

UPPER LIMB

Vessels of Upper Limb

Vessels of Upper limb

ARTERIAL SUPPLY

VENOUS DRAINAGE

LYMPHATICS

Vessels of Upper Limb

Arterial Supply

1 Subclavian Artery

2 Axilla: Axillary Artery

2.1 Clinical Relevance: Axillary Artery Aneurysm

3 Upper Arm: Brachial Artery

3.1 Clinical Relevance: Occlusion or Laceration of the Brachial Artery

4 Forearm: Radial and Ulnar Arteries

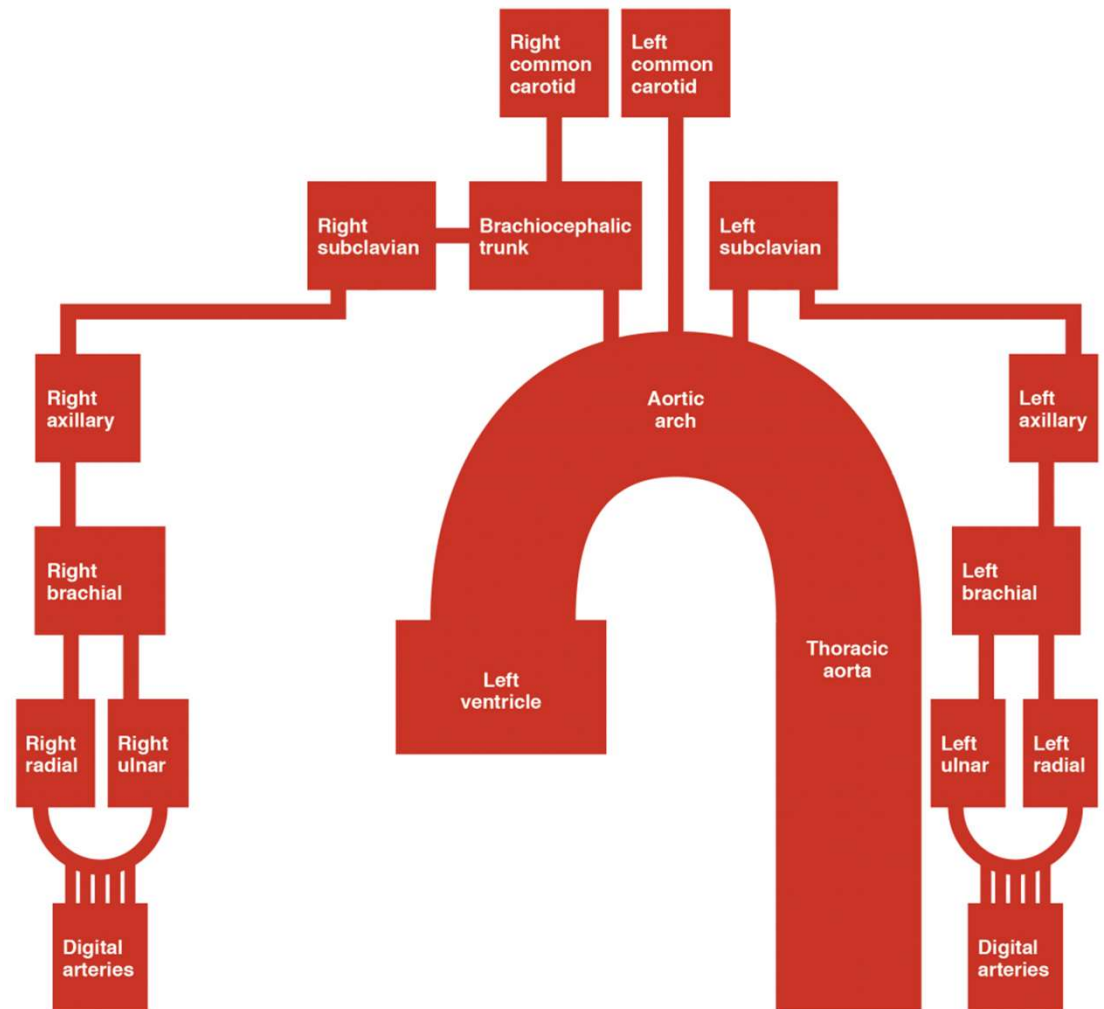
5 Hand: Superficial and Deep Palmar Arches

Vessels of Upper Limb

The **arterial supply to the upper limb** is delivered via five main vessels (proximal to distal):

- Subclavian artery
- Axillary artery
- Brachial artery
- Radial artery
- Ulnar artery

Vessels of Upper Limb



Vessels of Upper limb

Subclavian Artery

The arterial supply to the upper limb begins as the **subclavian artery**. On the right, the subclavian artery arises from the brachiocephalic trunk. On the left, it branches directly from the arch of aorta.

The subclavian artery travels laterally towards the axilla. It can be divided into three parts based on its position relative to the anterior scalene muscle:

First part – origin of the subclavian artery to the medial border of the anterior scalene.

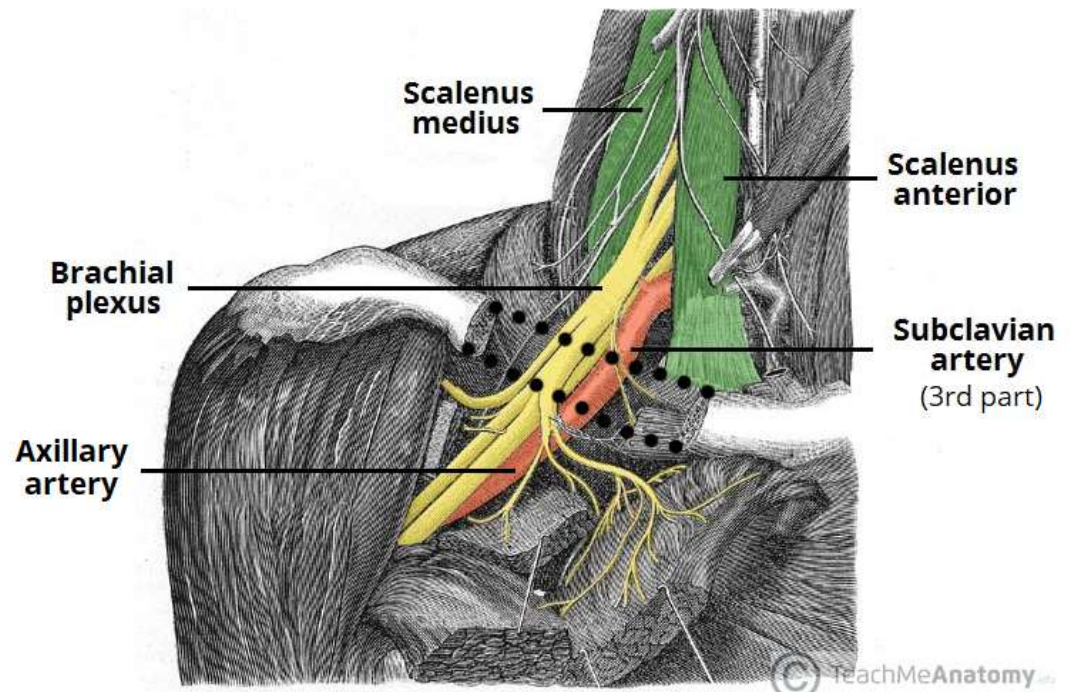
Second part – posterior to the anterior scalene.

Third part – lateral border of anterior scalene to the lateral border of the first rib.

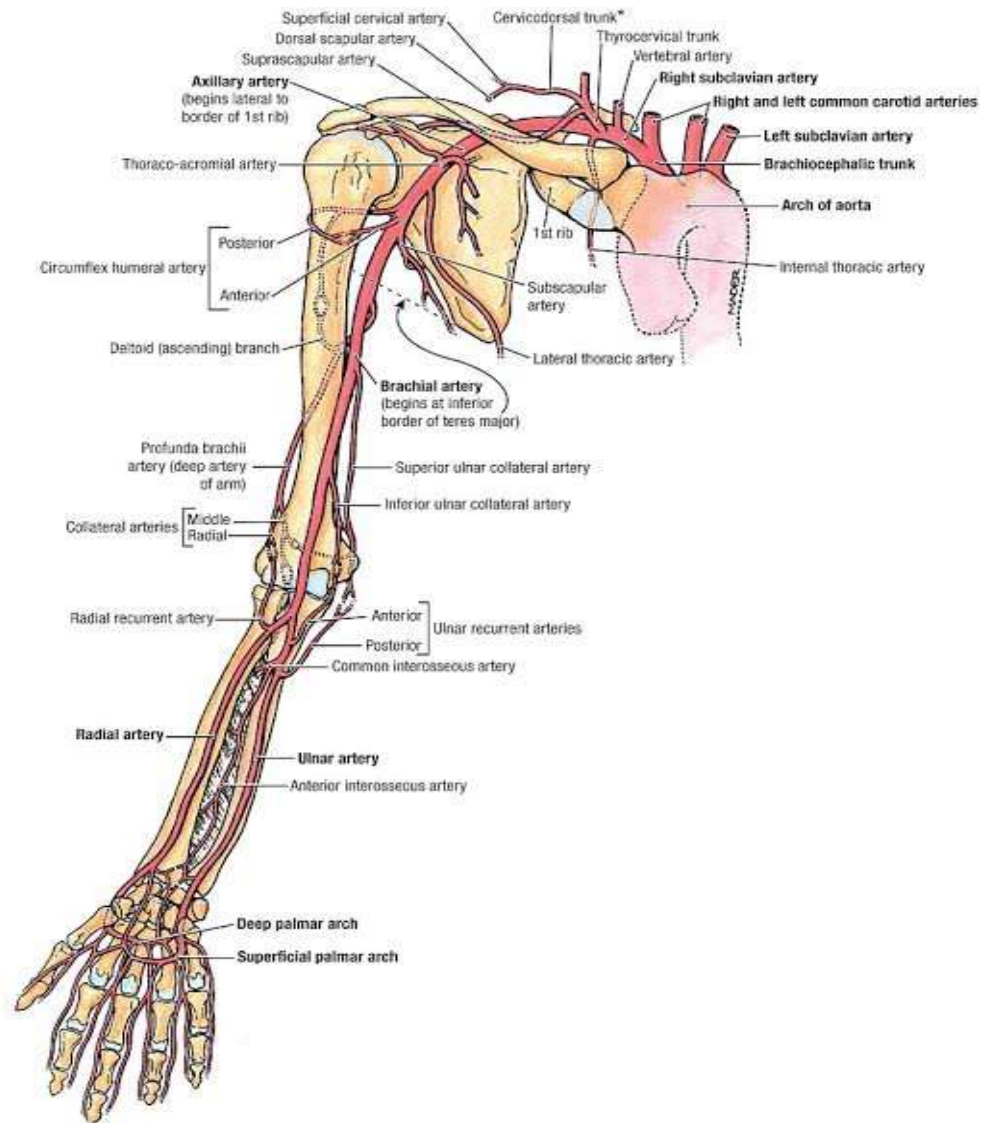
At the lateral border of the first rib, the subclavian artery enters the axilla – and is renamed the **axillary artery**.

Vessels of Upper Limb

Subclavian Artery



Vessels of Upper Limb



Vessels of Upper Limb

Axilla: Axillary Artery

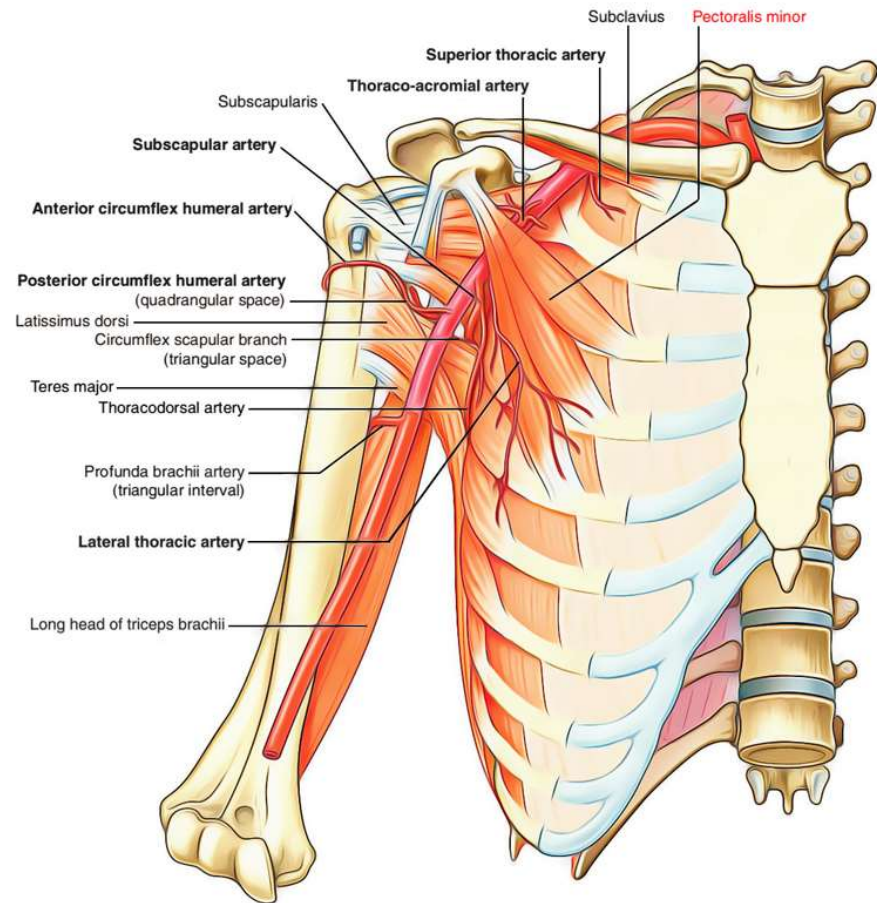
The **axillary artery** lies deep to the pectoralis minor and is enclosed in the axillary sheath (a fibrous layer that covers the artery and the three cords of the brachial plexus).

Importantly, the artery can be divided into three parts based on its position relative to the **pectoralis minor** muscle:

- **First part** – proximal to pectoralis minor
- **Second part** – posterior to pectoralis minor
- **Third part** – distal to pectoralis minor

Vessels of Upper limb

Axillary Artery



Vessels of Upper Limb

Axillary Artery

First Part	Second Part	Third Part
Superior thoracic artery	Thoracoacromial artery Lateral thoracic artery	Subscapular artery Anterior and posterior circumflex arteries

Vessels of Upper limb

Axillary Artery

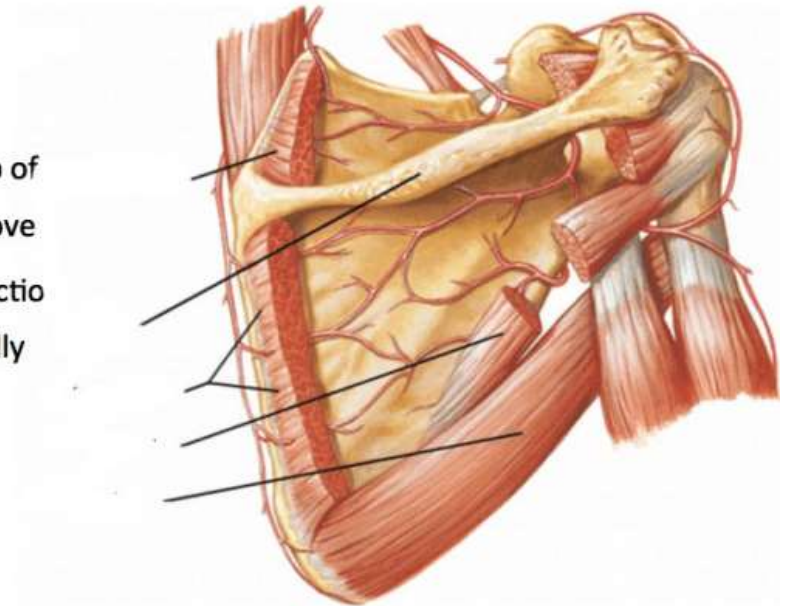
Teres major

Origin:

Insertion: Medial lip of
intertubercular groove

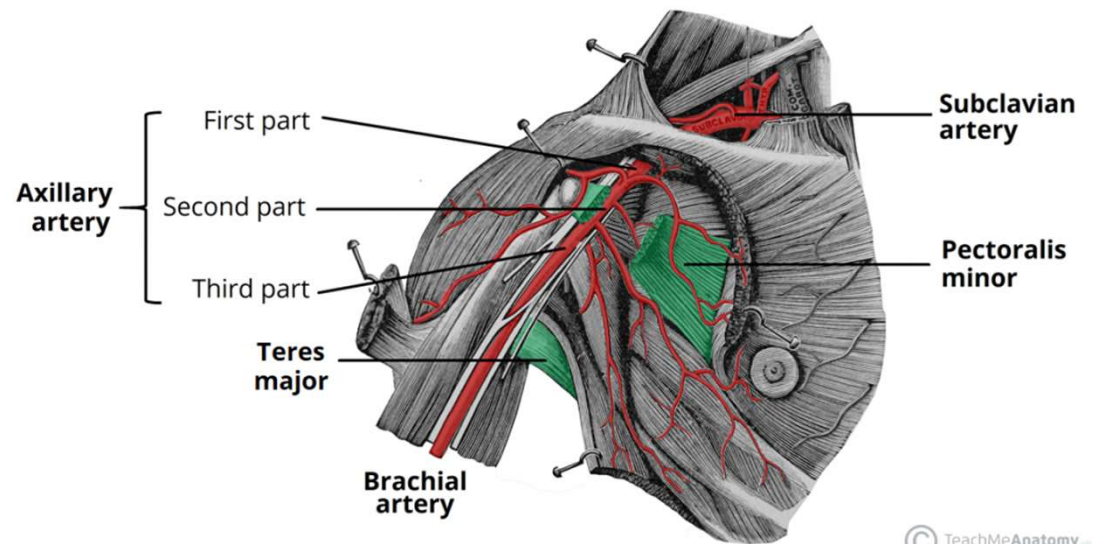
Main actions: Adductio
of the arm & Medially
rotates shoulder

Innervation:



Vessels of Upper Limb

Axillary artery



Vessels of Upper limb

Axillary Artery

Clinical Relevance:

Axillary Artery Aneurysm

- An **axillary artery aneurysm** is a dilation of the vessel to more than twice its original size. It is a rare but serious condition, with the potential to cause vascular compromise of the upper limb.
- The dilated portion of the axillary artery can compress the [brachial plexus](#), producing neurological symptoms such as **paraesthesia** and muscle weakness.
- The definitive treatment of an axillary artery aneurysm is surgical. It involves excising the aneurysm and reconstructing the vessel wall using a **vascular graft**.



Vessels of Upper Limb

Brachial Artery

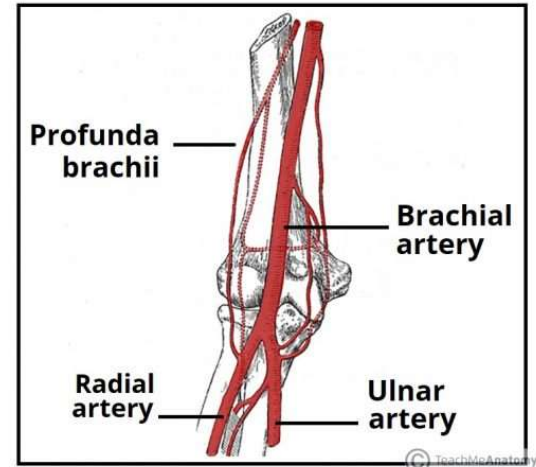
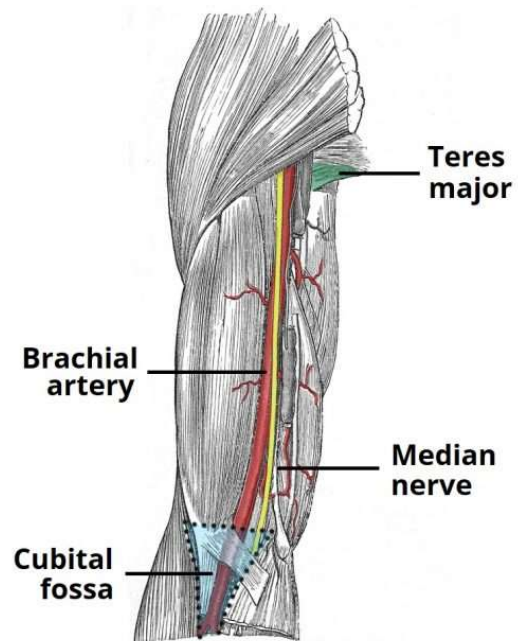
The **brachial artery** is a continuation of the axillary artery past the lower border of the **teres major**. It is the main supply of blood for the arm.

Immediately distal to the teres major, the brachial artery gives rise to the **profunda brachii** (deep artery), which travels with the radial nerve in the radial groove of the humerus and supplies structures in the posterior aspect of the upper arm (e.g. triceps brachii). The profunda brachii terminates by contributing to an anastomotic network around the elbow joint.

The brachial artery proper descends down the arm. As it moves through the **cubital fossa**, underneath the brachialis muscle, the brachial artery **terminates** by bifurcating into the radial and ulnar arteries.

Vessels of Upper limb

Brachial artery



Vessels of Upper Limb

Brachial Artery

Clinical Relevance

The arm has relatively good **anastomotic supply**. This means that it is well protected from ischaemia in cases of temporary or partial occlusion of the brachial artery.

However, if the artery is completely occluded (or severed), the resulting ischaemia can cause **necrosis** of forearm muscles. Muscle fibres are replaced by scar tissue and shorten considerably – this can cause a characteristic flexion deformity, called **Volkman's ischaemic contracture**



Vessels of upper limb

Forearm: Radial and Ulnar Arteries

The **radial** and **ulnar arteries** are formed by the bifurcation of the brachial artery within the cubital fossa:

Radial artery – supplies the posterolateral aspect of the forearm. It contributes to anastomotic networks surrounding the elbow joint and carpal bones.

The radial pulse can be palpated in the distal forearm, immediately lateral to the prominent tendon of the flexor carpi radialis muscle.

Ulnar artery – supplies the anteromedial aspect of the forearm. It contributes to an anastomotic network surrounding the elbow joint.

Also gives rise to the anterior and posterior interosseous arteries, which supply deeper structures in the forearm.

These two arteries **anastomose** in the hand by forming two arches – the superficial palmar arch, and the deep palmar arch.

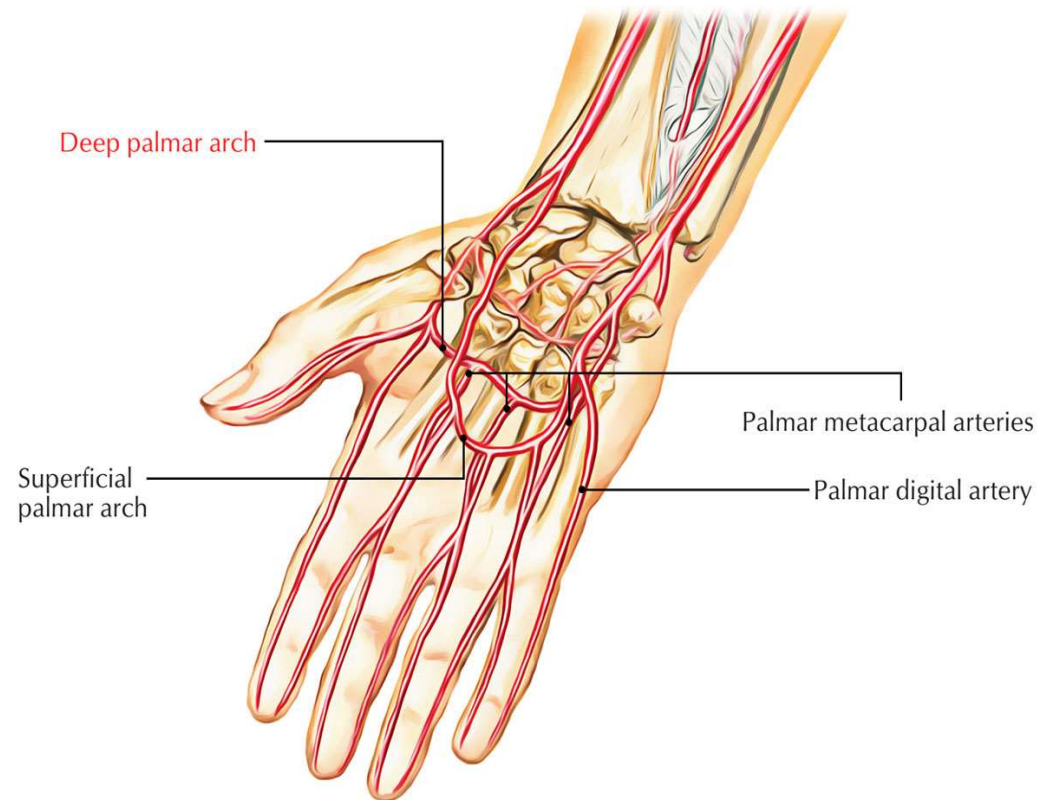
Vessels of Upper limb

Superficial and Deep palmer Arches

- The hand has a **rich arterial supply** with many anastomoses between vessels. This allows the hand to be perfused even when under high resistance to flow (such as when grasping or applying pressure).
- Arterial supply to the hand begins with the ulnar and radial arteries. The **ulnar artery** enters the hand anteriorly to the flexor retinaculum and laterally to the ulnar nerve. It gives rise to the deep palmar branch and continues laterally across the palm as the superficial palmar arch.
- The **radial artery** enters the hand dorsally, crossing the floor of the [anatomical snuffbox](#). It then turns medially and travels between the heads of the adductor pollicis muscle. The radial artery supplies a branch to the thumb, the index finger and to the superficial palmar arch – it then continues as the deep palmar arch.

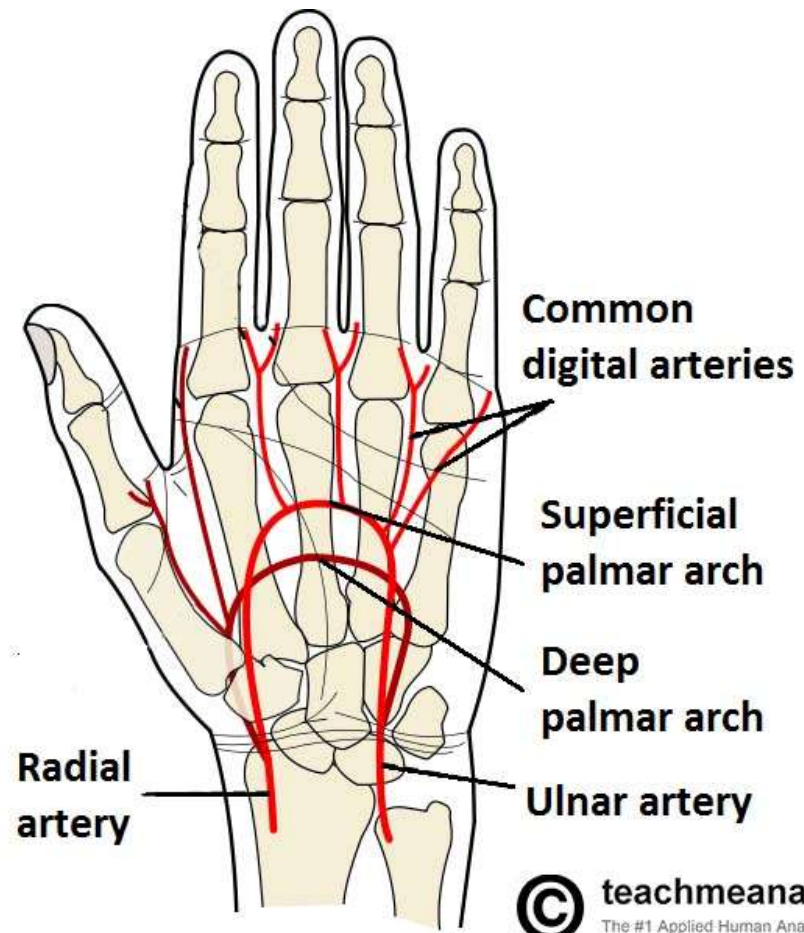
Vessels of Upper Limb

- **Superficial palmar arch** – located anteriorly to the flexor tendons in the hand and deep to the palmar aponeurosis. It gives rise to the digital arteries, which supply the four fingers.
- **Deep palmar arch** – located deep to the flexor tendons of the hand. It contributes to the blood supply to the digits and to the wrist joint



Vessels of Upper limb

Superficial and deep Palmer Arches



Vessels of upper limb

Clinical Relevance

Radial pulsation

Most common site for counting pulses.

Vessels of Upper limb

Venous Drainage

1 Superficial Veins

1.1 Basilic Vein

1.2 Cephalic Vein

2 Deep Veins

3 Clinical Relevance: Venepuncture

Vessels of Upper limb

Venous system of the upper limb

Drains deoxygenated blood from the arm, forearm and hand. It can be subdivided into the

Superficial system

Deep system.

Vessels of Upper limb

Superficial Veins

Basilic Vein

The **basilic vein** originates from the dorsal venous network of the hand and ascends the medial aspect of the upper limb.

At the border of the teres major, the vein moves deep into the arm. Here, it combines with the brachial veins from the deep venous system to form the **axillary vein**.

Vessels of Upper Limb

Superficial Vein

Cephalic Vein

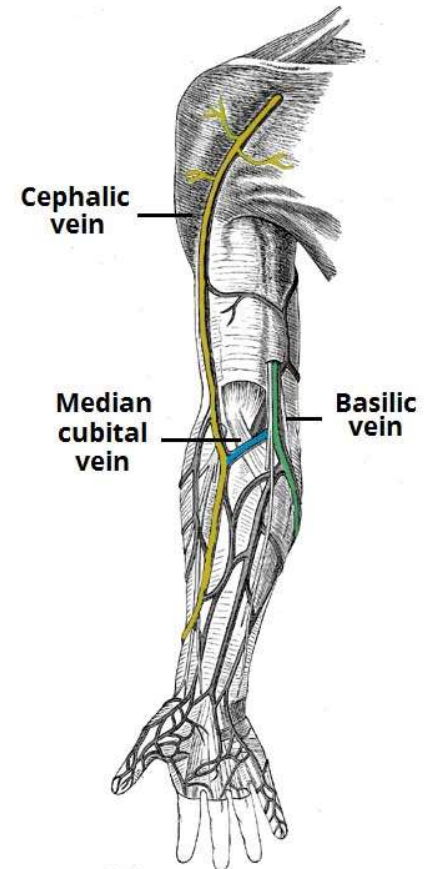
The **cephalic vein** also arises from the dorsal venous network of the hand. It ascends the antero-lateral aspect of the upper limb, passing anteriorly at the elbow.

At the shoulder, the cephalic vein travels between the deltoid and pectoralis major muscles (known as the deltopectoral groove), and enters the [Axilla region](#) via the **Clavipectoral Triangle**. Within the axilla, the cephalic vein empties into axillary vein.

The cephalic and basilic veins are connected at the elbow by the **Median Cubital Vein**.

Vessels of Upper Limb

Superficial Veins



Vessels of Upper limb

Venous Drainage

Deep veins

The **deep venous system** of the upper limb is situated underneath the deep fascia. It is formed by paired veins, which accompany and lie either side of an artery. In the upper extremity, the deep veins share the name of the artery they accompany.

The Brachial veins are the largest in size, and are situated either side of the brachial artery. The pulsations of the brachial artery assist the venous return. Veins that are structured in this way are known as **Vena Comitantes**.

Vessels of Upper limb

Venous Drainage

Clinical Relevance: Venepuncture

Venepuncture is the practice of obtaining intravenous access. This is usually for the purpose of providing intravenous therapy (e.g. fluids, medications) or for obtaining a blood sample.

The **Median Cubital Vein** is a common site of venepuncture. It is a superficial vein that is located anteriorly to the cubital fossa region. It is thought to be fixed in place by perforating veins, which arise from the deep venous system and pierce the bicipital aponeurosis.

Its ease of access, fixed position and superficial position make the median cubital vein a good site for venepuncture in many individuals.

Vessels of Upper Limb

Lymphatic Drainage of Upper Limb

Vessels of upper Limb

Lymphatic System

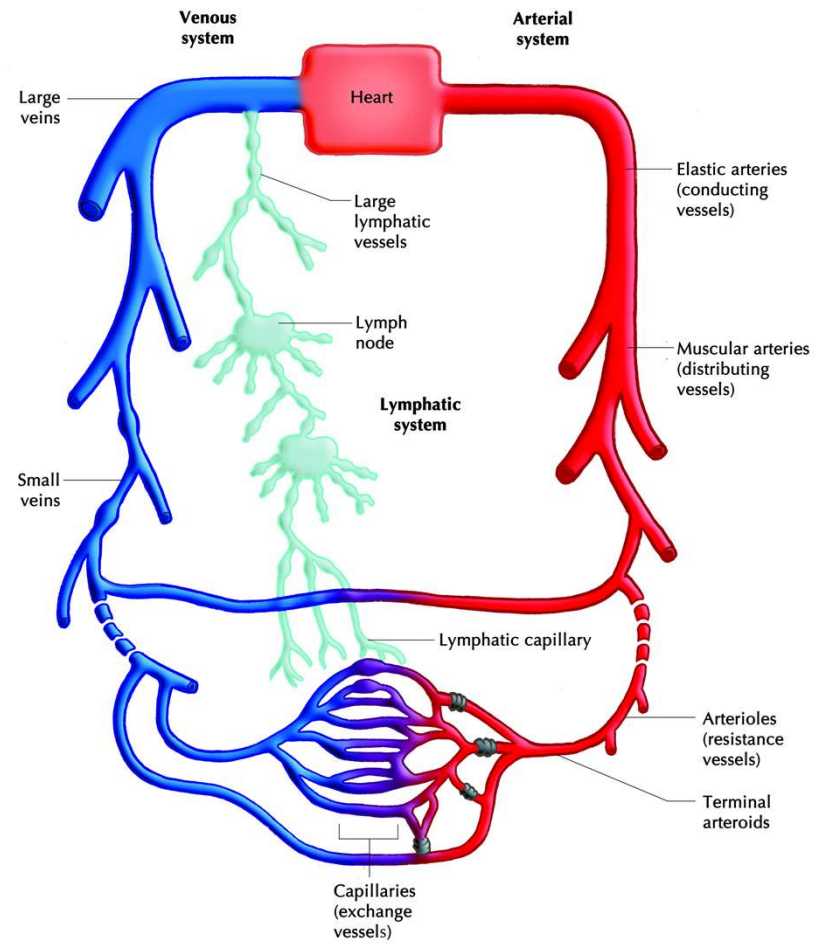
The **lymphatic system** is part of the [vascular system](#) and an important part of the [immune system](#), comprising a large network of [lymphatic vessels](#) that carry a clear fluid called [lymph](#) (from Latin, *lymph*a meaning "[water](#)") directionally towards the [heart](#)

Unlike the circulatory system, the lymphatic system is not a [closed system](#).

The lymphatic system is a series of vessels and nodes that collect and filter excess tissue fluid (lymph), before returning it to the venous circulation. It forms a vital part of the body's immune defence.

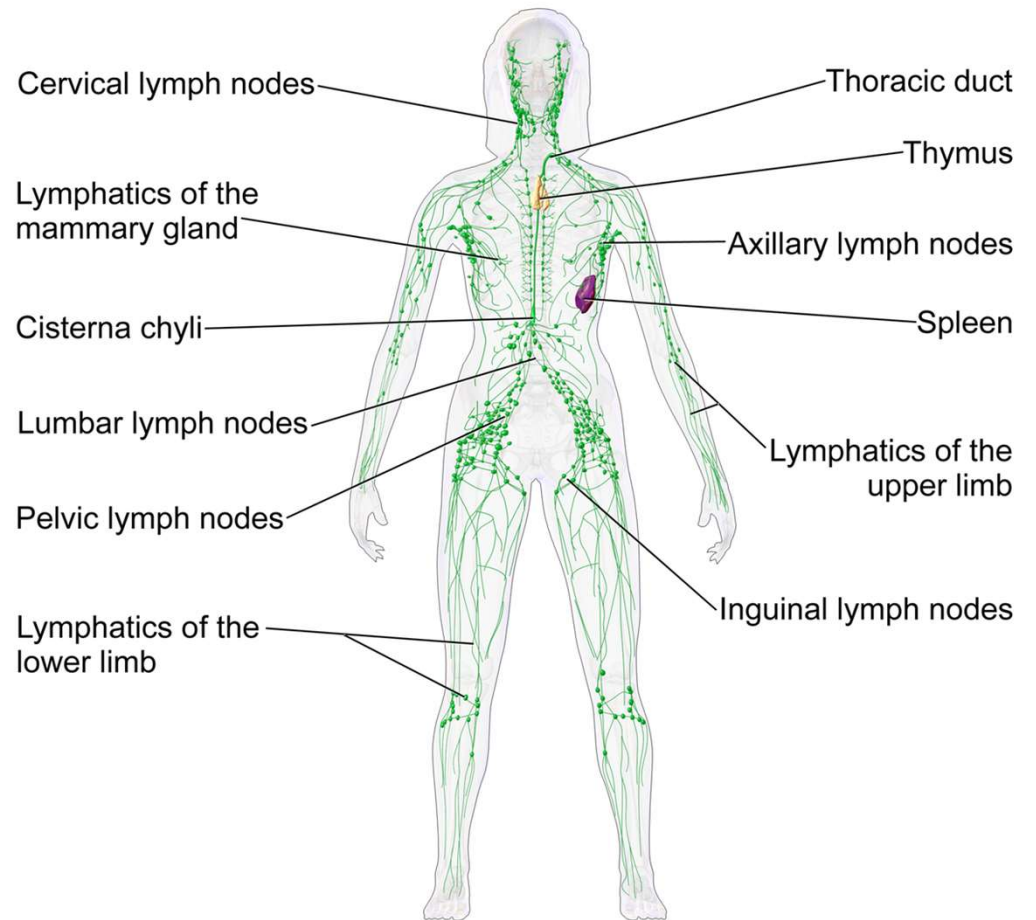
Vessels of upper limb

Lymphatic System



Vessels of the Upper Limb

Lymphatic System



Vessels of the Upper Limb

1 Lymphatic Vessels

1.1 Superficial Lymphatic Vessels

1.2 Deep Lymphatic Vessels

2 Lymph Nodes

3 Clinical Relevance

3.1 Axillary Lymphadenopathy

3.2 Axillary Lymph Node Dissection

Vessels of the Upper Limb

The **lymphatic system**

Drain tissue fluid, plasma proteins and other cellular debris back into the blood stream, and is also involved in immune defence.

Once this collection of substances enters the lymphatic vessels it is known as **lymph**. It is subsequently filtered by lymph nodes, from which it returns to the circulation via venous system.

This article will explore the anatomy of lymphatic drainage throughout the **upper limb** – the lymphatic vessels, lymph nodes, and its clinical correlations.

Vessels of upper Limb

Lymphatic vessels

Superficial Lymphatic Vessels

The vessels shadowing the **basilic vein** go on to enter the cubital lymph nodes. These are found medially to the vein, and proximally to the medial epicondyle of the [humerus](#). Vessels carrying on from these nodes then continue up the arm, terminating in the lateral axillary lymph nodes.

The vessels shadowing the **cephalic vein** generally cross the proximal part of the arm and shoulder to enter the apical axillary lymph nodes, though some exceptions instead enter the more superficial deltopectoral lymph nodes.

Vessels of Upper Limb

Deep Lymphatic Vessels

- The deep lymphatic vessels of the upper limb follow the [major deep veins](#) (i.e. radial, ulnar and brachial veins), terminating in the **humeral axillary lymph nodes**. They function to drain lymph from joint capsules, periosteum, tendons and muscles. Some additional lymph nodes may be found along the ascending path of the deep vessels.

Vessels of the Upper Limb

Lymph Nodes of Axilla

Pectoral (anterior) – 3-5 nodes, located in the medial wall of the [axilla](#). They receive lymph primarily from the anterior thoracic wall, including most of the [breast](#).

Subscapular (posterior) – 6-7 nodes, located along the posterior axillary fold and subscapular blood vessels. They receive lymph from the posterior thoracic wall and scapular region.

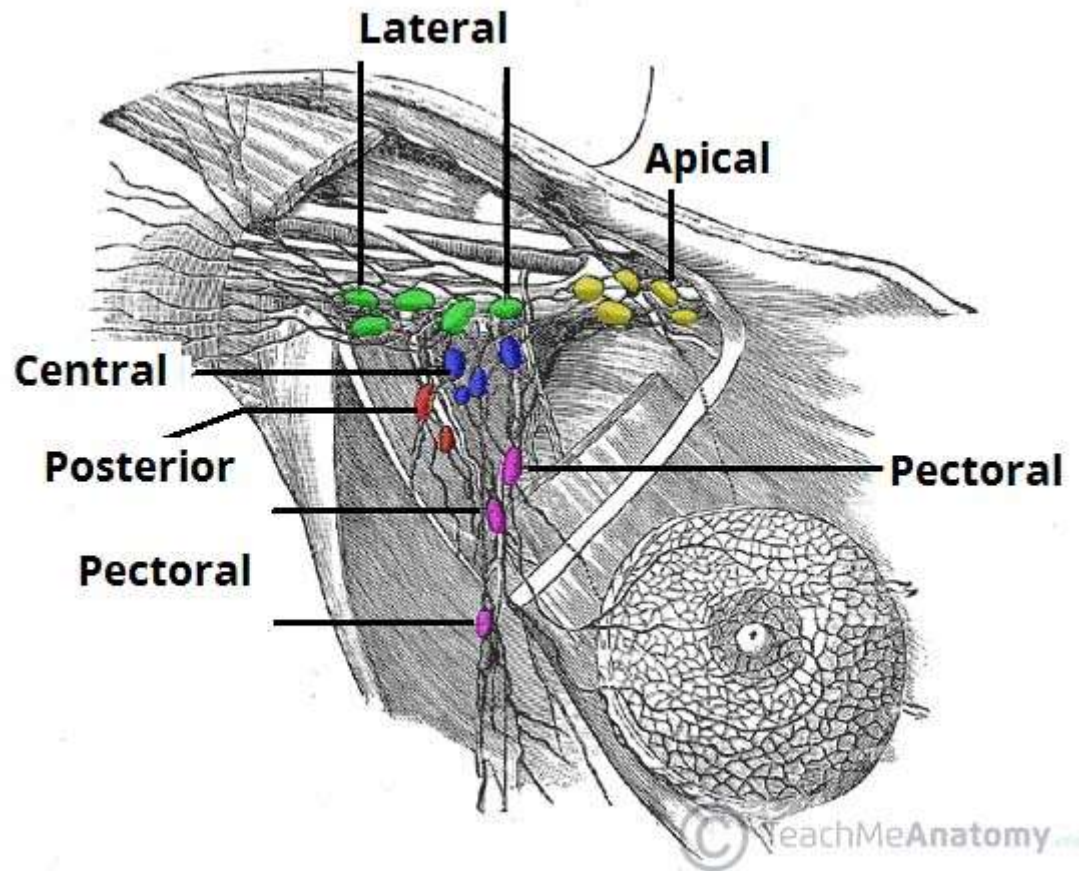
Humeral (lateral) – 4-6 nodes, located in the lateral wall of the axilla, posterior to the axillary vein. They receive the majority of lymph drained from the upper limb.

Central – 3-4 large nodes, located near the base of the axilla (deep to pectoralis minor, close to the 2nd part of the axillary artery). They receive lymph via efferent vessels from the pectoral, subscapular and humeral axillary lymph node groups.

Apical – Located in the apex of the axilla, close to the axillary vein and 1st part of the axillary artery. They receive lymph from efferent vessels of the central axillary lymph nodes, therefore from all axillary lymph node groups. The apical axillary nodes also receive lymph from those lymphatic vessels accompanying the cephalic vein.

Vessels of upper Limb

Lymphatic system
Axillary Lymph node



Vessels of Upper Limb

Lymphatic

Clinical Relevance

Axillary Lymphadenopathy

Axillary lymphadenopathy refers to enlargement of the axillary lymph nodes. Common causes include:

Infection of the upper limb, resulting in **lymphangitis** (inflammation of lymphatic vessels, with tender, enlarged lymph nodes).

The humeral group of lymph nodes is usually affected first, and red, warm and tender streaks are visible in the skin of the upper limb.

Infections of the pectoral region and breast.

Metastasis of breast cancers

A 56-year-old man comes to the emergency department due to persistent left wrist pain. While walking his dog 5 hours ago, he fell forward to the ground and landed on his outstretched hand. Examination shows mild swelling over the dorsum of the left hand with preserved range of motion. There is point tenderness over the dorsolateral aspect of the hand between the tendons of the extensor pollicis longus and extensor pollicis brevis. An x-ray of his left wrist is shown in the image below

