likely cause painful neuromas (Fig. 12.19B). The deep fascial layer is incised between the EPL and APL tendons (Fig. 12.19C), and careful blunt dissection will expose the radial artery in the base of the snuffbox (Fig. 12.19A).

NERVE ANATOMY OF THE ARM AND FOREARM

The terminal branches of the brachial plexus exit the axilla intimately related to the proximal brachial artery (Fig. 12.5). This arrangement is complex but consistent, and their position in relation to the brachial artery, as well as their branching patterns allows for intraoperative identification of the required nerve.

THE ULNAR NERVE

The ulnar nerve is the direct continuation of the medial cord of the brachial plexus. It does not innervate any structures in the arm, however it innervates the flexor carpi ulnaris and the ulnar half of the flexor digitorum profundus in the forearm. In the hand, it supplies motor innervation to all interossei, adductor pollicis, the ulnar-sided lumbricals, the hypothenar muscles, and the deep head of flexor pollicis brevis (Fig. 12.14). It also supplies sensory innervation to the small finger, the ulnar half of the ring finger, and the ulnar half of the volar and dorsal aspects of the hand (Fig. 12.15).

The ulnar nerve lies medial to the brachial artery in the proximal arm, along with the medial antebrachial cutaneous nerves (Fig. 12.2). Proximally, it is located in the anterior compartment but as the brachial artery gradually courses in an anterior direction towards the antecubital fossa, the ulnar nerve heads posteriorly away from the artery, piercing the medial intermuscular septum half way down the arm to enter the posterior compartment of the arm medial to the triceps. From here, it passes just posterior to the medial epicondyle of the humerus where it can reliably be found as it enters the forearm between the two heads of the flexor carpi ulnaris muscle (Fig. 12.6).

The ulnar nerve joins the ulnar artery in the proximal forearm and accompanies it between the flexor digitorum superficialis and profundus muscles throughout its course (Fig. 12.4). It gives off a dorsal sensory branch 6–8 cm proximal to the wrist. Approximately 5 cm proximal to the pisiform, this branch pierces the antebrachial fascia dorsal to the flexor carpi ulnaris tendon to lie in a subcutaneous plane and supplies the ulnar aspect of the dorsum of the hand (Fig. 12.10).

The ulnar nerve enters the hand through Guyon's canal, bound by the volar carpal ligament on its superficial surface (Fig. 12.20). It passes deep to the palmaris brevis muscle, medial to the hook of the hamate, and divides into a deep motor branch and its two distal sensory branches.

THE MEDIAN NERVE

The median nerve is formed from contributions of the medial and lateral cords of the brachial plexus. It does not innervate any structures in the arm, however supplies motor innervation to the flexor carpi radialis, pronator teres, flexor digitorum superficialis, radial half of flexor digitorum profundus, flexor pollicis longus, and the pronator quadratus in the forearm. In the hand, it supplies the muscles of the thenar eminence and the first two lumbricals. It also supplies sensory innervation to the volar side of the thumb, index, middle and radial half of the ring finger as well as the radial side of the palm (Fig. 12.12).

The median nerve lies anterior to the brachial artery in the proximal arm (Fig. 12.2), and remains in the anterior compartment intimately related to the artery along its whole course in the arm. It crosses the brachial artery to lie medial to it in the distal arm and antecubital fossa. It enters the forearm passing between the two heads of the pronator teres to lie deep to the flexor digitorum superficialis muscle belly for the remainder of its course in the forearm (Fig. 12.6). It sequentially innervates the majority of the aforementioned forearm muscles directly, however supplies the flexor pollicis longus, the radial half of flexor digitorum profundus, and pronator quadratus via its anterior interosseous branch (Fig. 12.4). In the distal forearm, the median nerve can be reliably found as a superficial structure on the radial side of the flexor digitorum superficialis muscle where it gives rise to the palmar cutaneous nerve approximately 8 cm proximal to the distal wrist crease. This branch pierces the deep fascia between the palmaris longus and flexor carpi radialis tendons to become a superficial structure at the wrist, supplying sensation to the palm and thenar eminence (Fig. 12.10). At the wrist level, it runs just ulnar to the flexor carpi radialis, and could potentially be injured during harvest of a radial forearm flap (Fig. 12.9).

The median nerve remains deep to the fascia and passes through the carpal tunnel under the transverse carpal ligament. After entering the carpal tunnel, the median nerve divides into four main branches (Fig. 12.20). The recurrent motor branch of the median nerve is the most anterior of the fascicular bundles and supplies the thenar muscles. The next branch usually divides into three terminal branches supplying sensation to the ulnar and radial sides of the thumb and the radial side of the index finger. The remaining two branches form the common digital nerves to the second and third web spaces, but despite being predominantly sensory nerves, they also innervate the second and third lumbrical muscles, respectively.

THE MUSCULOCUTANEOUS NERVE

The musculocutaneous nerve forms from the lateral cord of the brachial plexus. It innervates the biceps, brachialis and coracobrachialis in the anterior compartment of the arm, and provides sensory innervation to the lateral aspect of the forearm through its terminal branch, the lateral antebrachial cutaneous nerve.

The musculocutaneous nerve is well known to have significant variability, frequently adhering to the median nerve with which it may exchange fibers. Typically, it leaves the axilla laterally piercing the coracobrachialis (Fig. 12.2). After passing through this muscle, it descends the arm between the brachialis and biceps muscles providing several motor branches to each muscle (Fig. 12.11). In the distal arm, it emerges lateral to the biceps tendon and pierces the deep fascia to become a more superficial structure that continues into the proximal forearm as the lateral

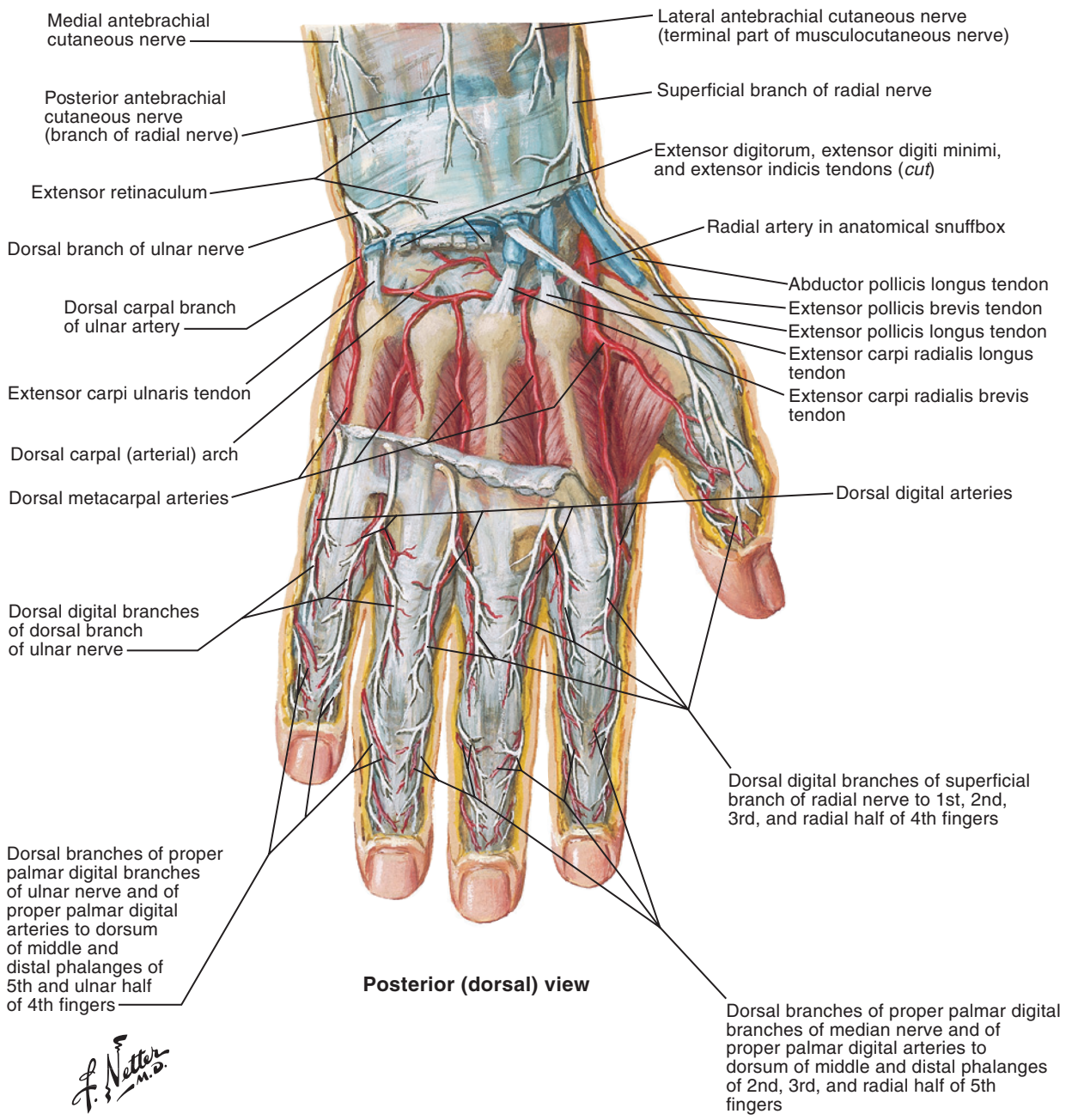

Figure 12.20 Deep dissection of the dorsum of the hand. (Reprinted from Netter Anatomy Illustration Collection. ©Elsevier Inc. All Rights Reserved.)

antebrachial cutaneous nerve (Fig. 12.21). This direct continuation of the musculocutaneous nerve remains superficial to the brachioradialis to provide sensory innervation to the lateral aspect of the forearm (Fig. 12.12).

THE RADIAL NERVE

The radial nerve is the direct continuation of the posterior cord of the brachial plexus. In the arm, it classically only innervates the triceps muscle, however also contributes a motor branch to the brachialis muscle in approximately 65–90% of patients. While the radial nerve only contributes 11% of the relative innervation of the brachialis,[11] acknowledging its presence can avoid confusion, as it may be encountered while dissecting a lateral arm flap. In the forearm, the radial nerve innervates the brachioradialis, anconeus, the wrist extensors, supinator and all the extensor of the fingers and thumb, including the abductor pollicis longus. It does not supply any muscles within the hand, however provides sensory innervation to the dorsum of the radial side of the hand and radial digits (Fig. 12.12).

The radial nerve lies immediately posterior to the brachial artery in the proximal arm but rapidly heads deeper and more lateral through the triangular interval into the posterior compartment. Here, it lies adjacent to the posterior aspect of the midshaft of the humerus where it gives off