MEDICAL EDUCATION RESOURCE

Axillary Vein & Axillary Lymph Nodes

AXILLARY VEIN AND AXILLARY LYMPH NODES

MEDMENTOR EDU | UPPER LIMB ANATOMY | MBBS • NEET PG • INI-CET

PART I — AXILLARY VEIN

1. Introduction

- The axillary vein is the principal venous channel draining the upper limb.
- Situated within the axilla, it is closely related to the axillary artery and brachial plexus.
- It receives blood from the superficial and deep veins of the upper limb, shoulder and axillary regions.
- Clinically important in venous catheterisation, axillary surgery, upper-limb venous thrombosis and vascular trauma.

Axillary vein – formation an

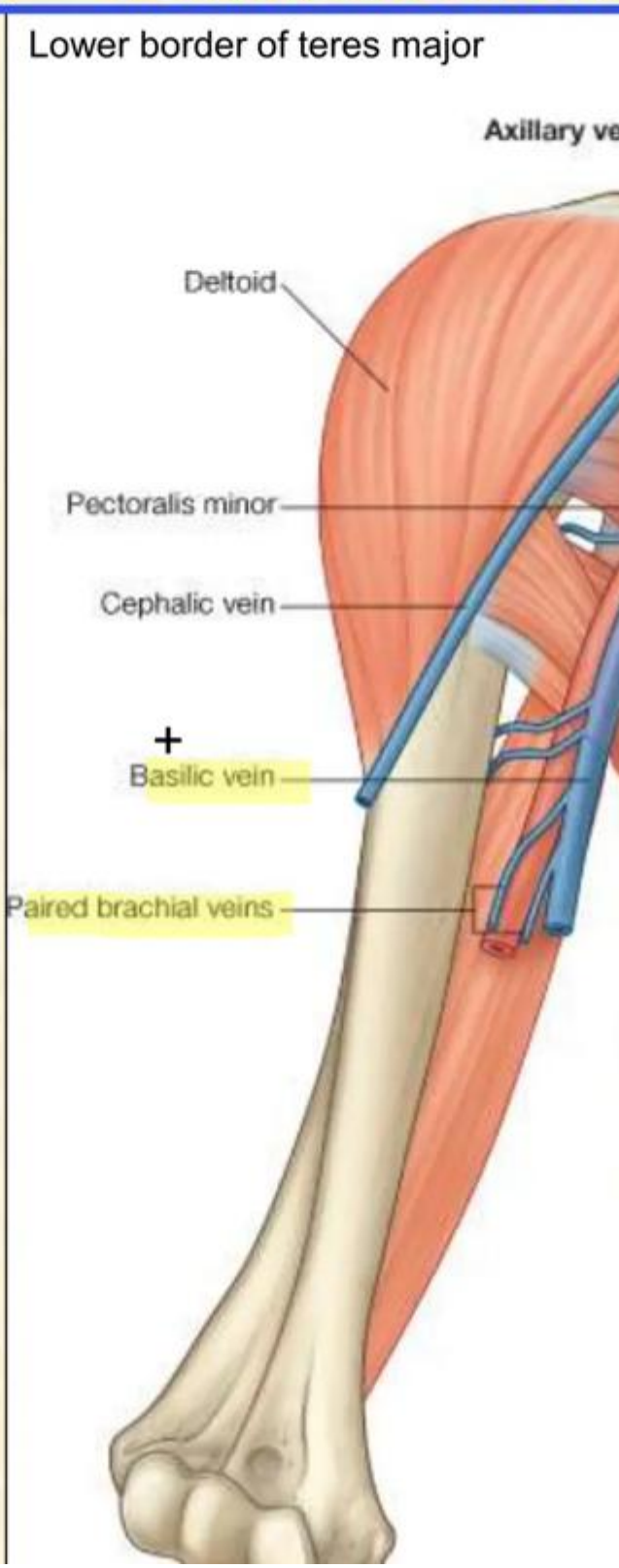
Axillary vein is formed by union of basilic vein and paired brachial veins

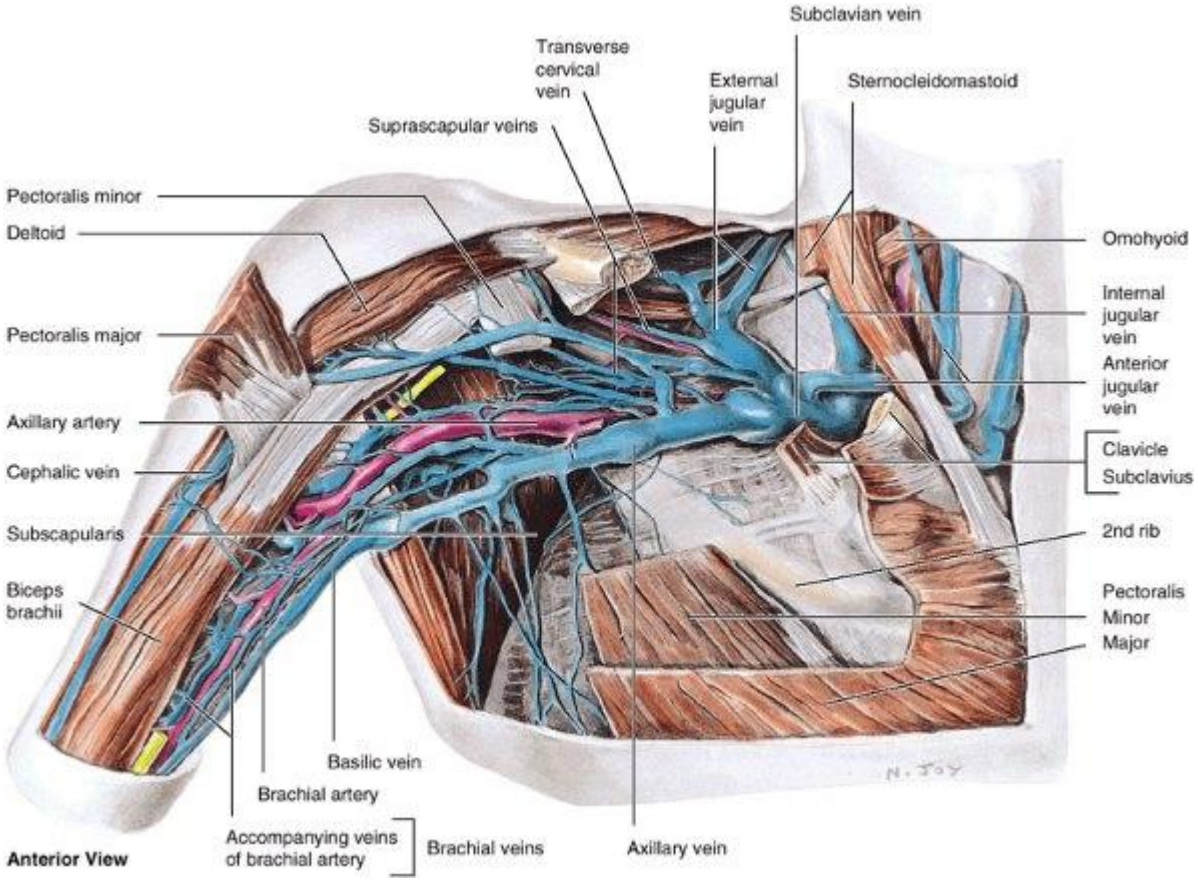
Axillary vein extends from:
the lower border of teres major to outer border of 1st rib

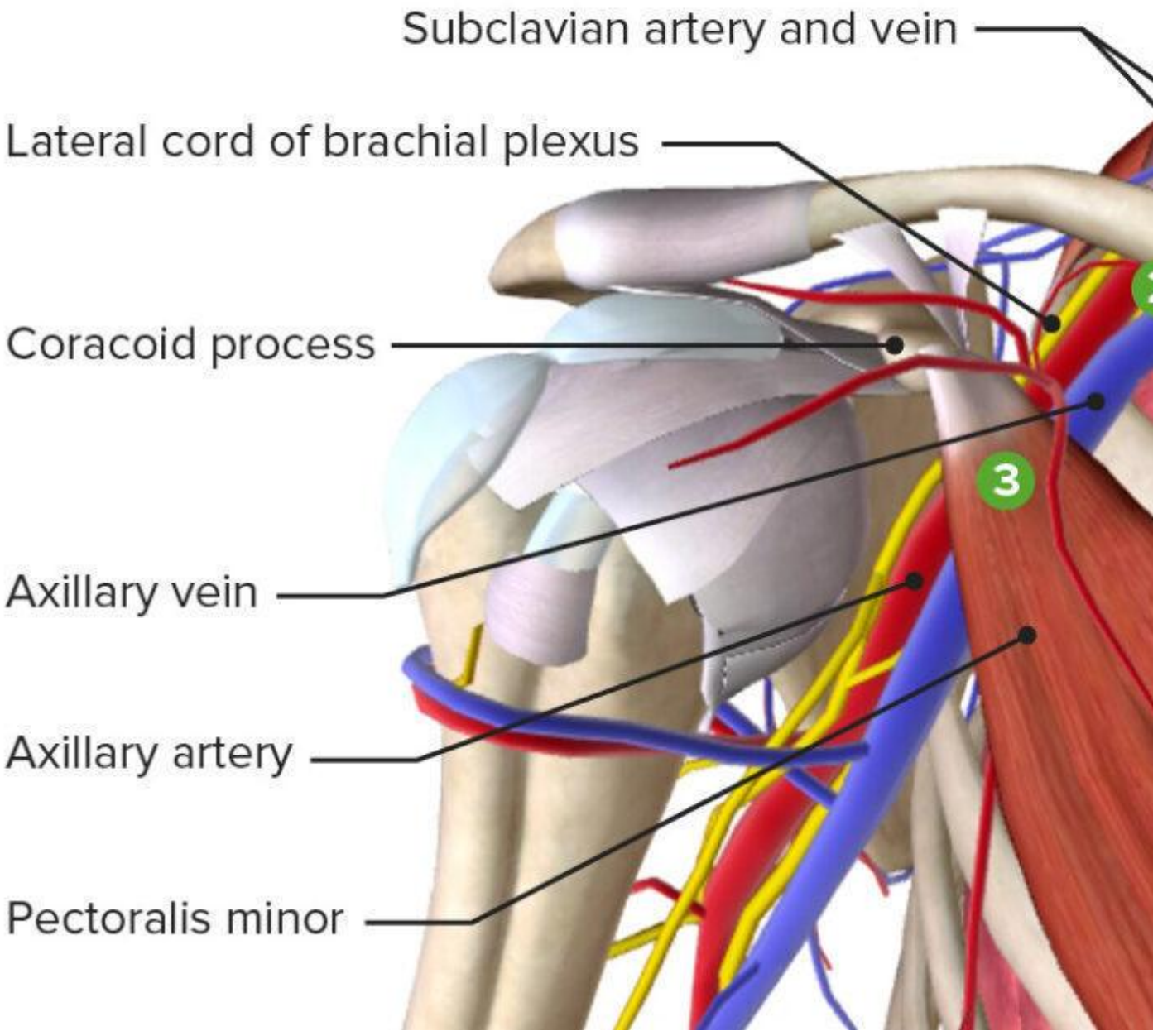
It ends by continuing as the subclavian vein

Has 1st, 2nd and 3rd parts

The axillary vein accompanies the axillary artery throughout its course




Subclavian vein
Transverse cervical vein
External jugular vein
Sternocleidomastoid
Suprascapular veins
Pectoralis minor
Deltoid
Omohyoid
Internal jugular vein
Pectoralis major
Anterior jugular vein
Axillary artery
Clavicle
Cephalic vein
Subclavius
Subscapularis
2nd rib
Biceps brachii
Pectoralis Minor Major
Basilic vein
Brachial artery
Accompanying veins of brachial artery
Brachial veins
Axillary vein
Anterior View


Subclavian artery and vein
Lateral cord of brachial plexus
Coracoid process
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Axillary vein
Axillary artery
Pectoralis minor

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2. Origin, Course and Termination

FEATURE	DESCRIPTION
Formation	Union of the basilic vein and brachial venae comitantes near the inferior border of teres major
Beginning	Inferior border of teres major
Course	Ascends through the axilla, generally anteromedial to the axillary artery
Termination	Continues as the subclavian vein at the lateral border of the first rib
Type	Deep vein of the upper limb

Course

- Begins at the inferior border of teres major.
- Ascends through the axilla towards the lateral border of the first rib.
- Lies predominantly anteromedial to the axillary artery.
- Receives several tributaries from the shoulder, thoracic wall and upper limb.
- Continues proximally as the subclavian vein.

Must know: The axillary vein becomes the subclavian vein at the lateral border of the first rib.

3. Tributaries of the Axillary Vein

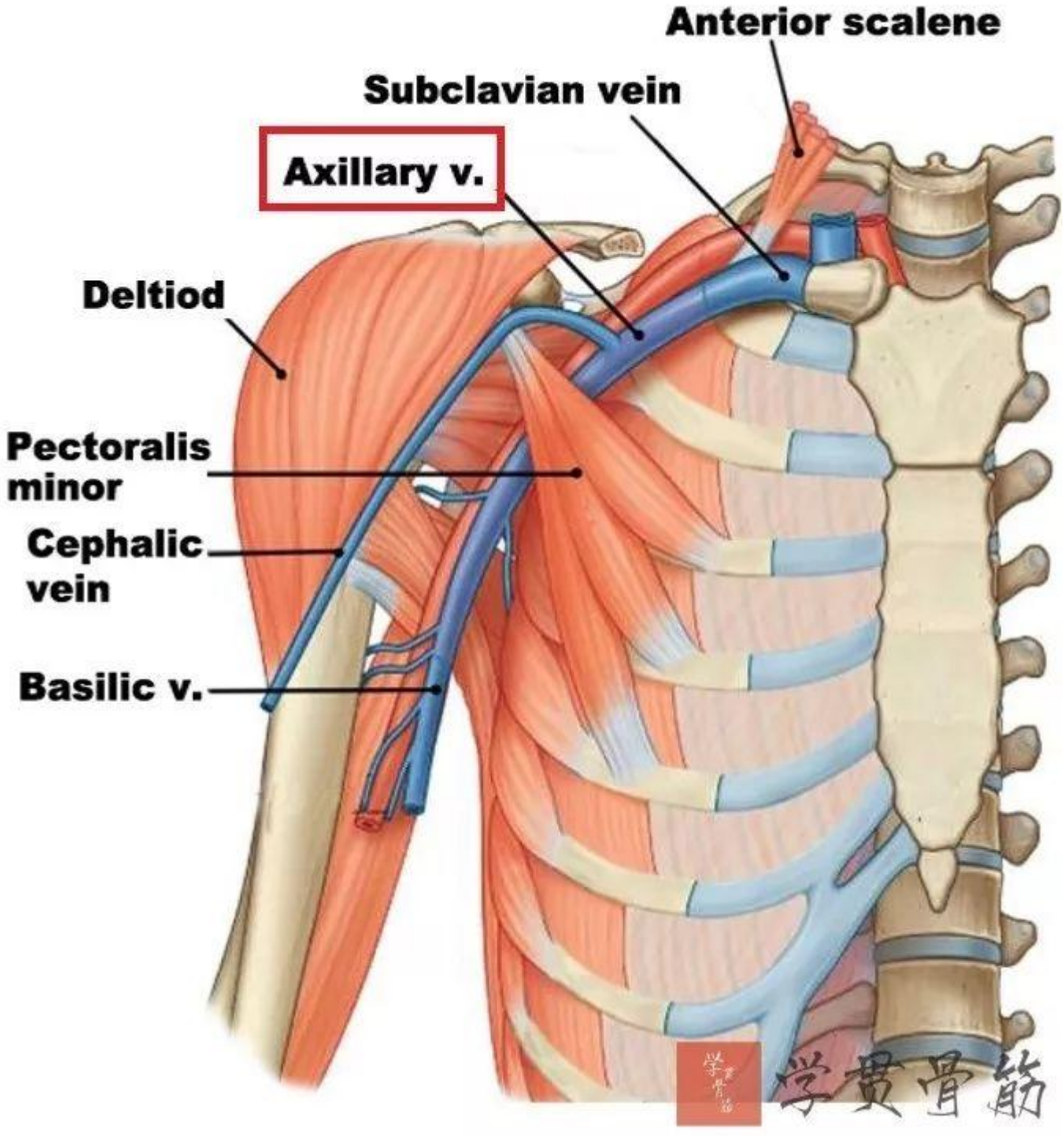
The tributaries generally correspond to branches of the axillary artery, although venous patterns are variable.

TRIBUTARY	IMPORTANT FEATURE
Cephalic vein	Major superficial tributary; enters after piercing the clavipectoral fascia
Thoracoacromial veins	Drain pectoral and shoulder regions
Lateral thoracic vein	Drains lateral thoracic wall and parts of breast
Subscapular vein	Drains posterior axillary and scapular regions
Anterior circumflex humeral vein	Drains structures around proximal humerus
Posterior circumflex humeral vein	Accompanies corresponding artery around shoulder
Superior thoracic veins	Drain upper thoracic wall; drainage pattern may vary

Cephalic vein — Important tributary

- Begins from the lateral part of the dorsal venous network of the hand.
- Ascends along the lateral side of the forearm and arm.
- Enters the deltopectoral groove between deltoid and pectoralis major.
- Pierces the clavipectoral fascia.

- Drains into the proximal axillary vein.



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Clinical importance: The cephalic vein may be used for venous cutdown and insertion of cardiac device leads.

4. Relations of the Axillary Vein

The axillary vein lies within the axilla and maintains close relationships with the artery and surrounding neurovascular structures.

DIRECTION	RELATIONS
Anterior	Skin, superficial and deep fasciae, pectoralis major; pectoralis minor proximally
Posterior	Axillary artery, with brachial plexus structures lying deeper
Medial	Medial axillary soft tissues, lymph nodes and thoracic wall proximally
Lateral	Axillary artery for much of its course

Important anatomical features

- The axillary vein is usually anteromedial to the artery.
- The cords of the brachial plexus are named relative to the second part of the artery, not the vein.
- The axillary vein generally lies outside the principal fascial sheath surrounding the axillary artery and brachial plexus.

Viva pearl: The axillary artery lies lateral and posterior to the axillary vein for much of its course.

CLINICAL ANATOMY OF AXILLARY VEIN

5. Axillary Venous Catheterisation

- The axillary vein is an important route for selected central venous access procedures.
- The infraclavicular axillary vein may be accessed under ultrasound guidance.
- Compared with more medial subclavian access, appropriately selected lateral axillary approaches may reduce certain risks, including pneumothorax, but complications remain possible.
- Knowledge of the artery–vein relationship helps avoid accidental arterial puncture.

Possible complications

- Haematoma.
- Accidental arterial puncture.
- Thrombosis.
- Infection.
- Pneumothorax with deeper or more medial approaches.
- Rare air embolism.

6. Axillary Vein Injury

Causes

- Penetrating trauma.
- Axillary or shoulder surgery.
- Proximal upper-limb injuries.

- Vascular access procedures.

Clinical manifestations

- Significant bleeding.
- Axillary haematoma.
- Venous congestion and upper-limb swelling.
- Possible compression of neighbouring nerves or arteries.

Clinical importance: Injury to a large axillary vein can cause major haemorrhage. Air embolism is also a potential complication of open central venous injuries under conditions permitting air entry.

7. Axillary Vein Compression

- Compression may occur due to enlarged lymph nodes, tumours, vascular abnormalities or other space-occupying lesions.
- May impair venous drainage from the upper limb.

Clinical features

- Arm swelling.
- Heaviness or discomfort.
- Dilated superficial veins.
- Occasionally cyanosis.

8. Axillary Vein Thrombosis

Paget–Schroetter syndrome

- Also called effort thrombosis.
- A form of upper-extremity deep venous thrombosis associated with venous thoracic outlet compression, often involving the axillosubclavian venous segment.
- May occur after repetitive or strenuous upper-limb activity, particularly overhead movements.

Clinical features

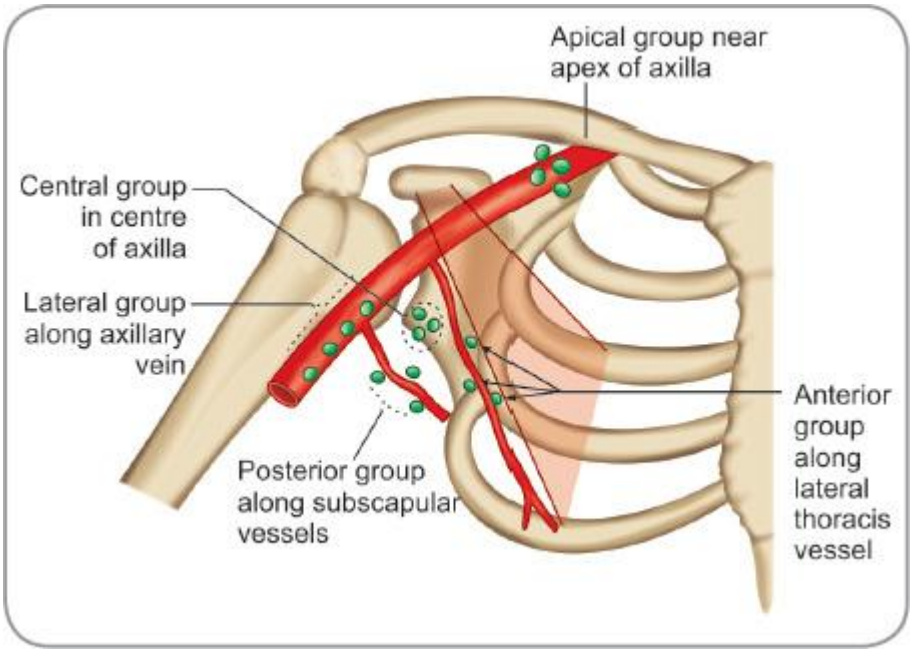
- Sudden swelling of the affected arm.
- Pain or heaviness.
- Cyanotic discolouration in some patients.
- Prominent superficial collateral veins.

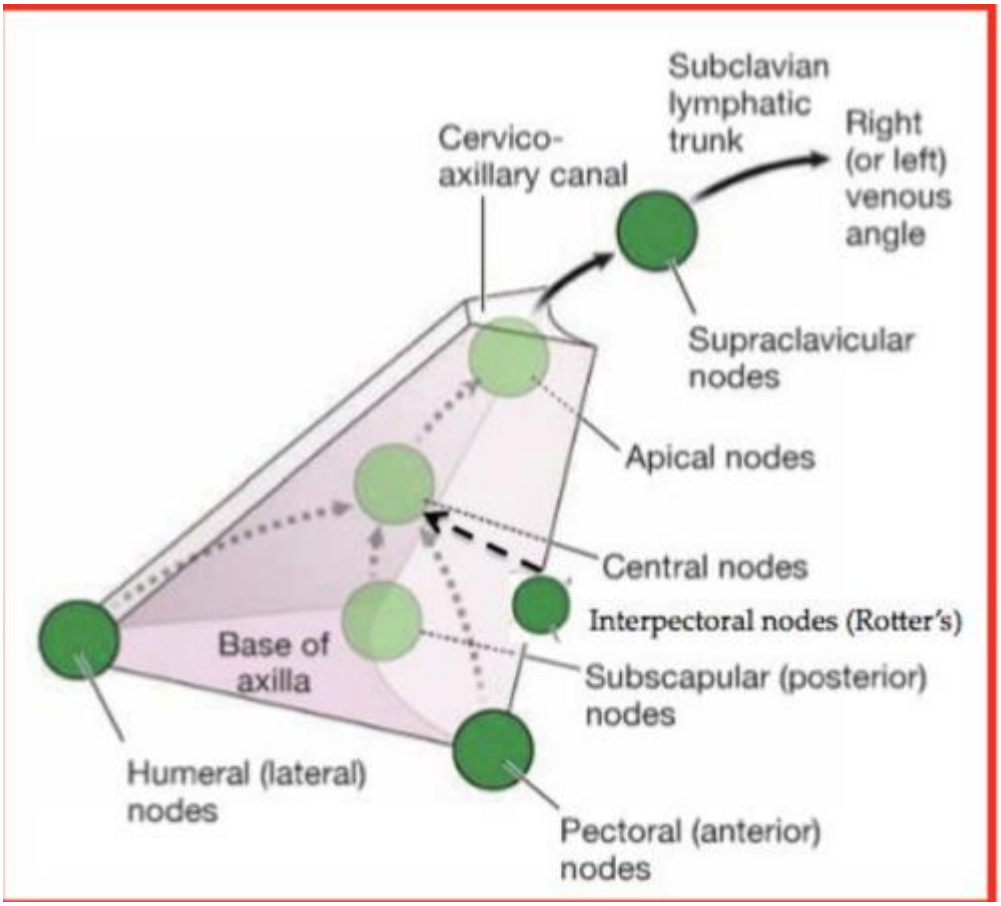
NEET PG pearl: Paget–Schroetter syndrome = effort-related axillosubclavian vein thrombosis.

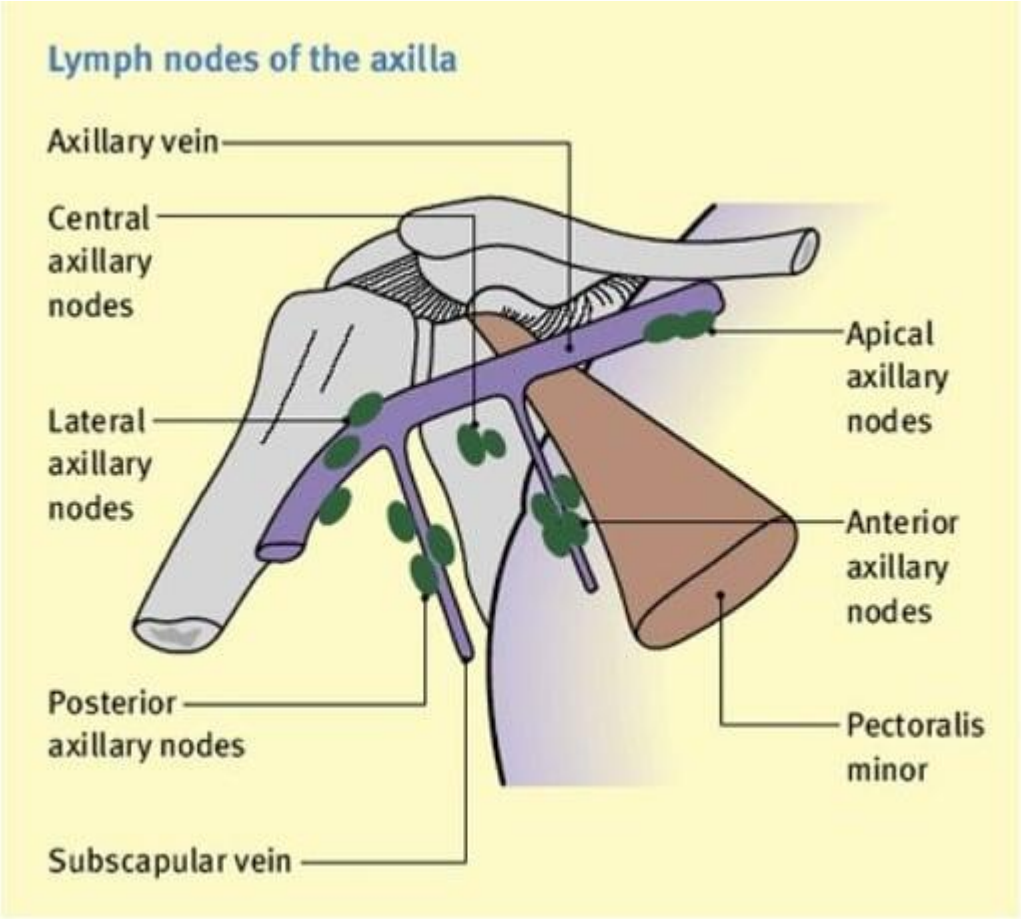
PART II — AXILLARY LYMPH NODES

9. General Features

- The axilla contains approximately 20–30 lymph nodes, although the number varies considerably between individuals.
- These nodes are embedded in the fat and loose connective tissue of the axilla.
- They drain lymph from the upper limb, breast, anterior and posterior thoracic walls, and adjacent shoulder regions.
- Axillary nodes are particularly important because they are the major regional lymphatic drainage pathway for the breast.
- Conventionally classified into five principal groups.


Apical group near apex of axilla
Central group in centre of axilla
Lateral group along axillary vein
Posterior group along subscapular vessels
Anterior group along lateral thoracis vessel


Subclavian lymphatic trunk
Right (or left) venous angle
Cervico-axillary canal
Supraclavicular nodes
Apical nodes
Central nodes
Interpectoral nodes (Rotter's)
Base of axilla
Subscapular (posterior) nodes
Humeral (lateral) nodes
Pectoral (anterior) nodes



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10. Groups of Axillary Lymph Nodes

A. Pectoral (anterior) group

Location

- Along the lateral thoracic vessels.
- Near the lower border of pectoralis minor and the anterior axillary wall.

Drainage

- Anterior thoracic wall.

- Anterolateral abdominal wall above the umbilical region.
- A substantial proportion of lymph from the breast, particularly its lateral portions.

Clinical importance

- Commonly involved in lymphatic spread of breast carcinoma.
- An important regional nodal group during breast surgery.

B. Subscapular (posterior) group

Location

- Along the subscapular vessels.
- Near the posterior axillary wall.

Drainage

- Posterior thoracic wall.
- Scapular region.
- Posterior shoulder region.

Clinical importance

- May enlarge in infections involving the posterior thoracic wall and upper back.

C. Humeral (lateral) group

Location

- Along the axillary vein, near the lateral wall of the axilla.

Drainage

- Receives most lymph from the upper limb.

- Some superficial lymphatics accompanying the cephalic vein may bypass this group and drain towards infraclavicular or apical nodes.

Clinical importance

- Frequently involved in reactive lymphadenopathy secondary to upper-limb infections.

D. Central group

Location

- Centrally within the axillary fat, near the base of the axilla.

Drainage

- Receives lymph from the pectoral, subscapular and humeral groups.
- Efferent vessels usually pass towards the apical nodes.

Clinical importance

- Important intermediate station in regional lymphatic drainage.
- May become involved as lymphatic disease progresses.

E. Apical group

Location

- Situated at the apex of the axilla, near the clavicle and first rib.
- Closely related to the proximal axillary vessels.

Drainage

- Receives lymph from central nodes.
- May receive direct drainage from superior breast regions and superficial lymphatics accompanying the cephalic vein.
- Efferent vessels form the subclavian lymphatic trunk.

Termination of lymphatic drainage

- On the right, the subclavian lymphatic trunk may drain into the right lymphatic duct or directly into the right venous angle.
- On the left, it may drain into the thoracic duct or directly into the left venous angle.
- Anatomical variations are common.

11. Summary of Axillary Lymph Node Groups

GROUP	LOCATION	MAIN DRAINAGE
Pectoral (anterior)	Lateral thoracic vessels	Breast, anterior thoracic wall
Subscapular (posterior)	Subscapular vessels	Posterior thoracic wall, scapular region
Humeral (lateral)	Axillary vein	Upper limb
Central	Central axillary fat	Pectoral, subscapular and humeral groups
Apical	Apex of axilla	Central nodes and additional direct pathways

12. Lymphatic Drainage Pathways

Main lymphatic drainage of the axilla

Breast

Pectoral nodes

Upper limb

Humeral nodes

Posterior thorax

Subscapular nodes

Central axillary nodes

Apical axillary nodes

Subclavian lymphatic trunk

Lymphatic duct / venous angle

This represents the conventional principal drainage pathway. Direct and variable routes also occur.

CLINICAL ANATOMY OF AXILLARY LYMPH NODES

13. Breast Carcinoma

A. Lymphatic spread

- Approximately 75% of breast lymph is traditionally described as draining towards axillary lymph nodes.
- The pectoralis-associated anterior group is a common initial regional drainage station.
- Lymphatic spread may involve central and apical nodes.
- Parasternal nodes and other regional pathways may also be involved.

B. Clinical findings

- Enlarged, firm or hard axillary nodes.
- Reduced mobility or fixation in more advanced nodal involvement.
- Occasionally matted lymph nodes.

- Associated breast findings may include skin dimpling, nipple retraction and peau d'orange.

Important: Axillary lymph node enlargement does not necessarily indicate malignancy. Reactive and inflammatory causes are common.

C. Importance in staging

- Axillary lymph node involvement forms part of the regional nodal (N) classification of breast carcinoma.
- The number, size and anatomical location of involved nodes influence staging and management.
- Apical nodal involvement may indicate more extensive regional disease but does not by itself establish distant metastatic spread.

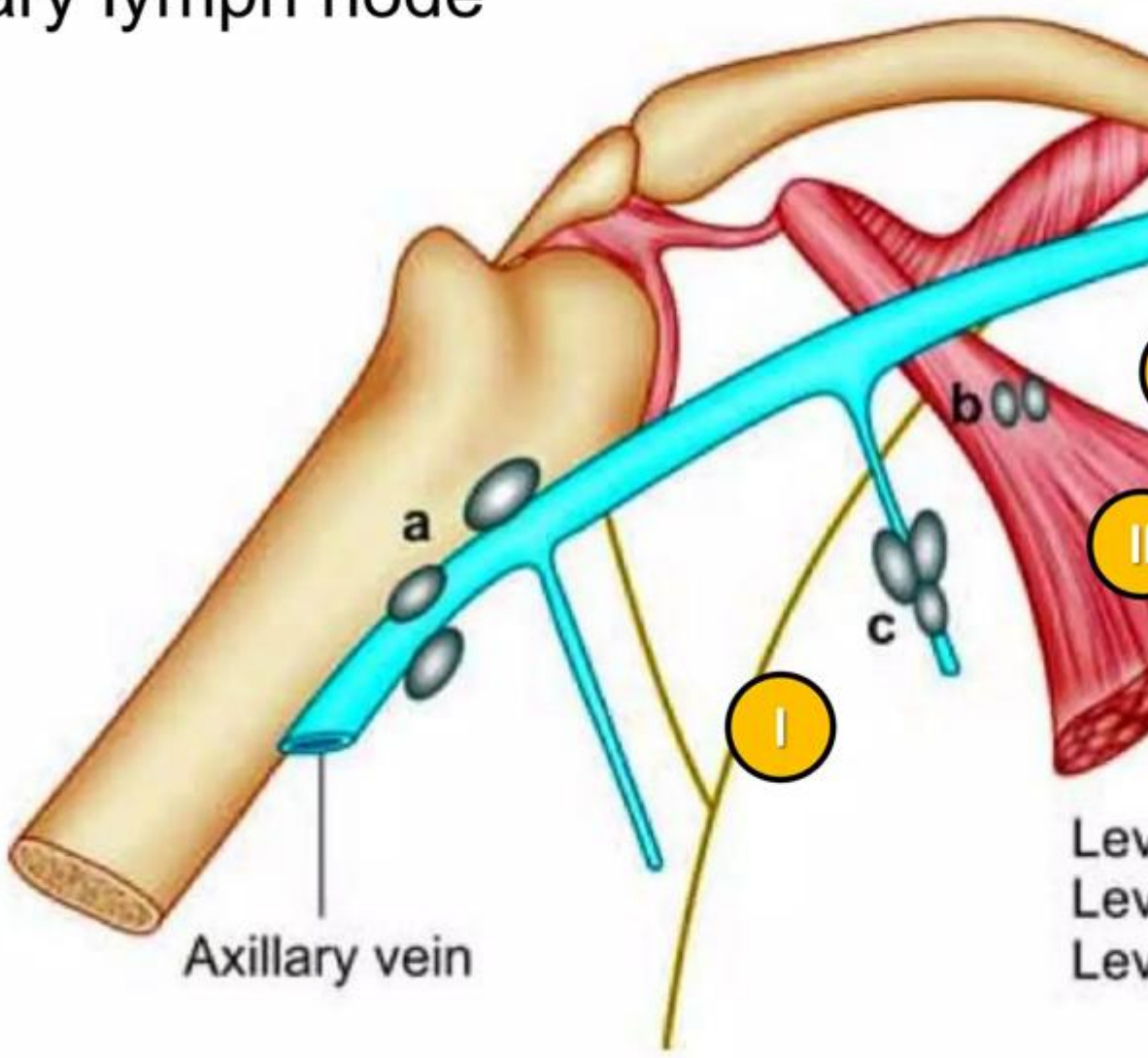
14. Axillary Lymph Node Levels

For breast surgery, axillary lymph nodes are classified by their relationship to pectoralis minor.

LEVEL	LOCATION
Level I	Lateral to the lateral border of pectoralis minor
Level II	Posterior to pectoralis minor
Level III	Medial to the medial border of pectoralis minor

Anatomy

Axillary lymph node



Must know: Pectoralis minor is the key landmark for both the three parts of the axillary artery and the three surgical levels of axillary lymph nodes.

15. Sentinel Lymph Node Biopsy

Definition

The sentinel lymph node is the first lymph node, or group of nodes, receiving lymphatic drainage from a tumour-bearing region.

Principle

- Tumour cells spreading through lymphatics may initially reach the sentinel nodes.
- Sentinel nodes can be identified using radiotracer, blue dye or other validated mapping techniques.
- The identified nodes are removed for pathological examination.
- Findings help determine regional nodal involvement and guide treatment.

Clinical importance

- Less extensive than complete axillary dissection.
- Reduces the risk of lymphoedema and some nerve-related complications.
- A negative sentinel node usually allows complete axillary dissection to be avoided.
- Even some patients with limited positive sentinel nodes do not require completion axillary dissection.
- In carefully selected low-risk patients, sentinel lymph node biopsy itself may be omitted.

NEET PG pearl: Sentinel lymph node biopsy is an important regional staging procedure, but it is not mandatory in every early breast cancer patient.

16. Axillary Lymph Node Dissection

Axillary lymph node dissection (ALND) involves surgical removal of axillary lymph nodes and surrounding lymphatic tissue.

Indications

- Selected cases of node-positive breast carcinoma.
- Specific circumstances requiring regional disease control or further staging.
- Decisions depend on tumour stage, nodal findings, breast surgery, radiotherapy and systemic treatment plans.

Important structures to preserve

STRUCTURE	CONSEQUENCE OF INJURY
Long thoracic nerve	Serratus anterior paralysis ? winged scapula
Thoracodorsal nerve	Latissimus dorsi weakness
Intercostobrachial nerve	Sensory loss or neuropathic pain over upper medial arm
Axillary vein	Significant haemorrhage
Axillary lymphatic vessels	Increased risk of postoperative lymphoedema

Postoperative complications

- Upper-limb lymphoedema.

- Shoulder stiffness.
- Seroma formation.
- Sensory disturbances.
- Nerve injury.
- Wound complications.

Clinical pearl: Routine axillary clearance is no longer required for all patients with breast cancer. Modern management increasingly uses selective surgery based on nodal findings and overall treatment planning.

17. Tuberculous Axillary Lymphadenitis

- Tuberculosis may involve axillary lymph nodes.
- Affected nodes may be enlarged, firm and matted.
- Chronic cases may develop caseation, cold abscesses or draining sinuses.
- May be associated with tuberculosis elsewhere or present as isolated lymphadenitis.

Viva pearl: Matted lymph nodes with a chronic, relatively painless course raise suspicion of tuberculous lymphadenitis, although confirmation requires appropriate investigations.

18. Axillary Lymphadenitis Due to Upper-Limb Infections

- Infections of the hand, forearm or arm may produce reactive enlargement of axillary nodes.
- Commonly involves the humeral (lateral) group.

- Nodes may become painful and tender.
- Acute lymphangitis may sometimes accompany the infection.

Clinical presentation

- Tender enlarged nodes.
- Local warmth.
- Possible fever.
- Associated infection in the draining territory.

19. Systemic Diseases Involving Axillary Nodes

Axillary lymphadenopathy may occur in:

- Lymphoma.
- Leukaemia.
- Viral and other systemic infections.
- Autoimmune or inflammatory disorders.
- Metastatic malignancies.

Clinical significance

- Generalised lymphadenopathy suggests a systemic process.
- Isolated axillary lymphadenopathy requires assessment of the ipsilateral breast, upper limb and thoracic wall, together with relevant clinical history.

- Persistent unexplained or suspicious lymphadenopathy may require imaging or tissue sampling.

20. Differential Diagnosis of Axillary Swelling

CONDITION	TYPICAL CLINICAL FEATURES
Lymphadenopathy	Enlarged lymph nodes; tender or painless
Axillary abscess	Painful, erythematous, warm swelling
Hidradenitis suppurativa	Recurrent nodules, abscesses, tunnels and scarring
Lipoma	Soft, usually mobile swelling
Accessory breast tissue	May enlarge or become tender with hormonal changes
Axillary artery aneurysm	Potentially pulsatile mass
Epidermoid cyst	Localised subcutaneous nodule

21. High-Yield Quick Revision

EXAMINATION POINT	ANSWER

Axillary vein formation	Basilic vein and brachial venae comitantes
Axillary vein begins	Inferior border of teres major
Axillary vein terminates	Lateral border of first rib
Continuation of axillary vein	Subclavian vein
Relation to axillary artery	Anteromedial
Major superficial tributary	Cephalic vein
Cephalic vein passes through	Deltopectoral groove and clavipectoral fascia
Effort thrombosis	Paget–Schroetter syndrome
Number of principal axillary node groups	Five
Breast drains mainly to	Pectoral axillary nodes
Upper limb drains mainly to	Humeral axillary nodes
Posterior thorax drains mainly to	Subscapular axillary nodes
Central nodes drain into	Apical nodes

Apical efferents form	Subclavian lymphatic trunk
Axillary node surgical landmark	Pectoralis minor
First tumour-draining node	Sentinel lymph node
Long thoracic nerve injury	Winged scapula
Post-axillary dissection swelling	Lymphoedema

22. Exam Focus

University long-answer questions

1. Describe the axillary vein under the headings of formation, course, termination, tributaries, relations and applied anatomy.
2. Describe the groups of axillary lymph nodes, their locations and areas of drainage.
3. Explain the clinical importance of axillary lymph nodes in breast carcinoma.
4. Describe axillary lymph node levels and their surgical relevance.

Short-note questions

- Axillary vein and tributaries.
- Paget–Schroetter syndrome.
- Groups of axillary lymph nodes.

- Sentinel lymph node biopsy.
- Axillary lymph node dissection.
- Axillary lymphadenopathy.
- Tuberculous axillary lymphadenitis.
- Postoperative upper-limb lymphoedema.

Viva questions

1. Where does the axillary vein begin? — Inferior border of teres major.
2. Where does it become the subclavian vein? — Lateral border of the first rib.
3. Which major superficial vein drains into the axillary vein? — Cephalic vein.
4. What is Paget–Schroetter syndrome? — Effort-related axillosubclavian vein thrombosis.
5. How many principal groups of axillary lymph nodes are described? — Five.
6. Which axillary nodes mainly drain the upper limb? — Humeral nodes.
7. Which nodes drain the posterior thoracic wall? — Subscapular nodes.
8. Which nodes receive lymph from the central group? — Apical nodes.
9. What is the sentinel lymph node? — The first node or nodes receiving lymph from the tumour-bearing region.
10. Which nerve injury causes winged scapula during axillary dissection? — Long thoracic nerve.

NEET PG / INI-CET Clinical Pearls

- Axillary vein position ? Anteromedial to axillary artery.
- Cephalic vein ? Pierces clavipectoral fascia to drain into axillary vein.

- Effort thrombosis of upper limb ? Paget–Schroetter syndrome.
- Breast carcinoma lymphatic spread ? Commonly involves pectoral axillary nodes.
- Upper-limb infection with axillary lymphadenitis ? Humeral nodes may be involved.
- Matted axillary nodes with chronic course ? Consider tuberculosis.
- Axillary lymph node levels I, II and III ? Defined by pectoralis minor.
- First tumour-draining node ? Sentinel lymph node.
- Winged scapula following axillary surgery ? Long thoracic nerve injury.
- Upper-limb swelling after axillary clearance ? Secondary lymphoedema.