MEDICAL EDUCATION RESOURCE

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.

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**

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).

(B) Parietal Branches

(a) Paired

- **Inferior phrenic arteries** – supply diaphragm.

- **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).

(C) Terminal Branches

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

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.

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.

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**

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.

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.

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.

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.

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.

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.

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).

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.

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).

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)

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).

- 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).

- **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.

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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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

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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.

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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).

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

- Coeliac trunk
- Superior mesenteric artery
- Inferior mesenteric artery

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

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

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

- Inferior phrenic arteries
- Four pairs of lumbar arteries

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7. What is the cisterna chyli?

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

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8. What is the lumbar plexus?

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

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9. Name the major branches of the lumbar plexus.

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

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10. Which nerve supplies the cremaster muscle?

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

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

- The **psoas major** muscle.

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

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

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13. What is the action of the quadratus lumborum?

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

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14. Where is the superior hypogastric plexus located?

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

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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**.

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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.

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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

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

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

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

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

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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.