

THE ARM

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Arm

The arm is the part of the upper limb between shoulder and elbow. The bone of the arm—the humerus articulates above with scapula to form shoulder joint and below with radius and ulna to form elbow joint. The humerus is almost entirely covered by muscles. The primary neurovascular bundle of the arm is located on the medial side of the arm, hence protected by the limb, which it serves. It consists of brachial artery, the basilic vein, and median, ulnar, and radial nerves.

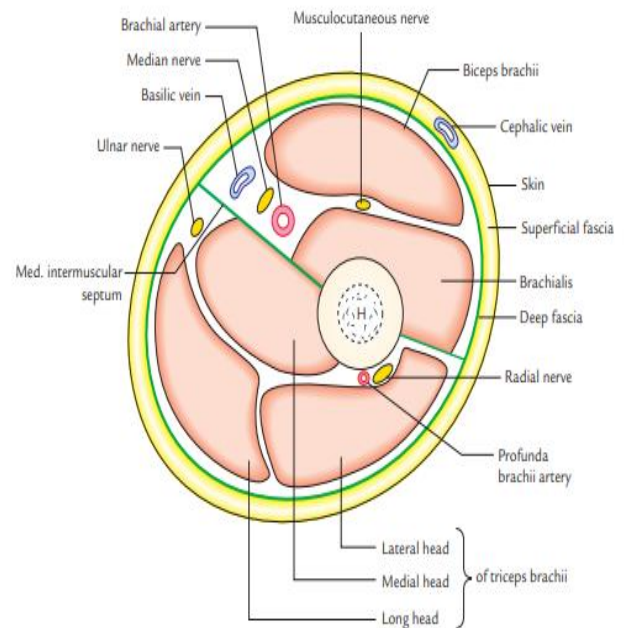
COMPARTMENTS OF THE ARM

The deep fascia encloses the arm like a sleeve. The two fascial septa, one on the medial side and one on the lateral side extend inwards from the fascial sleeve and get attached to the medial and lateral supracondylar ridges of the humerus, respectively. These septa and fascial sleeve divide the arm into anterior and posterior compartments. Each compartment has its own muscles, nerves, and artery.

Some structures, however, pierce the intermuscular septum to shift from one compartment to the other.

- Ulnar nerve and superior ulnar collateral artery pierce the medial intermuscular septum to enter the posterior compartment.

- Radial nerve and radial collateral artery pierce the lateral intermuscular septum to enter the anterior compartment.

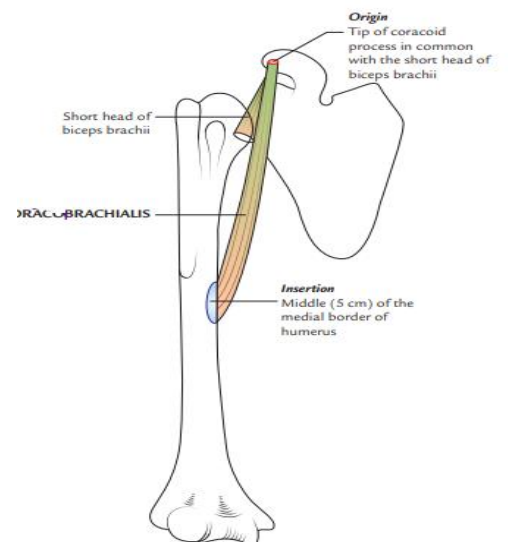
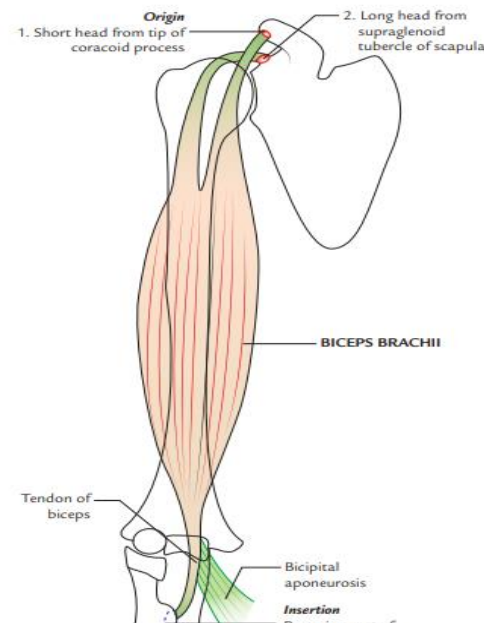


CONTENTS OF THE ANTERIOR COMPARTMENT OF THE ARM

- Muscles: Biceps brachii, coracobrachialis, and brachialis.
- Nerve: Musculocutaneous nerve.
- Artery: Brachial artery.
- In addition to the above structures, the following large nerves also pass through the anterior compartment of arm:
 - ✓ Median nerve.
 - ✓ Ulnar nerve.
 - ✓ Radial nerve.

Muscle	Origin	Insertion	Nerve supply	Actions
Biceps brachii	<ul style="list-style-type: none"> • <i>Short head</i> from tip of the coracoid process of the scapula • <i>Long head</i> from supraglenoid tubercle of the scapula 	Posterior rough part of the radial tuberosity	Musculocutaneous nerve	<ul style="list-style-type: none"> • Supination of the forearm when elbow is flexed • Flexion of the forearm when elbow is extended
Coracobrachialis	Tip of coracoid process of the scapula along with short head of biceps	Middle one-third of medial border of the humerus	Musculocutaneous nerve	Helps in flexion and adduction of the arm
Brachialis	Lower half of the anterior surface of the humerus	On the anterior surface of coronoid process of the ulna including ulnar tuberosity	<ul style="list-style-type: none"> • Musculocutaneous nerve (mainly) • Radial nerve 	Flexion of the forearm in all positions

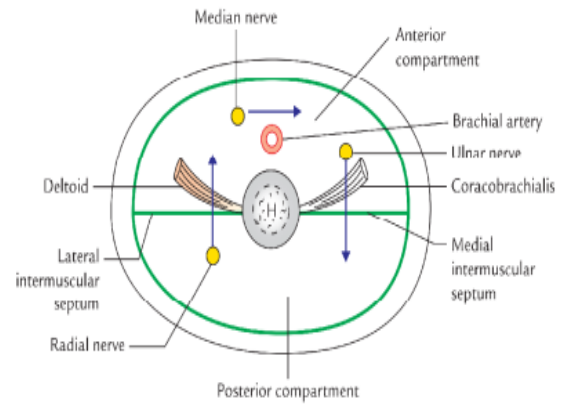
- The biceps brachii muscle arises from scapula by two heads: long and short:
 1. Long head arises from supraglenoid tubercle within the capsule of shoulder joint. Its tendon runs above the head of humerus and emerges from the joint through intertubercular sulcus.
 2. Short head arises along with coracobrachialis from the tip of the coracoid process.
- The two heads join in the distal third of the arm to form a belly that ends in a tendon, which gives off the bicipital aponeurosis from its medial aspect.
- The bicipital aponeurosis protects the underlying brachial artery and median nerve.
- It is a strong supinator of the forearm when elbow is flexed. This action is used in screwing movements such as tightening the screw with screwdriver.
- It is a powerful flexor of the forearm when elbow is extended.
- It is also a weak flexor of the shoulder joint.
- **Coracobrachialis** is a weak flexor and adductor of the arm.



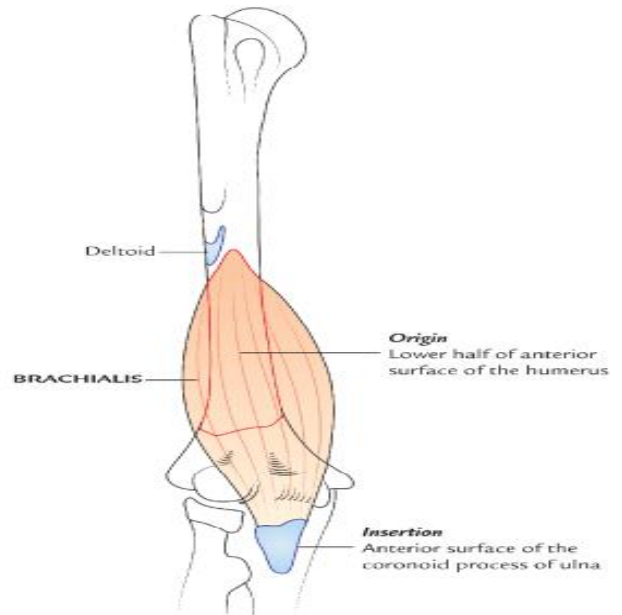
Important Anatomical events occurring at insertion of coracobrachialis.

1. Below the level of insertion circular shaft of humerus become triangular.
2. Brachial artery passes from medial to anterior aspect of the arm.
3. Basilic vein pierces the deep fascia.

4. Median nerve crosses over the brachial artery at this point from lateral to medial side.
5. Radial nerve pierces the lateral intermuscular septum to pass from posterior compartment to anterior.
6. The ulnar nerve pierces the medial intermuscular septum to pass to posterior compartment.
7. Medial cutaneous nerve of the arm and forearm pierce the deep fascia.
8. Nutrient artery pierces the humerus shaft.



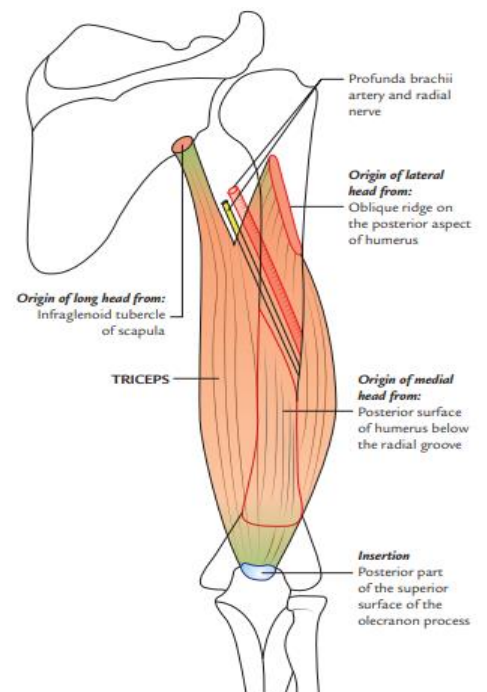
- Brachialis is untiring strong flexor of elbow joint hence it is called “workhorse of the elbow joint.”
- Innervation of the brachialis muscle is predominantly by the musculocutaneous nerve. A small component of the lateral part is innervated by the radial nerve.



Posterior compartment

The content of the posterior compartment

- Muscles: The only muscle of the posterior compartment of the arm is the triceps brachii muscle.
 - Nerve: radial artery
 - Artery: profunda brachii artery.
- The long head originates from the infraglenoid tubercle of the scapula.
 - The medial head originates from the posterior surface of the shaft of the humerus.
 - The lateral head originates from a linear roughening superior to the radial groove of the humerus.
- The three heads converge to form a large tendon, which inserts on the superior surface of the olecranon of the ulna.
 - The triceps brachii muscle extends the forearm at the elbow joint.



- Innervation of the triceps brachii is by branches of the radial nerve.

Arteries and veins

Brachial artery

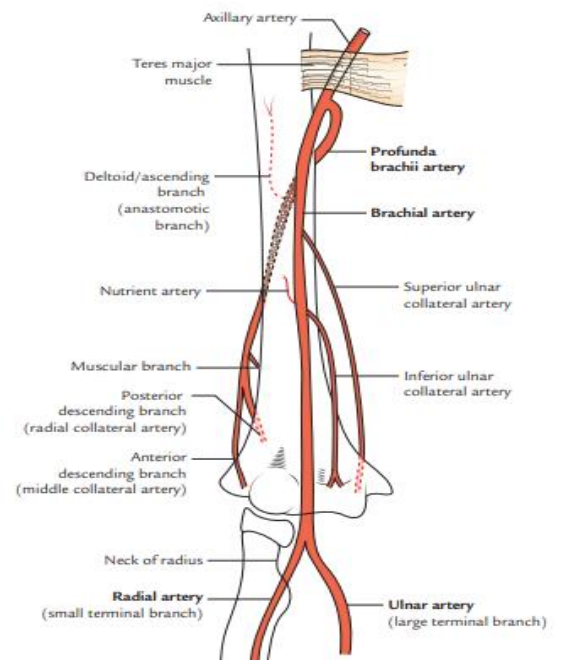
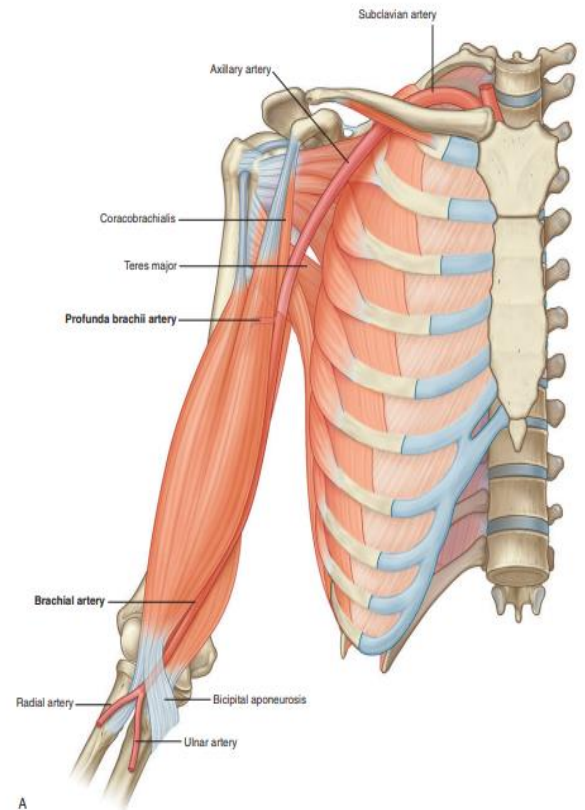
The major artery of the arm, the brachial artery, is found in the anterior compartment. Beginning as a continuation of the axillary artery at the lower border of the teres major muscle, it terminates just distal to the elbow joint where it divides into the radial and ulnar arteries.

In the proximal arm, the brachial artery lies on the medial side. In the distal arm, it moves laterally to assume a position midway between the lateral epicondyle and the medial epicondyle of the humerus. It crosses anteriorly to the elbow joint where it lies immediately medial to the tendon of the biceps brachii muscle.

The brachial artery is palpable along its length. In proximal regions, the brachial artery can be compressed against the medial side of the humerus.

Branches

1. Muscular branches to the muscles of the anterior compartment of the arm.
2. Profunda brachii artery (largest and first branch). It arises from the posteromedial aspect of the brachial artery just below the lower border of the teres major. It accompanies the radial nerve with which it immediately leaves the lower triangular intermuscular space to enter the spiral groove on the posterior surface of the humerus.
3. Nutrient artery to humerus enters the nutrient foramen of humerus located near the insertion of coracobrachialis.
4. Superior ulnar collateral artery arises near the middle of the arm and accompanies the ulnar nerve.



5. Inferior ulnar collateral (or supratrochlear artery) arises near the lower end of humerus and divides into the anterior and posterior branches, which take part in the formation of arterial anastomosis around the elbow.
6. Radial and ulnar arteries (terminal branches).

Profunda brachii artery

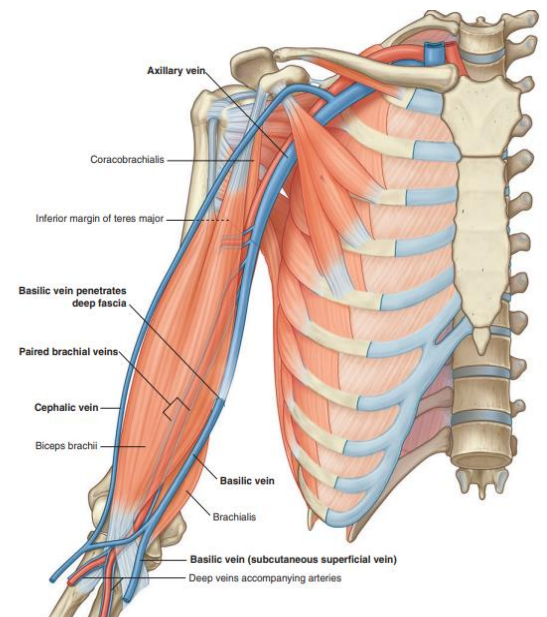
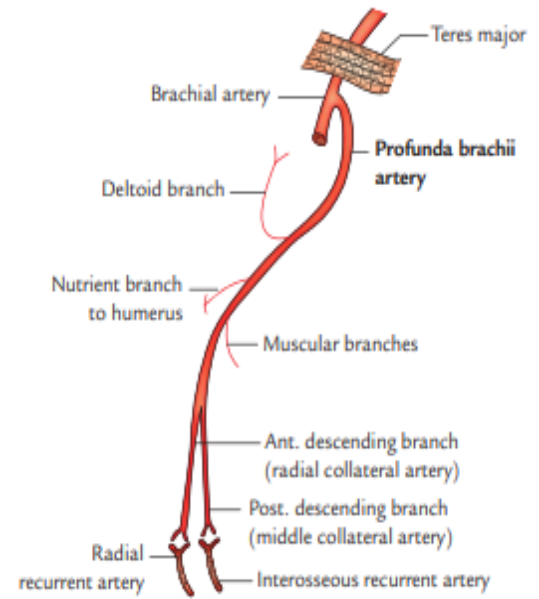
The profunda brachii artery, the largest branch of the brachial artery, passes into and supplies the posterior compartment of the arm. It enters the posterior compartment with the radial nerve and together they pass through the triangular interval, which is formed by the shaft of the humerus, the inferior margin of the teres major muscle, and the lateral margin of the long head of the triceps muscle. They then pass along the radial groove on the posterior surface of the humerus deep to the lateral head of the triceps brachii muscle.

Branches

1. Deltoid (ascending) branch: It ascends between long and lateral heads of triceps and anastomoses with the descending branch of the posterior circumflex humeral artery.
2. Nutrient artery to humerus: It enters the shaft of humerus in the radial groove, just behind the deltoid tuberosity.
3. Anterior descending (radial collateral) artery: It is the smaller terminal branch, which accompanies the radial nerve and anastomoses with the radial recurrent artery in front of the lateral epicondyle of the humerus.
4. Posterior descending (middle collateral) artery: It is the larger terminal branch of the profunda brachii artery, which descends behind the shaft of humerus and anastomoses with the interosseous recurrent artery behind the lateral epicondyle of the humerus.

Veins

Paired brachial veins pass along the medial and lateral sides of the brachial artery, receiving tributaries that accompany branches of the artery. In addition to these deep veins, two large



subcutaneous veins, the basilic vein and the cephalic vein, are in the arm.

The basilic vein passes vertically in the distal half of the arm, penetrates deep fascia to assume a position medial to the brachial artery, and then becomes the axillary vein at the lower border of the teres major muscle. The brachial veins join the basilic, or axillary, vein. The cephalic vein passes superiorly on the anterolateral aspect of the arm and through the anterior wall of the axilla to reach the axillary vein.

Nerves

Musculocutaneous nerve

The musculocutaneous nerve leaves the axilla and enters the arm by passing through the coracobrachialis muscle. It passes diagonally down the arm in the plane between the biceps brachii and brachialis muscles. After giving rise to motor branches in the arm, it emerges laterally to the tendon of the biceps brachii muscle at the elbow, penetrates deep fascia, and continues as the lateral cutaneous nerve of the forearm.

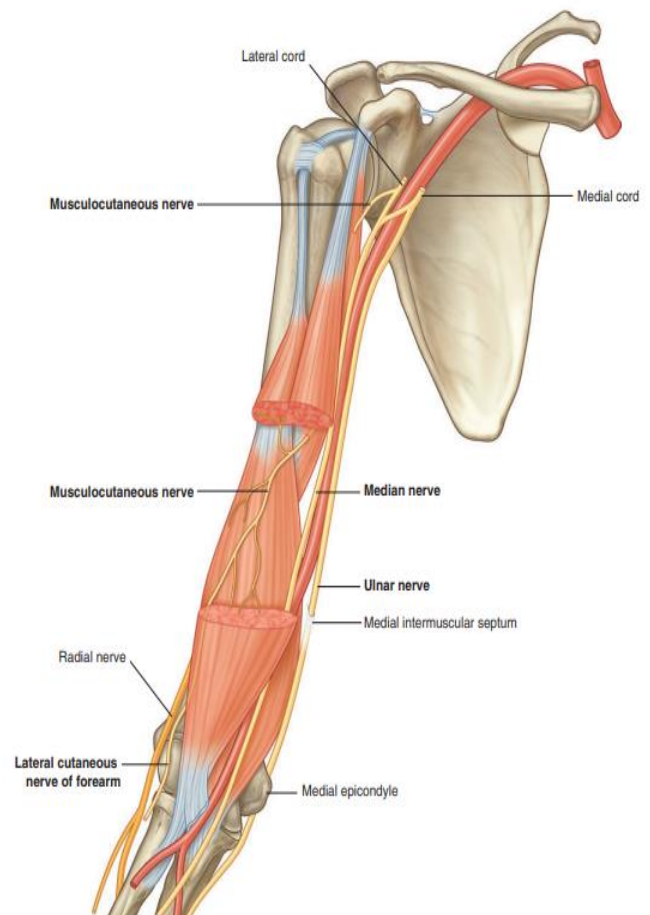
The musculocutaneous nerve provides:

- motor innervation to all muscles in the anterior compartment of the arm, and
- sensory innervation to skin on the lateral surface of the forearm.

Median nerve

The median nerve enters the arm from the axilla at the inferior margin of the teres major muscle. It passes vertically down the medial side of the arm in the anterior compartment and is related to the brachial artery throughout its course:

- In proximal regions, the median nerve is immediately lateral to the brachial artery.
- In more distal regions, the median nerve crosses to the medial side of the brachial artery and lies anterior to the elbow joint. The median nerve has no major branches in the arm, but a branch to one of the muscles of the forearm, the pronator teres muscle, may originate from the nerve immediately proximal to the elbow joint.

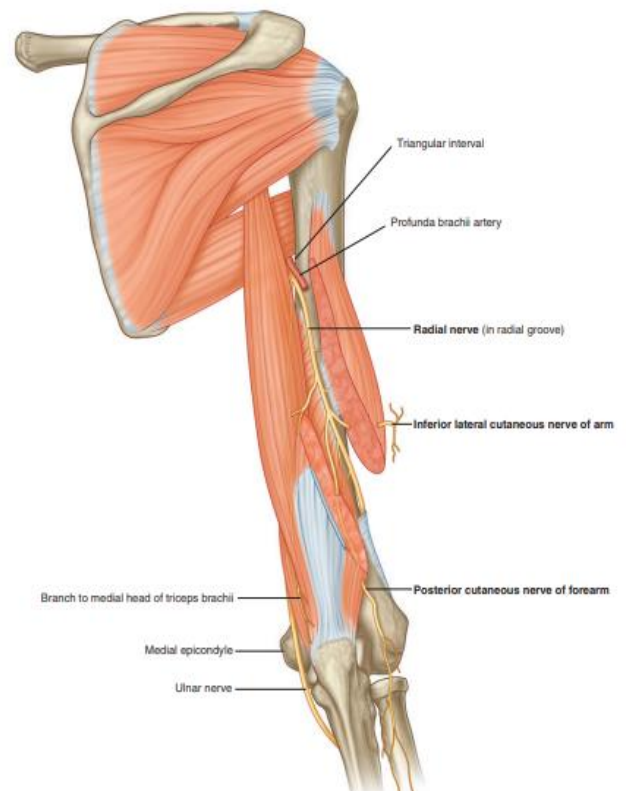


Ulnar nerve

The ulnar nerve enters the arm with the median nerve and axillary artery. It passes through proximal regions medial to the axillary artery. In the middle of the arm, the ulnar nerve penetrates the medial intermuscular septum and enters the posterior compartment where it lies anterior to the medial head of the triceps brachii muscle. It passes posterior to the medial epicondyle of the humerus and then into the anterior compartment of the forearm. The ulnar nerve has no major branches in the arm.

Radial nerve

The radial nerve originates from the posterior cord of the brachial plexus and enters the arm by crossing the inferior margin of the teres major muscle. As it enters the arm, it lies posterior to the brachial artery. Accompanied by the profunda brachii artery, the radial nerve enters the posterior compartment of the arm by passing through the triangular interval. As the radial nerve passes diagonally, from medial to lateral, through the posterior compartment, it lies in the radial groove directly on bone. On the lateral side of the arm, it passes anteriorly through the lateral intermuscular septum and enters the anterior compartment where it lies between the brachialis muscle and a muscle of the posterior compartment of the forearm—the brachioradialis muscle, which attaches to the lateral supra-epicondylar ridge of the humerus. The radial nerve enters the forearm anterior to the lateral epicondyle of the humerus, just deep to the brachioradialis muscle.



In the arm, the radial nerve has muscular and cutaneous branches.

- Muscular branches include those to the triceps brachii, brachioradialis, and extensor carpi radialis longus muscles. In addition, the radial nerve contributes to the innervation of the lateral part of the brachialis muscle. One of the branches to the medial head of the triceps brachii muscle arises before the radial nerve's entrance into the posterior compartment and passes vertically down the arm in association with the ulnar nerve.
- Cutaneous branches of the radial nerve that originate in the posterior compartment of the arm are the inferior lateral cutaneous nerve of the arm and the posterior cutaneous nerve of the forearm, both of which penetrate through the lateral head of the triceps brachii muscle and the overlying deep fascia to become subcutaneous.