the ulnar side forms the basilic vein. There are numerous patterns of superficial venous anatomy, although the anatomy of the cephalic, basilic and median cubital veins is fairly constant (Fig. 12.22).

The cephalic vein is formed at the level of the anatomic snuffbox, and runs proximally on the radial aspect of the forearm receiving tributaries from both sides of the forearm. The main trunk of the cephalic vein crosses the antecubital fossa on the lateral side, superficial to the lateral antebrachial nerve. It continues proximally in the arm along the lateral groove of the biceps muscle, eventually entering the groove between the deltoid and pectoralis muscles (Fig. 12.21). It then continues heading towards the clavicle, passes deep to the clavicular head of the pectoralis major and pierces the clavipectoral fascia, crossing anterior to the axillary artery to drain into the axillary vein just inferior to the clavicle (Fig. 12.23). The cephalic vein is usually of large caliber and can be used for venous drainage of a flap

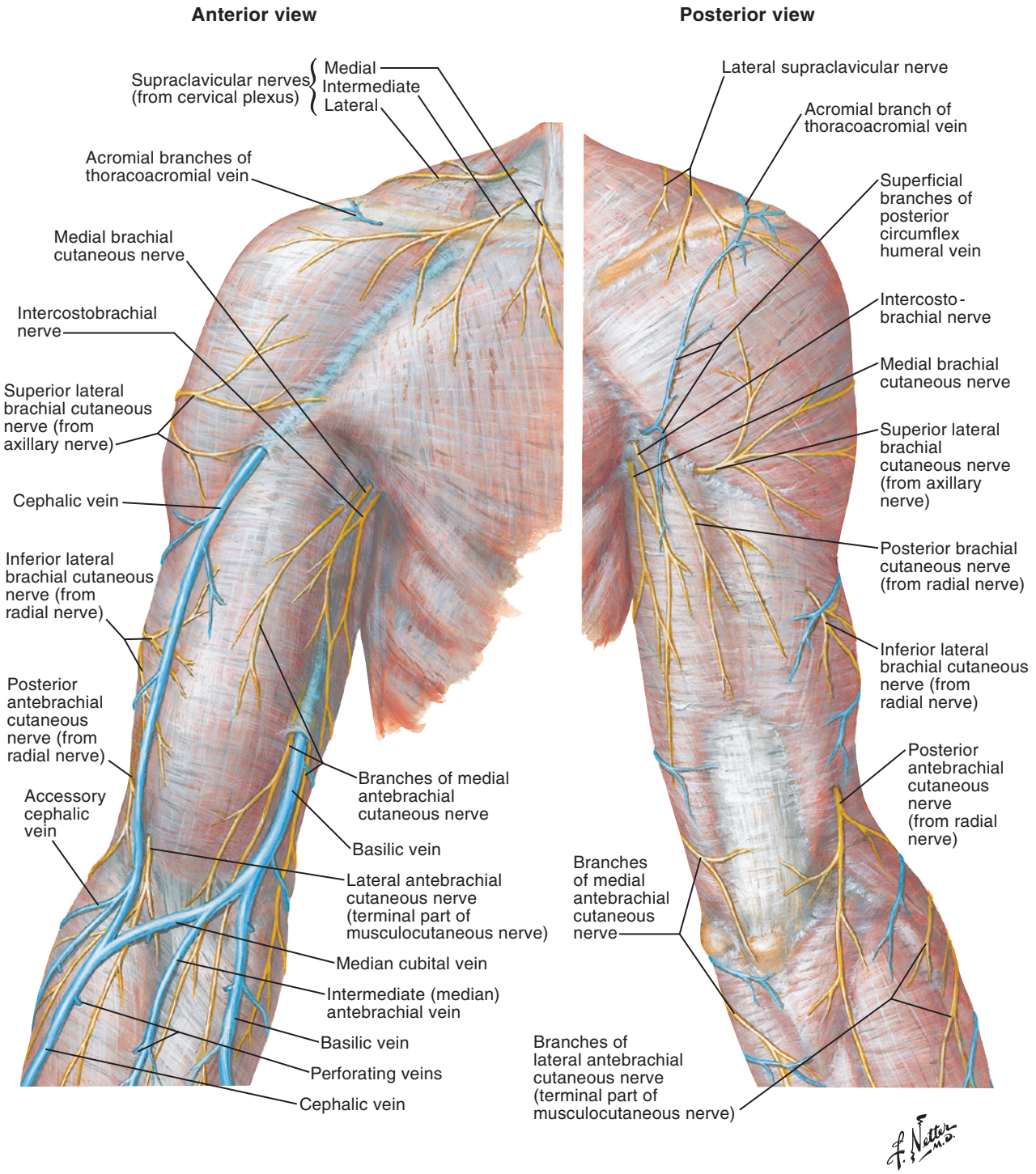

Figure 12.23 Superficial veins and cutaneous nerves of the arm. (Reprinted from Netter Anatomy Illustration Collection. ©Elsevier Inc. All Rights Reserved.)

anywhere along its length in the upper extremity. Additionally, it may be useful as a vein graft, or can be harvest distally and pedicled proximally to provide microvascular drainage in the chest or trunk.

The basilic vein arises on the dorsal ulnar side of the hand, and remains on the dorsal ulnar side of the forearm until the proximal third. Here it curves medially to cross the elbow anteriorly, on the medial side of the antecubital fossa. At this level, it receives the median antecubital vein a tributary rising from the cephalic vein in the proximal forearm (Fig. 12.10). It continues proximally in the anteromedial arm, along the medial border of the biceps, superficial to the brachial artery, and can be intimately related to branches of the medial antebrachial cutaneous nerve. It pierces the deep fascia of the arm just distal to its midpoint (Fig. 12.21) to run on the medial side of the brachial artery. The basilic vein then joins the brachial veins to form the axillary vein at the distal border of the teres major (Fig. 12.5).

RECIPIENT VESSEL SELECTION IN THE UPPER EXTREMITY

The anatomy of the major upper extremity vessels is well-defined, and many of these structures are easily accessed. However, there can be significant variability in vascular branching patterns and collateral anastomoses. Careful dissection and confirmation of distal vascular sufficiency, after clamping potential recipient vessels prior to division, avoids unnecessary complications. Additionally, knowledge of the gross regional anatomy of the upper extremity allows for an appreciation of the critical structures that may be encountered during vessel exposure. In general terms, the location and course of the major upper extremity nerves can be described in relation to the arterial system, whereas the abundant superficial venous network may be more intimately related to the named cutaneous nerve branches.

Workhorse recipient vessels that are easily exposed for reconstructive microsurgery of the upper extremity include:

- The brachial artery along its course in the medial arm (Fig. 12.2)
- The brachial artery bifurcation, including large branches arising from the proximal radial artery (recurrent radial artery) and proximal ulnar artery (ulnar recurrent and interosseous arteries) (Fig. 12.4)
- The ulnar artery in the distal forearm and Guyon's canal (Fig. 12.4)
- The radial artery along its course in the forearm and the superficial palmar branch at the wrist (Fig. 12.4)
- The radial artery in the anatomic snuffbox (Fig. 12.17).

The brachial, ulnar, and radial arteries are of sufficient caliber to be used in an end-to-side manner without difficulty at any point along their course. Vessel diameter in the distal part of the upper extremity and hand can be variable depending on branching and dominance patterns (Table 12.2). The superficial palmar branch of the radial artery is almost always present, however its diameter may vary (0.8–3.0 mm).[13] It can be used in end-to-end fashion for a suitably-sized flap pedicle (e.g., medial femoral condyle flap), however if the vessel is larger than average, an incomplete arch or radial dominant system may be present and distal perfusion should be confirmed with the vessel clamped. Digital artery dominance varies for each digit, typically corresponding to the more median of the two vessels[14] (i.e., the ulnar side of the thumb, index and long fingers, the radial side of the ring and small fingers), and should be considered when planning revascularization, replantation or toe transfers.

Table 12.2 Vessel lumens in the hand

Vessel	Average lumen diameter (mm)
Radial	2.6
Ulnar	2.5
Superficial arch	1.8
Deep arch	1.5
Superficial palmar branch of radial artery	1.4
Common digital	1.6
Common palmar metacarpal	1.2

ANESTHETIC AND INTRAOPERATIVE CONSIDERATIONS

For lengthy upper extremity procedures, general anesthesia may be required. However, regional anesthesia by axillary or subclavian regional nerve blocks also provides some sympathetic blockade. This may facilitate dissection and anastomoses as it encourages vasodilatation of smaller branches, and can be used as an adjunct to general anesthesia.

Routine use of a tourniquet allows for more expeditious and careful dissection in the upper extremity, however complete exsanguination prior to application of the tourniquet may hinder vessel identification. Incomplete exsanguination by elevation alone allows for easier visualization of small vessels and venae comitantes. Superficial veins can be marked preoperatively with the arm dependent or after applying a venous tourniquet.

Access Figures 12.6, 12.7, 12.11 and 12.13, as well as case examples 1, 2, 3 and 4 online at http://expertconsult.inkling.com

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