midline branch near bifurcation.

(b) Unpaired

- **Median sacral artery** (continuation of aorta below bifurcation).
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(C) Terminal Branches

- **Right and left common iliac arteries** – supply lower limbs and pelvis.
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Key Clinical Correlations

- **Abdominal aortic aneurysm (AAA):** common below renal arteries; rupture causes fatal retroperitoneal hemorrhage.
- **Aortic pulsations:** felt near umbilicus; visible in thin individuals.
- **Aortic bifurcation:** landmark for **L4 vertebra**; important for surgical and radiological reference.

Common Iliac Arteries

- The **abdominal aorta** ends at the **lower border of L4**, dividing into **right and left common iliac arteries**.
- Each **common iliac artery** runs **downward and laterally** along the **medial border of psoas major**.

- They **terminate** at the level of the **sacroiliac joint**, dividing into:
 - **External iliac artery** ? continues as **femoral artery** in thigh.
 - **Internal iliac artery** ? supplies **pelvic organs** and **gluteal region**.

Relations:

- **Right common iliac vein** lies behind and partly to the right of the right artery.
 - **Left common iliac vein** lies medial to its artery.
 - **Ureter** crosses both arteries anteriorly.
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Inferior Vena Cava (IVC)

- The **largest vein in the body**.
- Formed by the union of **right and left common iliac veins** at the level of **L5** (below aortic bifurcation).
- Ascends **on the right side of aorta**, pierces the **central tendon of the diaphragm at T8**, and opens into the **right atrium**.

Relations:

- **Anteriorly:** duodenum (3rd part), pancreas head, right renal artery, hepatic surface.
- **Posteriorly:** right psoas, right renal artery, right crus of diaphragm.
- **To the left:** abdominal aorta.

- **To the right:** right kidney and suprarenal gland.
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Tributaries of the Inferior Vena Cava

1. Visceral Tributaries

- Right and left **renal veins** (left is longer, crosses anterior to aorta).
- Right **suprarenal vein** (left drains to left renal vein).
- Right and left **gonadal veins** (right opens directly into IVC; left into left renal vein).
- **Hepatic veins** (three main veins draining liver directly into IVC).

2. Parietal Tributaries

- **Inferior phrenic veins**
 - **Lumbar veins** (four pairs)
 - **Common iliac veins**
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Clinical Anatomy Related to IVC and Common Iliac Arteries

- **Aneurysm of the abdominal aorta** may compress the IVC, causing **leg edema and venous congestion**.
- **Thrombosis of IVC** can lead to bilateral lower-limb edema and venous collateral formation.

- **Left renal vein compression** (between aorta and SMA) ? “**Nutcracker syndrome**”, presenting with **hematuria and flank pain**.
 - **Right common iliac artery** may compress **left common iliac vein** (due to overlap), leading to **May–Thurner syndrome** ? left leg swelling and thrombosis.
 - **IVC filter** can be inserted below renal veins to prevent **pulmonary embolism** from leg DVT.
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Abdominal Parts of Azygos and Hemiazygos Veins

- The **azygos system** drains **posterior thoracoabdominal wall**.
- **Azygos vein** arises from the **right ascending lumbar vein** and **right subcostal vein**; passes through the **aortic opening (T12)** to enter thorax.
- **Hemiazygos vein** arises from **left ascending lumbar and left subcostal veins**; crosses at **T8–T9** to join the azygos vein.
- Both veins form important **collateral pathways** between **superior and inferior vena cava**.

Clinical Note:

- In **IVC obstruction**, blood drains through **azygos–hemiazygos system**, maintaining venous return to the heart.
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Lymph Nodes of the Posterior Abdominal Wall

1. Pre-aortic Group

- Lie in front of the aorta.
- Include **coeliac**, **superior mesenteric**, and **inferior mesenteric** nodes.
- Drain lymph from **gastrointestinal tract and related organs**.

2. Para-aortic (Lateral Aortic) Group

- Lie on either side of the aorta.
- Drain lymph from:
 - Kidneys, suprarenal glands
 - Testes/ovaries
 - Uterus and uterine tubes (via ovarian lymphatics)
 - Posterior abdominal wall.

Lymph from these nodes ? **cisterna chyli** ? **thoracic duct**.

Cisterna Chyli

- A **dilated sac-like lymphatic reservoir**.
- Located at the **level of L1–L2**, between **aorta and right crus of diaphragm**, behind the right renal artery.
- It receives:

- **Intestinal trunks** (from gut)
- **Right and left lumbar trunks** (from lower limbs, pelvis, posterior wall).
- Continues upward as **thoracic duct** through the **aortic opening (T12)**.

Clinical Relevance:

- **Rupture** (trauma or surgery) ? **chylous ascites** (milky peritoneal fluid due to lymph leakage).

Muscles of the Posterior Abdominal Wall

1. Psoas Major

- **Origin:** T12–L5 vertebral bodies and transverse processes.
- **Insertion:** Lesser trochanter (with iliacus).
- **Nerve supply:** L1–L3.
- **Action:** Flexes thigh and trunk; stabilizes vertebral column.

2. Iliacus

- **Origin:** Iliac fossa.
- **Insertion:** Lesser trochanter (with psoas major ? iliopsoas).
- **Nerve:** Femoral nerve (L2–L4).

- **Action:** Flexes thigh on trunk.

3. Quadratus Lumborum

- **Origin:** Iliolumbar ligament, iliac crest.
- **Insertion:** 12th rib and transverse processes of L1–L4.
- **Nerve:** Subcostal nerve + L1–L4 ventral rami.
- **Action:** Lateral flexion of vertebral column; fixes 12th rib during respiration.

Dissection Overview

During posterior wall dissection:

1. Reflect **peritoneum** from posterior wall.
2. Expose **psoas major**, **quadratus lumborum**, and **iliacus**.
3. Identify **lumbar plexus nerves** emerging from psoas major.
4. Locate **aorta and IVC**, their branches, and **cisterna chyli**.

Clinical Anatomy of Muscles and Posterior Wall

- **Psoas abscess:** Tubercular infection of lumbar vertebrae spreading along psoas sheath to thigh.

- **Psoas sign:** Pain on hip extension in psoas abscess or appendicitis (due to psoas irritation).
- **Quadratus lumborum strain:** Common in lifting injuries causing low back pain.
- **Retroperitoneal hemorrhage** may track along psoas and appear in groin.
- **Enlarged para-aortic lymph nodes** may compress psoas major ? cause flexion deformity or pain.

Thoracolumbar Fascia (Lumbar Fascia)

- A strong sheet of fascia covering **deep muscles of the back** and forming part of the **posterior abdominal wall**.
- **Layers:**
 - **Anterior layer:** Covers quadratus lumborum; attached to transverse processes of lumbar vertebrae and forms anterior boundary of lumbar region.
 - **Middle layer:** Between quadratus lumborum and deep back muscles; attached to transverse processes.
 - **Posterior layer:** Covers erector spinae; attached to tips of spinous processes and to the posterior part of iliac crest.
- **Fusion:** The three layers join laterally to enclose the deep back muscles and blend with the **aponeurosis of transversus abdominis**.
- **Functions:**
 - Provides attachment for internal oblique and transversus abdominis.

- Stabilizes the **lumbar spine**.
 - Transmits forces between upper limb, trunk, and lower limb.
 - Helps maintain posture and intra-abdominal pressure.
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Nerves of the Posterior Abdominal Wall

- Derived from **lumbar plexus** formed within **psoas major** by the **ventral rami of L1–L4**.
 - Major branches:
 - **Iliohypogastric nerve (L1)**: Supplies lower part of abdominal wall muscles and skin above pubis.
 - **Ilioinguinal nerve (L1)**: Supplies upper medial thigh and external genitalia.
 - **Genitofemoral nerve (L1–L2)**: Divides into genital and femoral branches.
 - *Genital branch* ? cremaster muscle and scrotal/labial skin.
 - *Femoral branch* ? skin over femoral triangle.
 - **Lateral femoral cutaneous nerve (L2–L3)**: Supplies skin on lateral thigh.
 - **Femoral nerve (L2–L4)**: Largest branch; supplies iliacus, anterior thigh muscles, and skin of anterior thigh and medial leg.
 - **Obturator nerve (L2–L4)**: Passes through obturator canal; supplies medial thigh muscles and skin.
 - **Accessory obturator nerve (L3–L4)**: Inconstant; supplies pectineus.
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Abdominal Part of the Autonomic Nervous System

- Includes **sympathetic** and **parasympathetic** components.
 - **Sympathetic system:**
 - Formed by **lumbar sympathetic chain, coeliac ganglia and plexus, and superior hypogastric plexus.**
 - Controls visceral vasoconstriction, reduces gut motility, and contracts sphincters.
 - **Parasympathetic system:**
 - From **vagus nerve** and **pelvic splanchnic nerves (S2–S4).**
 - Increases gut motility and secretion; relaxes sphincters.
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Lumbar Sympathetic Chain

- Lies along **anterolateral aspects of lumbar vertebral bodies.**
- Usually consists of **four ganglia** on each side.
- **Relations:**
 - Right chain behind inferior vena cava.
 - Left chain behind abdominal aorta.
- **Connections:**
 - Receives **white rami communicantes** from L1 and L2 spinal nerves.

- Sends **grey rami** to all lumbar nerves.
 - **Branches:**
 - Postganglionic fibers to lumbar vessels.
 - Fibers forming **lumbar splanchnic nerves** ? coeliac and hypogastric plexuses.
 - **Functions:** Sympathetic supply to abdominal viscera and lower limbs.
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Coeliac Ganglia and Coeliac Plexus

- Located on each side of the **coeliac trunk** near the origin of the superior mesenteric artery.
 - **Coeliac ganglia:** Two large sympathetic ganglia interconnected by a plexus.
 - **Composition:**
 - Preganglionic fibers from greater and lesser splanchnic nerves.
 - Postganglionic fibers distributed via coeliac trunk branches.
 - **Distribution:**
 - To liver, stomach, spleen, pancreas, kidneys, intestines up to mid-transverse colon.
 - **Clinical importance:** Pain from upper abdominal viscera is referred to epigastric region (via T5–T9).
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Superior Hypogastric Plexus (Presacral Nerve)

- Located in front of the **lower part of the abdominal aorta and L5 vertebra**, continuing into pelvis as **right and left hypogastric nerves**.
- Formed by:
 - Descending fibers from **aortic plexus**.
 - **Lumbar splanchnic nerves (L3–L4)**.
- **Communications:**
 - Below, divides into **right and left hypogastric nerves** that join the **inferior hypogastric (pelvic) plexuses**.
- **Supply:**
 - Sympathetic fibers to pelvic viscera—mainly bladder, prostate, seminal vesicle, uterus.
- **Clinical relevance:**
 - Site for **hypogastric plexus block** in pelvic pain management.
 - Can be injured in pelvic surgery leading to bladder and sexual dysfunction.

Inferior Hypogastric Plexuses

- Also called **pelvic plexuses**; paired autonomic nerve networks on each side of the **rectum (in male) or vagina (in female)**.
- Formed by the union of:

- **Hypogastric nerves** (continuation of superior hypogastric plexus).
 - **Pelvic splanchnic nerves** (parasympathetic, from S2–S4).
 - **Sacral splanchnic nerves** (sympathetic, from sacral sympathetic chain).
- **Location:**
 - Situated lateral to rectum, base of bladder, prostate in males.
 - Situated lateral to vagina and cervix in females.
- **Distribution:**
 - Fibers radiate to form subsidiary plexuses:
 - **Vesical plexus** ? urinary bladder.
 - **Prostatic plexus** (in males) ? prostate, seminal vesicles, vas deferens, penis.
 - **Uterovaginal plexus** (in females) ? uterus and vagina.
 - **Rectal plexus** ? rectum and anal canal.
- **Functional components:**
 - **Sympathetic fibers:** Cause contraction of sphincters and ejaculation in males.
 - **Parasympathetic fibers:** Cause relaxation of sphincters, bladder contraction, and vasodilatation of erectile tissues.
- **Clinical importance:**

- Damage during pelvic surgery (e.g., hysterectomy or prostatectomy) ? urinary retention or impotence.
 - Site for **nerve block** in obstetric pain management.
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Clinical Anatomy of Posterior Abdominal Wall

- **Psoas abscess:**

- Infection (usually from tuberculosis of lumbar vertebra) spreads into the psoas sheath.
- Presents as a swelling below the inguinal ligament; hip flexion causes pain.

- **Retroperitoneal hemorrhage:**

- May occur due to rupture of lumbar vessels or aortic aneurysm.

- **Lumbar hernia:**

- Occurs through weak areas in posterior abdominal wall—**lumbar triangles** (Petit's or Grynfeltt's).

- **Aortic aneurysm:**

- Pulsatile swelling in epigastrium; may compress sympathetic plexus ? back pain.

- **Referred pain:**

- Irritation of diaphragm or posterior peritoneum ? referred to shoulder or flank region.

- **Lumbar sympathetic chain injury:**

- Causes vasodilatation and increased skin temperature in lower limb.

- **Psoas sign:**

- Pain on extension of thigh ? indicates irritation of psoas (e.g., appendicitis).
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Layers of the Abdomen

(From superficial to deep)

1. **Skin** – Loosely attached except at umbilicus; supplied by cutaneous branches of lower six thoracic and first lumbar nerves.
2. **Superficial fascia** – Has two layers:
 - **Camper's fascia:** Fatty superficial layer, continues into perineum and thigh.
 - **Scarpa's fascia:** Membranous deep layer; attached to fascia lata below inguinal ligament; continues into perineum as **Colles' fascia**.
3. **Muscles and their aponeuroses:**
 - **External oblique, internal oblique, and transversus abdominis** form the anterolateral wall.
 - **Rectus abdominis** and **pyramidalis** lie in front.
4. **Transversalis fascia:** Thin connective tissue layer lining inner surface of transversus abdominis.
5. **Extraperitoneal fat (areolar tissue):** Loose connective tissue containing fat, vessels, and nerves.

6. **Parietal peritoneum:** Serous membrane lining the inner surface of the abdominal cavity and reflecting over the viscera.

Functional significance:

- These layers protect abdominal viscera, maintain intra-abdominal pressure, assist in movements and respiration, and form surgical planes of dissection.

Mnemonics

1. Branches of Abdominal Aorta (in order from above downwards)

Mnemonic: “**Come, See, Super Man, In, Love**”

- **C** ? Coeliac trunk
- **S** ? Superior mesenteric artery
- **S** ? Suprarenal arteries (middle)
- **M** ? Renal arteries
- **I** ? Inferior mesenteric artery
- **L** ? Common iliac arteries

2. Tributaries of Inferior Vena Cava

Mnemonic: “**I Like To Rise So High**”

- **I** ? Iliac veins (common)
- **L** ? Lumbar veins

- **T** ? Testicular or ovarian veins (right side directly; left via renal vein)
- **R** ? Renal veins
- **S** ? Suprarenal veins (right directly, left via renal vein)
- **H** ? Hepatic veins

3. Openings in the Diaphragm (to recall relation with posterior wall)

Mnemonic: “**I Ate Ten Eggs At Twelve**”

- **I** (8) ? Inferior vena cava at T8
- **Ten** (10) ? Oesophagus at T10
- **Twelve** (12) ? Aorta at T12

4. Branches of Lumbar Plexus (from above downward)

Mnemonic: “**I Twice Get Laid On Fridays**”

- **I** ? Iliohypogastric nerve
- **Twice I** ? Ilioinguinal nerve
- **G** ? Genitofemoral nerve
- **L** ? Lateral femoral cutaneous nerve
- **O** ? Obturator nerve
- **F** ? Femoral nerve

5. Layers of Thoracolumbar Fascia

Mnemonic: “**All Men Pray**”

- **A** ? Anterior layer (covers quadratus lumborum)
 - **M** ? Middle layer (between QL and erector spinae)
 - **P** ? Posterior layer (covers erector spinae from behind)
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Facts to Remember

- **Posterior abdominal wall** is formed by **lumbar vertebrae**, **intervertebral discs**, **psoas major**, **quadratus lumborum**, **iliacus**, and **diaphragm**.
- **Thoracolumbar fascia** encloses the deep muscles of the back and gives attachment to abdominal muscles, providing mechanical stability.
- **Abdominal aorta** extends from **T12 to L4**, where it divides into **common iliac arteries**.
- **Inferior vena cava** begins at **L5** (union of common iliac veins) and ends at **T8** (pierces diaphragm).
- **Cisterna chyli** lies at the level of **L1–L2**, serving as a dilated lymphatic sac that continues upward as the thoracic duct.
- **Lumbar plexus** (L1–L4) lies within the **psoas major**, providing motor and sensory innervation to lower limb and part of abdominal wall.
- **Sympathetic chain** provides vasomotor fibers to vessels and viscera of abdomen and pelvis; injury causes loss of vascular tone in lower limbs.
- **Superior and inferior hypogastric plexuses** act as relay centers for autonomic control of pelvic viscera.

- **Lumbar lymph nodes** drain kidneys, suprarenal glands, gonads, uterus, and posterior abdominal wall.
- **Clinical correlation:** Psoas abscess, aortic aneurysm, and lumbar hernia are key applied topics from this region.

Clinicoanatomical Problem

1. Psoas Abscess

- **Cause:** Tuberculosis of lumbar vertebrae (Pott's disease) may spread into the psoas sheath.
 - **Pathway:** The abscess follows the **psoas fascia**, passing beneath the **inguinal ligament** to appear as a swelling in the **upper thigh** or **groin**.
 - **Clinical signs:**
 - Pain in lumbar region or thigh.
 - Flexion deformity of hip (as psoas is irritated).
 - Swelling in groin or below inguinal ligament.
 - **Diagnosis:** Confirmed by psoas sign—pain when the thigh is extended or internally rotated.
 - **Treatment:** Drainage and antitubercular therapy.
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2. Psoas Spasm

- **Cause:** Irritation of the psoas muscle due to appendicitis, ureteric stones, or vertebral inflammation.
 - **Effect:** Persistent hip flexion to reduce pain; seen in retrocecal appendicitis.
 - **Mechanism:** Psoas major flexes the thigh and vertebral column—any irritation causes reflex contraction.
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3. Lumbar Hernia

- **Definition:** Herniation of abdominal contents through weak areas of posterior abdominal wall.
 - **Sites:**
 - **Superior lumbar triangle (Grynfeltt-Lesshaft's):** Between 12th rib, internal oblique, and quadratus lumborum.
 - **Inferior lumbar triangle (Petit's):** Between iliac crest, external oblique, and latissimus dorsi.
 - **Clinical relevance:** Presents as a posterolateral swelling; rare but may contain bowel or omentum.
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4. Abdominal Aortic Aneurysm (AAA)

- **Definition:** Localized dilatation of the abdominal aorta, usually below the level of renal arteries (infrarenal).
- **Cause:** Atherosclerosis, hypertension, or trauma.
- **Clinical features:**

- Pulsatile swelling in epigastrium or umbilical region.
 - Back pain due to pressure on lumbar sympathetic plexus.
 - May rupture ? fatal retroperitoneal hemorrhage.
 - **Treatment:** Surgical repair with graft replacement.
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5. Referred Pain from Posterior Abdominal Viscera

- **Mechanism:** Due to shared spinal segments between viscera and skin.
 - **Examples:**
 - Kidney ? loin and groin (T10–L1).
 - Ureter ? lower abdomen and scrotum/labia (T11–L2).
 - Diaphragm ? shoulder (C3–C5).
 - **Clinical importance:** Helps localize visceral pathology during examination.
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6. Compression of Lumbar Nerves by Psoas Major

- **Mechanism:** Inflammation or hypertrophy of psoas may compress lumbar plexus within it.
 - **Symptoms:**
 - Pain radiating to anterior or medial thigh.
 - Weakness of quadriceps femoris (femoral nerve involvement).
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- Loss of knee jerk in severe cases.
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7. Retroperitoneal Hemorrhage

- **Cause:** Trauma or rupture of aortic aneurysm.
- **Manifestations:**
 - Flank ecchymosis (Grey-Turner's sign).
 - Hypotension, shock.
- **Clinical note:** Often difficult to detect early; high mortality if untreated.

Frequently Asked Questions

1. What forms the posterior abdominal wall?

- Lumbar vertebrae and intervertebral discs.
 - Psoas major, iliacus, and quadratus lumborum muscles.
 - Fascia covering these muscles (thoracolumbar fascia).
 - Posterior parts of diaphragm and iliac fossa.
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2. Name the main muscles of the posterior abdominal wall and their nerve supply.

- **Psoas major** ? Ventral rami of L1–L3.
 - **Iliacus** ? Femoral nerve (L2–L4).
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- **Quadratus lumborum** ? Subcostal nerve (T12) and L1–L3 spinal nerves.
 - **Diaphragm (posterior fibers)** ? Phrenic nerve (C3–C5).
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3. What is the thoracolumbar fascia and what are its layers?

- A strong fascial sheet enclosing deep back muscles.
 - **Layers:**
 - **Anterior:** Covers quadratus lumborum.
 - **Middle:** Between quadratus lumborum and erector spinae.
 - **Posterior:** Covers erector spinae from behind.
 - Provides attachment to internal oblique and transversus abdominis muscles.
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4. What are the branches of the abdominal aorta?

- **Anterior (unpaired visceral):** Coeliac trunk, superior and inferior mesenteric arteries.
 - **Lateral (paired visceral):** Middle suprarenal, renal, and gonadal arteries.
 - **Posterior (paired parietal):** Inferior phrenic and lumbar arteries.
 - **Terminal branches:** Right and left common iliac arteries.
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5. What are the tributaries of the inferior vena cava?

- Common iliac veins, lumbar veins, right gonadal vein, renal veins, right suprarenal vein, inferior phrenic veins, and hepatic veins.
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6. Where is the cisterna chyli located and what is its function?

- Lies anterior to L1–L2 vertebral bodies, behind the right crus of diaphragm.
 - It is a dilated sac receiving lymph from intestinal and lumbar lymph trunks; continues upward as thoracic duct.
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7. What is the lumbar plexus and where is it located?

- Formed by **ventral rami of L1–L4 spinal nerves** within psoas major.
 - Lies in the posterior abdominal wall.
 - Major branches: iliohypogastric, ilioinguinal, genitofemoral, lateral femoral cutaneous, obturator, and femoral nerves.
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8. What is the difference between superior and inferior hypogastric plexuses?

- **Superior hypogastric plexus:** In front of lower abdominal aorta; gives right and left hypogastric nerves.
 - **Inferior hypogastric plexus:** Lies on either side of rectum; receives fibers from hypogastric nerves and pelvic splanchnic nerves; supplies pelvic viscera.
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9. What are the main autonomic ganglia and plexuses in the posterior abdominal wall?

- Coeliac ganglia and plexus, superior mesenteric plexus, intermesenteric plexus, aortic plexus, and hypogastric plexuses.
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10. What are the clinical applications of knowledge of the posterior abdominal wall?

- Helps in diagnosis and management of:
 - Psoas abscess and psoas sign.
 - Lumbar hernia.
 - Aortic aneurysm and retroperitoneal hemorrhage.
 - Pain pathways from kidneys, ureters, and other retroperitoneal organs.
 - Surgical approaches for kidney, aorta, and lumbar sympathectomy.

Multiple Choice Questions

1. The posterior abdominal wall is mainly formed by:

- A. Transversus abdominis and rectus abdominis
- B. Quadratus lumborum, psoas major, and iliacus
- C. Internal and external oblique
- D. Erector spinae and latissimus dorsi

? **Answer:** B

Explanation: These three muscles form the key muscular components of the posterior abdominal wall, along with fascia and lumbar vertebrae.

2. The thoracolumbar fascia gives origin to:

- A. External oblique muscle
- B. Internal oblique and transversus abdominis muscles
- C. Rectus abdominis muscle
- D. Psoas major muscle

? **Answer:** B

Explanation: Both internal oblique and transversus abdominis arise from the thoracolumbar fascia.

3. The lumbar plexus is formed within which muscle?

- A. Quadratus lumborum
- B. Psoas major
- C. Iliacus
- D. Transversus abdominis

? Answer: B

Explanation: The lumbar plexus lies embedded within the psoas major muscle substance.

4. The cisterna chyli lies at the level of:

- A. T10–T11
- B. T12–L1
- C. L1–L2
- D. L3–L4

? Answer: C

Explanation: It is a dilated lymphatic sac located anterior to the bodies of L1–L2 vertebrae.

5. The inferior vena cava begins at the level of:

- A. T12
- B. L1
- C. L3
- D. L5

? Answer: D

Explanation: The IVC is formed by the union of the two common iliac veins at L5 level.

6. The right testicular vein drains directly into the:

- A. Left renal vein
- B. Inferior vena cava
- C. Common iliac vein
- D. Portal vein

? Answer: B

Explanation: The right testicular (or ovarian) vein opens directly into the IVC, while the left drains into the left renal vein.

7. The superior hypogastric plexus lies:

- A. Behind the diaphragm
- B. In front of the lower part of abdominal aorta
- C. Behind the pubic symphysis
- D. Behind the rectum

? **Answer:** B

Explanation: It is a continuation of the aortic plexus lying over the lower aorta and L5 vertebra.

8. The nerve that supplies the cremaster muscle is:

- A. Iliohypogastric nerve
- B. Ilioinguinal nerve
- C. Genital branch of genitofemoral nerve
- D. Femoral branch of genitofemoral nerve

? **Answer:** C

Explanation: The genital branch of the genitofemoral nerve supplies the cremaster muscle and scrotal/labial skin.

9. Lumbar hernia occurs most commonly through:

- A. Linea semilunaris
- B. Linea alba
- C. Superior or inferior lumbar triangle
- D. Umbilical ring

? **Answer:** C

Explanation: The weak areas in the posterior wall (Petit's and Grynfeltt's triangles) are common sites for lumbar hernia.

10. The sympathetic chain in lumbar region lies:

- A. Lateral to the psoas major
- B. Within psoas major
- C. Medial to the aorta
- D. Behind the inferior vena cava on the right side

? **Answer:** D

Explanation: On the right, the chain lies behind the IVC; on the left, it is behind the aorta.

11. The inferior hypogastric plexus receives parasympathetic fibers from:

- A. Thoracic splanchnic nerves
- B. Lumbar splanchnic nerves
- C. Pelvic splanchnic nerves (S2–S4)
- D. Vagus nerve

? Answer: C

Explanation: Parasympathetic fibers from pelvic splanchnic nerves contribute to the inferior hypogastric plexus.

12. Which of the following does NOT drain into the inferior vena cava directly?

- A. Hepatic veins
- B. Renal veins
- C. Left gonadal vein
- D. Right gonadal vein

? Answer: C

Explanation: Left gonadal vein drains into the left renal vein before reaching the IVC.

13. Which muscle is enclosed by all three layers of thoracolumbar fascia?

- A. Psoas major
- B. Quadratus lumborum
- C. Erector spinae
- D. Iliacus

? Answer: C

Explanation: Erector spinae is enclosed between anterior, middle, and posterior layers of the thoracolumbar fascia.

14. The lumbar sympathetic chain usually consists of how many ganglia?

- A. 2
- B. 3
- C. 4
- D. 6

? Answer: C

Explanation: Typically, there are four lumbar sympathetic ganglia on each side.

15. Which is the largest branch of the lumbar plexus?

- A. Obturator nerve
- B. Lateral femoral cutaneous nerve
- C. Femoral nerve
- D. Genitofemoral nerve

? **Answer:** C

Explanation: The femoral nerve (L2–L4) is the largest branch, supplying anterior thigh muscles and skin.

Viva Voce

1. Name the main components forming the posterior abdominal wall.

- Lumbar vertebrae and intervertebral discs
 - Psoas major, iliacus, and quadratus lumborum muscles
 - Thoracolumbar fascia and diaphragm
-

2. What is the extent of the abdominal aorta?

- From **T12** (aortic opening of diaphragm) to **L4**, where it divides into the right and left common iliac arteries.
-

3. At what level does the inferior vena cava begin and end?

- Begins at **L5** (union of common iliac veins)
 - Ends at **T8** (pierces diaphragm to open into the right atrium).
-

4. Name the three main unpaired branches of the abdominal aorta.

- Coeliac trunk
 - Superior mesenteric artery
 - Inferior mesenteric artery
-

5. What are the paired visceral branches of the abdominal aorta?

- Middle suprarenal arteries
 - Renal arteries
 - Gonadal arteries (testicular or ovarian)
-

6. What are the paired parietal branches of the abdominal aorta?

- Inferior phrenic arteries
 - Four pairs of lumbar arteries
-

7. What is the cisterna chyli?

- A dilated lymphatic sac located in front of **L1–L2 vertebrae**; it continues upward as the **thoracic duct**.
-

8. What is the lumbar plexus?

- A nerve network formed by **ventral rami of L1–L4 spinal nerves** within the **psoas major muscle**.
-

9. Name the major branches of the lumbar plexus.

- Iliohypogastric nerve
 - Ilioinguinal nerve
 - Genitofemoral nerve
 - Lateral femoral cutaneous nerve
 - Obturator nerve
 - Femoral nerve
-

10. Which nerve supplies the cremaster muscle?

- The **genital branch of the genitofemoral nerve**.
-

11. Which muscle covers the anterior surface of the lumbar vertebrae?

- The **psoas major** muscle.
-

12. What is the nerve supply of the quadratus lumborum?

- Subcostal nerve (T12) and ventral rami of L1–L3 spinal nerves.
-

13. What is the action of the quadratus lumborum?

- Fixes the 12th rib during inspiration and laterally flexes the vertebral column.
-

14. Where is the superior hypogastric plexus located?

- In front of the lower part of the abdominal aorta and the body of L5 vertebra.
-

15. What are the continuations of the superior hypogastric plexus?

- It divides into **right and left hypogastric nerves**, which descend into the pelvis to join the **inferior hypogastric plexuses**.
-

16. What is the function of the inferior hypogastric plexus?

- Provides sympathetic and parasympathetic fibers to pelvic viscera — urinary bladder, rectum, prostate, uterus, and vagina.
-

17. What are the functions of the thoracolumbar fascia?

- Encloses and supports the deep muscles of the back
 - Provides attachment to internal oblique and transversus abdominis
 - Transmits forces between trunk and limbs
 - Maintains stability of the lumbar spine
-

18. Name the weak areas through which lumbar hernia may occur.

- **Superior lumbar triangle (Grynfeltt-Lesshaft's)**
 - **Inferior lumbar triangle (Petit's)**
-

19. Why does an abdominal aortic aneurysm cause back pain?

- The aneurysm compresses the **lumbar sympathetic plexus**, resulting in pain radiating to the back.
-

20. Which nerve is responsible for psoas spasm in appendicitis?

- The **femoral nerve** (through its supply to psoas major) becomes irritated, causing reflex contraction and pain on thigh extension.