Level of difficulty: Companion

The lateral arm flap

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Abstract: The lateral arm flap is a versatile fasciocutaneous flap that may be used locally on the upper extremity or as a microvascular free flap. Since the flap’s description by Song et al. in 1982 [1], its ease of harvesting and the constancy of its vascular pedicle have made the lateral arm free flap an important component in the armamentarium of hand and reconstructive surgeons. The ability to harvest this flap in the same operative field as the recipient defect on the same upper extremity is a major asset in hand surgery.

Keywords: Lateral arm flap – Hand defect

Anatomy

The lateral arm flap is located on the lateral aspect of the upper arm, as indicated by its name. It is a fasciocutaneous flap whose vascular pattern is a Mathes-Nahai Type B, with a septocutaneous perforator from the posterior radial collateral artery (PRCA), itself a branch of the deep brachial artery (profunda brachii artery). The deep brachial artery arises from the brachial artery at the level of the proximal quarter of the humerus and accompanies the radial nerve along the spiral groove. While transiting the groove the deep brachial artery divides into the middle collateral artery (MCA), which proceeds along the posterior aspect of the humerus, and the radial collateral artery (RCA), which travels in proximity to the radial nerve and emerges in the septum between the triceps and brachialis muscles [2].

At a varying point in its course along the spiral groove toward the proximal edge of the brachialis muscle, the radial collateral artery bifurcates into the anterior (ARCA) and posterior (PRCA) radial collateral arteries. The ARCA proceeds anteriorly in the septum between the brachialis and brachioradialis muscles, while the PRCA continues along the axis of the arm between the triceps and brachioradialis muscles. The PRCA gives off four or more fascial branches located from 1 to 15 cm proximal to the lateral epicondyle, and its largest branch is found about 9.7 cm proximal to the lateral epicondyle [3,4]. At the level of the elbow, the PRCA anastomoses with the recurrent posterior interosseous artery.

Operative technique for free flap

The axis of the lateral arm flap is drawn on a line extending from the humeral insertion of the deltoid to the lateral epicondyle. While the distal segment of the arm is utilized more often, the flap may extend from 3 to 4 cm proximal to the deltoid insertion to 3 to 4 cm distal to the lateral epicondyle of the elbow. The width of the flap should not exceed 6 cm if primary closure is desired.

The flap axis and the flap borders are drawn with a surgical marker. A sterile tourniquet cuff is placed high on the arm to allow most if not all the dissection to proceed under pneumatic tourniquet control. The limb is placed on the hand surgical table with a padded sterile bolster under the elbow to provide internal rotation of the shoulder, giving easy access to the operative field.

Harvesting begins with an incision at the distal and posterior border of the planned flap. The dissection continues to the proximal half of the humerus and accompanies the radial nerve along the spiral groove. While transiting the groove the deep brachial artery divides into the middle collateral artery (MCA), which proceeds along the posterior aspect of the humerus, and the radial collateral artery (RCA), which travels in proximity to the radial nerve and emerges in the septum between the triceps and brachialis muscles [2].

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Harvesting begins with an incision at the distal and posterior border of the planned flap. The dissection continues to the deep fascia, which is separated from the underlying triceps with ease. As with all fasciocutaneous flaps, it is important to secure the fascia to the subdermal tissue with interrupted absorbable sutures in order to avoid shearing off the cutaneous perforating vessels. The occasional muscular perforating vessel is carefully cauterized, preferably using a bipolar electrocautery. Vessels coursing along the surface of the fascia are seen readily by virtue of the fascia’s transparent nature. The dissection at the proximal end of the flap continues in the plane between the triceps and brachialis, almost to the supracondylar ridge, because the septum containing the transiting vessels is commonly not well defined until at a more proximal level.

Once the posterior border dissection is completed, the bolster is removed from beneath the elbow, which in turn now lies flat on the hand table with the shoulder in neutral rotation. This permits dissection of the anterior flap border from distal to proximal. In contradistinction to the posterior dissection, the deep fascia beneath the

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anterior border is quite adherent to the underlying muscles. Harvesting from distal to proximal along the anterior border permits identification of the anterior radial collateral artery in the septum between the brachialis and brachioradialis so that it may be ligated and divided. The posterior antebrachial cutaneous nerve is identified and divided.

The radial nerve is located at the proximal edge of the brachioradialis muscle. It lies at the deep aspect of the radial collateral vascular bundle from which it will be carefully dissected. More proximally, the dissection continues along the deep brachial artery if a longer pedicle is desired. At the level of the mid-humerus, the radial nerve gives off the posterior brachial cutaneous nerve, which is the sensory nerve of the flap.

Now attention is turned to dissection of the proximal portion of the flap. In flaps limited to the distal part of the arm, the vascular pedicle is comprised of the radial collateral artery and its venae comitantes. This artery’s diameter is typically 2 mm, and the associated veins are of appropriate size to ensure adequate venous drainage without the necessity for utilizing a superficial vein. At this point one removes the sterile tourniquet. When a longer pedicle (5 to 7 cm) or larger diameter (2.5 to 3 mm) is required, one can extend the dissection by retracting the posterior–inferior edge of the deltoid and the lateral head of the triceps, permitting exposure of the deep brachial artery. A more extensive proximal dissection of this artery between the long and lateral heads of the triceps can provide a pedicle reaching 13 cm in length [5].

Once the dissection is complete, one divides the pedicle and instills a heparinised saline solution into the artery via an atraumatic vascular catheter. The flap is transferred to the recipient site for micro vascular anastomosis. The donor site is closed at a convenient time.

Case example n° 1

A 43-year-old woman presented with recurrent superficial circumferential infections of the right wrist after a carpal tunnel release. Repeated split and full thickness skin grafts over a two years period had all failed. The Fig. 1 shows a dorsal view of the wound Fig. 1A, a volar view of the wound Fig. 1B, and a close-up dorsal view Fig. 1C, before surgery. After debridement of all the granulomatous and infected tissue, the Fig. 2 reveals the complete lack of all soft tissue coverage of the dorsal Fig. 2A and

![Fig. 1. Preoperative views](image)

![Fig. 2. After debridement of the lesion](image)