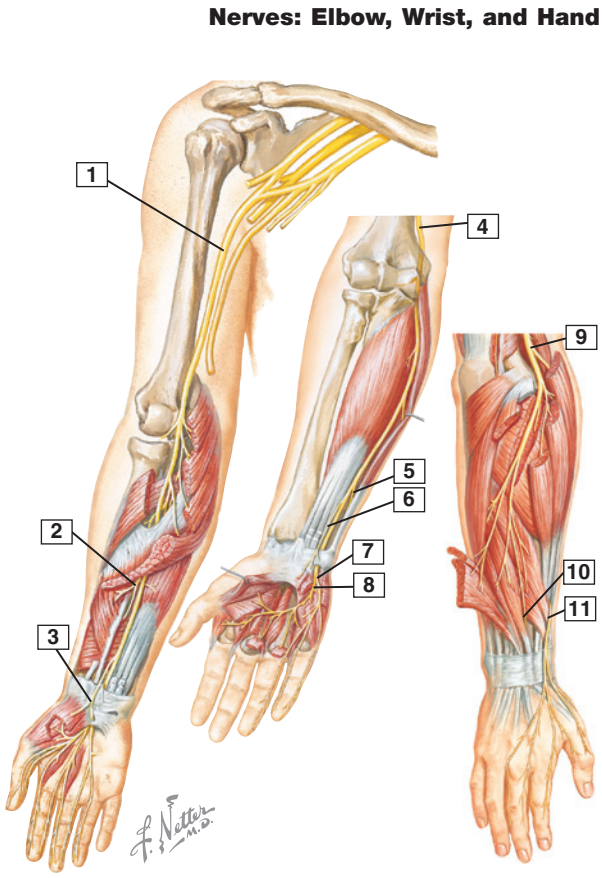

1. Median nerve
2. Anterior interosseous nerve
3. Palmar branch of median nerve
4. Ulnar nerve
5. Dorsal branch of ulnar nerve
6. Palmar branch of ulnar nerve
7. Superficial branch of ulnar nerve
8. Deep branch of ulnar nerve
9. Radial nerve
10. Posterior interosseous nerve
11. Superficial branch of the radial nerve

Comment: The median nerve (C5-T1) passes anteriorly and centrally through the elbow to supply the anterior compartment of the forearm; then it passes into the hand through the carpal tunnel, where it provides innervation to the thumb, index, and middle fingers. The ulnar nerve (C7-T1) arises from the medial cord of the brachial plexus, passes the elbow just posterior to the medial epicondyle, and moves into the wrist through the Guyon canal. It supplies the flexor digitorum profundus and carpi ulnaris muscles. It also has both motor and sensory supplies to the ulnar aspect of the palm. The radial nerve (C5-T1) divides into superficial and deep branches at the elbow and innervates the wrist extensors and sensation to the posterior forearm and dorsal hand (thumb, index finger, middle finger, and half of the ring finger).

Figure 12.14 Median, ulnar, and radial nerves in the forearm. (Reprinted from Netter Anatomy Illustration Collection. ©Elsevier Inc. All Rights Reserved.)

(Fig. 12.4). Distally, it divides into terminal palmar and dorsal branches. The palmar branch contributes to the palmar carpal arch and eventually anastomoses with recurrent vessels off the deep palmar arch (Fig. 12.15), while the dorsal branch pierces the interosseous membrane just proximal to the DRUJ to communicate with the posterior interosseous artery and eventually the dorsal branch of the radial artery, supplying the dorsal carpal arches. These arches (Fig. 12.16) form the basis of several pedicled distal radius vascularized bone grafts, and also provide retrograde flow to the distally-based posterior interosseous artery flap.[5–7]

The posterior interosseous artery is smaller than its anterior counterpart, runs on the dorsal surface of the interosseous membrane between the extensor muscle bellies (Fig. 12.14). Early in its course, it gives rise to the interosseous recurrent artery (Fig. 12.7) that heads superiorly back towards the elbow, anastomosing with the middle collateral, inferior ulnar collateral, and posterior ulnar collateral arteries.

In the mid-forearm, the posterior interosseous artery gives off an average of 7–14 septocutaneous perforators along its course, which can be located along a line drawn from the lateral epicondyle to the midpoint of the DRUJ.

The posterior interosseous artery receives the dorsal branch of the anterior interosseous artery just proximal to the DRUJ, and continues on the dorsal aspect of the wrist forming several dorsal arches that communicate with branches of the radial and ulnar arteries. As mentioned previously, this provides for retrograde perfusion of a distally-based posterior interosseous artery flap that can be used for dorsal hand coverage.

EXPOSURE OF THE ULNAR ARTERY IN THE DISTAL FOREARM AND GUYON'S CANAL

The ulnar artery can be exposed proximally in the antecubital fossa as described earlier, otherwise it is best exposed in the distal half of the forearm where it is relatively superficial (Fig. 12.11).

The ulnar artery in the proximal arm is deep and of limited use as a recipient vessel, unless there is a large preexisting defect. In the distal half of the forearm, the ulnar artery lies under the flexor carpi ulnaris muscle and tendon. Its course can be marked by drawing a line from the medial epicondyle to the pisiform and a skin incision can be made distally anywhere along this line (Fig. 12.17A). The antebrachial fascia (Fig. 12.17B) is incised and the flexor carpi ulnaris tendon is retracted ulnarly to expose the neurovascular bundle (Fig. 12.17C). The ulnar artery lies radial to the ulnar nerve, just medial to the flexor digitorum muscles and tendons. There are usually no large arterial side branches in the distal half of the forearm, and given that the ulnar artery is the dominant supply to the hand, an end-to-side arterial anastomosis is preferable. There are typically two accompanying veins that can be used for end-to-end venous anastomoses.

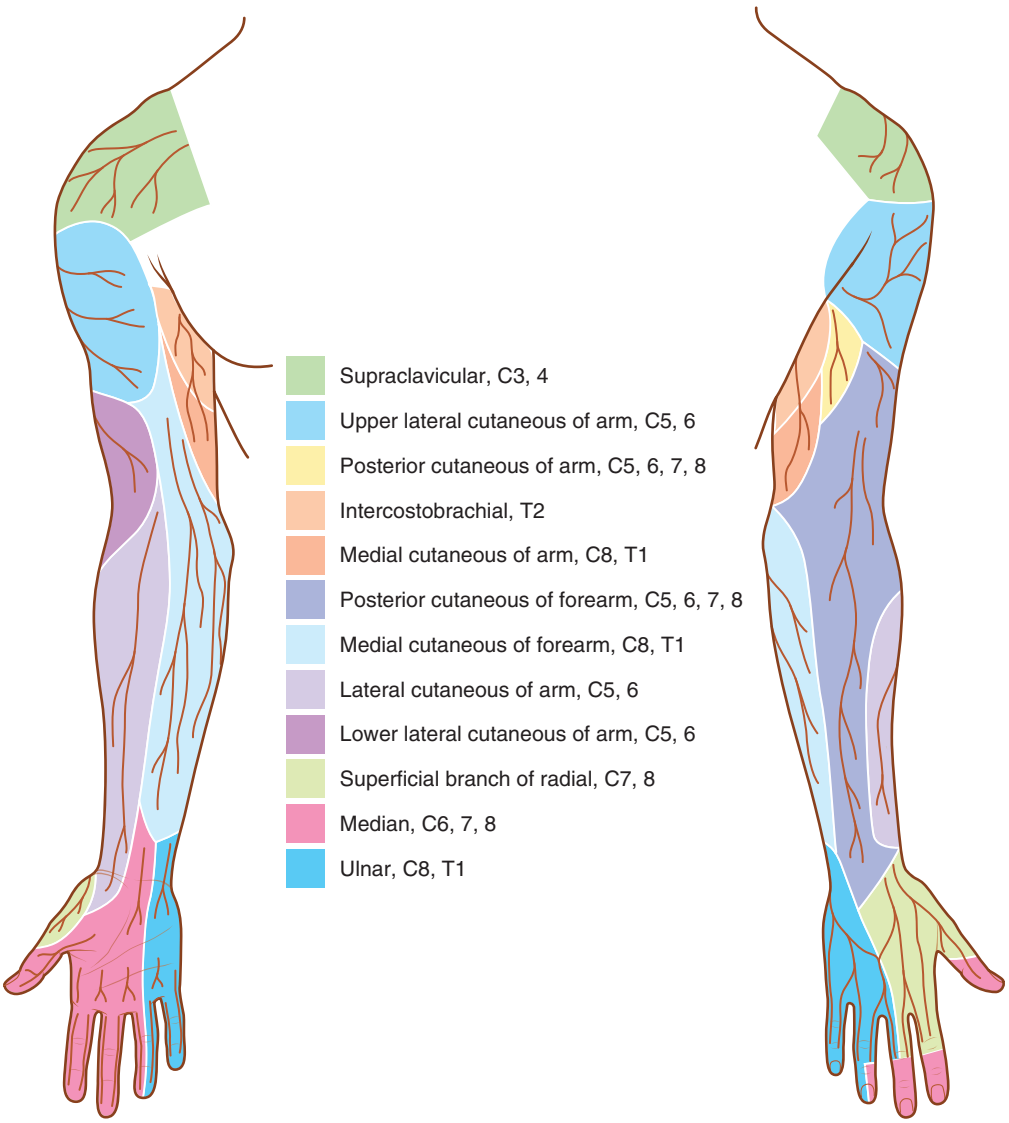

Figure 12.15 Dermatomes of the upper extremity.

Distal exposure of the artery in Guyon's canal can be achieved by curving the incision across the volar wrist crease around the pisiform (Fig. 12.17A) and this exposure is useful for arterial bypass grafts or revascularization of the hand. The subcutaneous tissues in this region are thicker and less pliable requiring more dissection than those of the forearm. The volar carpal ligament is a well-defined fascial layer that covers the ulnar artery at this level and this needs to be released (Fig. 12.17D), exposing the contents of Guyon's canal. The artery can be dissected distally under the palmaris brevis into the palm if required (Fig. 12.17E). Care should be taken to avoid injury to the ulnar nerve and its branches, as these are intimately related to the artery in the canal. Adequate exposure of the artery at this level does not typically require significant dissection of the nerve, which could lead to neuropraxia or trauma to its branches. Specific care should be paid not to damage the deep (motor) branch, which arises posteriorly and therefore may not be easily visible in the field (Fig. 12.17F – nerve dissection shown for anatomic demonstration purposes only).

THE RADIAL ARTERY

After the brachial artery bifurcates approximately 2–3 cm distal to the elbow crease, the radial artery continues along the radial aspect of the forearm along with its two venae comitantes (Fig. 12.12). It is slightly smaller than the ulnar artery, and runs just under the brachioradialis muscle. Along its course in the forearm it remains superficial to the biceps insertion, supinator, pronator teres, flexor digitorum superficialis, and flexor pollicis longus muscles. In the middle third, it runs alongside the superficial branch of the radial nerve. In the distal third of the forearm, it becomes even more superficial, lying between the brachioradialis and flexor carpi radialis tendons, covered only by deep and superficial fascia and skin, where the radial pulse is typically palpated. Proximally, it gives off the radial recurrent artery, which is a large, consistent well-defined branch and this provides the vascular basis for the pedicled brachioradialis muscle flap. It is also a reliable recipient vessel for end-to-end microvascular anastomosis.