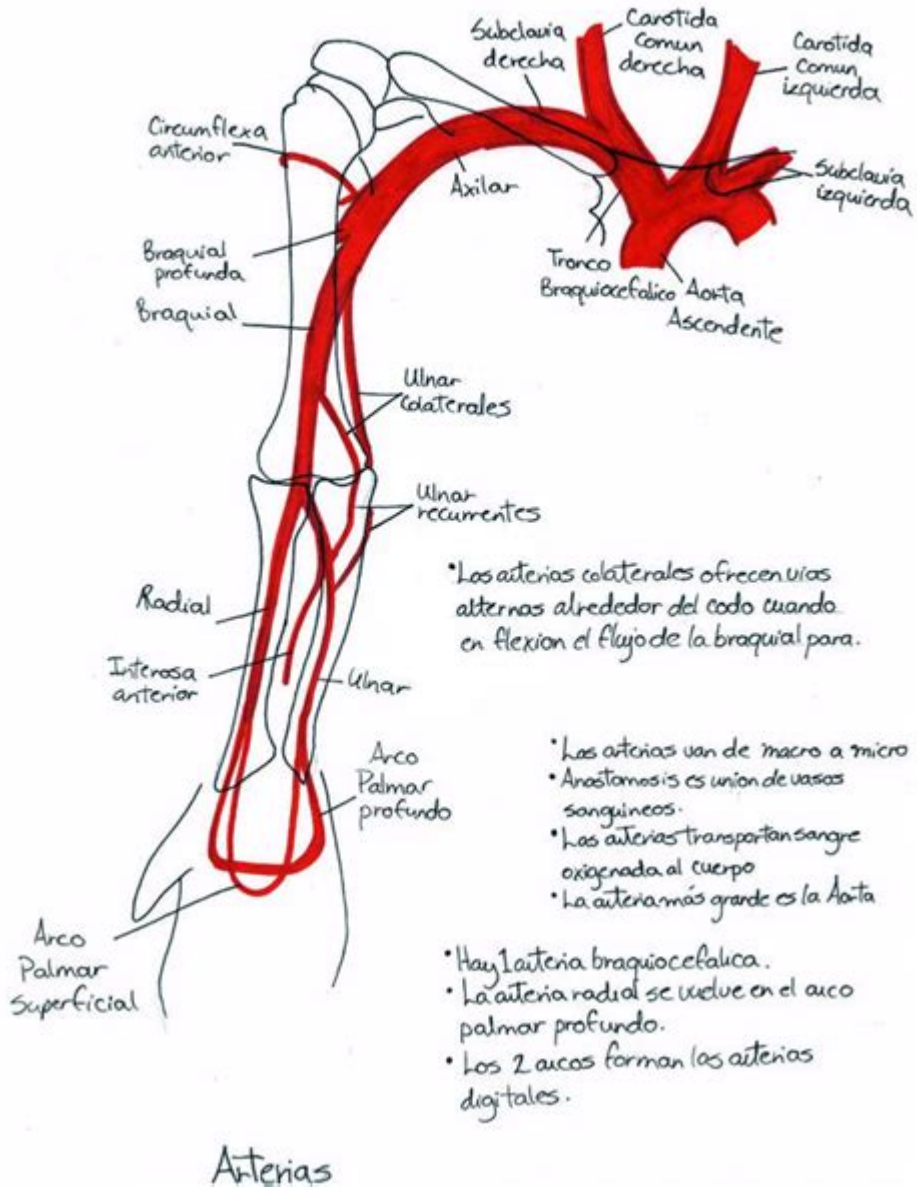
Arterial Anatomy Upper Extremity



Arterial anatomy upper extremity is a critical aspect of human physiology that ensures the proper supply of oxygenated blood to the arms and hands. Understanding this intricate network of arteries is essential for healthcare professionals, especially those involved in surgery, diagnostics, and rehabilitation. The arterial system of the upper extremity is not only vital for maintaining arm function but also plays a significant role in systemic circulation. In this article, we will explore the major arteries, their branches, and clinical significance, providing a comprehensive overview of the arterial anatomy in the upper limb.

Overview of Upper Extremity Arterial Supply

The arterial supply of the upper extremity is primarily derived from the subclavian artery, which branches off the aorta. The subclavian artery travels laterally and posteriorly, becoming the axillary artery as it passes the first rib. This artery then continues into the arm as the brachial artery, which is responsible for supplying

blood to the forearm and hand through its numerous branches.

Major Arteries of the Upper Extremity

1. Subclavian Artery
- Origin: Branches from the aortic arch on the left side and from the brachiocephalic trunk on the right.
- Course: Runs laterally beneath the clavicle.
- Branches:
- Vertebral artery
- Internal thoracic artery
- Thyrocervical trunk
- Costocervical trunk

2. Axillary Artery
- Origin: Continuation of the subclavian artery after it passes the first rib.
- Course: Extends from the lateral border of the first rib to the inferior border of the teres major muscle.
- Branches:
- Superior thoracic artery
- Thoracoacromial artery
- Lateral thoracic artery
- Subscapular artery (gives rise to the circumflex scapular and thoracodorsal arteries)
- Anterior and posterior circumflex humeral arteries

3. Brachial Artery
- Origin: Continuation of the axillary artery at the inferior border of the teres major.
- Course: Descends along the medial aspect of the arm.
- Branches:
- Deep brachial artery (profunda brachii)
- Nutrient artery to the humerus
- Radial and ulnar arteries (at the level of the elbow)

4. Radial Artery
- Origin: One of the terminal branches of the brachial artery.
- Course: Runs along the lateral aspect of the forearm, crossing the wrist to the hand.
- Branches:
- Radial recurrent artery
- Palmar carpal branch
- Superficial palmar branch
- Dorsal carpal branch

5. Ulnar Artery
- Origin: The second terminal branch of the brachial artery.
- Course: Travels along the medial side of the forearm, entering the hand.
- Branches:
- Ulnar recurrent artery
- Common interosseous artery (which further branches into anterior and posterior interosseous arteries)
- Palmar carpal branch
- Superficial palmar arch

Branches and Anastomoses

The arterial system of the upper extremity is characterized by several important branches and anastomoses that ensure adequate blood supply despite variations in blood flow or potential blockages.

Anastomoses in the Upper Extremity

- Shoulder Region:
- The anterior and posterior circumflex humeral arteries form an anastomosis around the surgical neck of the humerus, providing collateral circulation.

- Elbow Region:
- The radial and ulnar arteries form anastomoses with branches of the brachial artery, such as the brachial profunda and ulnar recurrent arteries, ensuring blood supply during flexion or extension of the elbow.

- Wrist Region:
- The superficial and deep palmar arches are formed by the terminal branches of the radial and ulnar arteries, providing a rich vascular network for the hand.

Clinical Significance

Understanding the arterial anatomy of the upper extremity has significant implications in clinical practice, particularly in diagnosing and managing vascular disorders, performing surgical procedures, and understanding trauma-related injuries.

Common Conditions Related to Upper Extremity Arteries

1. Peripheral Arterial Disease (PAD)
- Caused by atherosclerosis leading to reduced blood flow in the arteries of the upper extremity.
- Symptoms may include pain, fatigue, and weakness in the arms.

2. Thoracic Outlet Syndrome (TOS)
- Compression of the subclavian artery and brachial plexus can lead to pain, numbness, and weakness in the arm.
- Can be caused by anatomical anomalies or trauma.

3. Aneurysms
- Can occur in the axillary or brachial arteries, potentially leading to complications if ruptured.
- Symptoms may include a pulsating mass and pain.

4. Traumatic Injuries
- Fractures or dislocations in the shoulder or elbow regions can damage the axillary or brachial arteries.
- Immediate recognition and management are crucial to prevent ischemia.

Diagnostic Techniques

Diagnosing arterial conditions in the upper extremity typically involves a combination of clinical examination and imaging techniques:

- Ultrasound: A non-invasive method to visualize blood flow and detect blockages or abnormalities.
- Angiography: Imaging technique that uses contrast dye to visualize the arterial system.
- MRI and CT Scans: Useful for assessing soft tissue and vascular structures around the arteries.

Surgical Interventions

The knowledge of arterial anatomy is crucial during surgical procedures, such as:

- Bypass Surgery: For cases of severe PAD, bypass grafts may be created using veins or synthetic materials.
- Decompression Procedures: In TOS, surgical decompression may involve removing anatomical structures compressing the arteries.
- Vascular Repairs: In trauma cases, knowledge of the location and branches of arteries helps in performing successful repairs.

Conclusion

In summary, the arterial anatomy of the upper extremity plays a vital role in maintaining the health and functionality of the arms and hands. A thorough understanding of the major arteries, their branches, anastomoses, and clinical implications is essential for healthcare providers. This knowledge not only aids in diagnosing and treating vascular conditions but also enhances surgical outcomes, ultimately improving patient care. As research continues to evolve in this field, an even greater understanding of the complexities of upper extremity arterial anatomy will undoubtedly benefit both practitioners and patients alike.

Frequently Asked Questions

What are the major arteries of the upper extremity?

The major arteries of the upper extremity include the subclavian artery, axillary artery, brachial artery, radial artery, and ulnar artery.

How does the brachial artery bifurcate in the arm?

The brachial artery bifurcates at the cubital fossa into the radial and ulnar arteries, which supply blood to the forearm and hand.

What is the significance of the collateral circulation in the upper extremity?

Collateral circulation in the upper extremity is significant as it provides alternative pathways for blood flow, which can protect against ischemia in case of vascular occlusion.

What clinical conditions are commonly associated with arterial anatomy of the upper extremity?

Common clinical conditions include peripheral artery disease, thoracic outlet syndrome, and conditions leading to ischemic limb pain.

How can variations in upper extremity arterial anatomy affect surgical procedures?

Variations in upper extremity arterial anatomy can lead to unexpected complications during surgical procedures, making preoperative imaging and understanding of individual anatomy crucial.

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MAP: Mean Arterial Pressure（平均动脉压）- 血压的平均值，通过收缩压和舒张压的比例计算得出。 ABP: Arterial Blood Pressure（动脉血压）- 表示在动脉中测量的血压。 BPV: Blood Pressure Variability（血压变异性）- 血压数值在一段时间内的变化程度。

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