



The unique and valuable soft tissue free flap in head and neck reconstruction: Lateral arm

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ABSTRACT

While the lateral arm free flap has been well described, there is a relative paucity in its use compared to other free flaps and regional flaps. The lateral arm free flap is a unique soft tissue free flap that provides several reconstructive advantages in head and neck reconstruction: excellent contour and color match to facial skin, well compartmentalized fat, donor nerves for nerve grafting, and the ability to two-team harvest and close the donor site without a skin graft. A detailed anatomic and harvest technique is described, along with indications and advantages of using lateral free flap for head and neck reconstruction. A scoping literature review was also conducted to tabulate indications, overall success and complications of the flap. The lateral arm flap is a primary option for defects requiring soft tissue reconstruction in the head and neck.

Introduction

This article is a review of a less common but versatile and important flap in the head and neck reconstructive tool box: the lateral arm flap. The lateral arm flap was described by Song and colleagues in 1982 and further defined by Katsaros in 1984 [1,2]. This donor site provides well-vascularized soft tissue that can be utilized to reconstruct a variety of head and neck defects. The lateral arm donor site has several key reconstructive advantages that make it an ideal donor site for many head and neck defects. In this article, we perform a scoping review of the literature and present the anatomical considerations, surgical indications, technique, and reconstructive advantages of this relatively underutilized donor site.

Anatomic considerations

The lateral arm free flap is a fasciocutaneous flap supplied by the posterior radial collateral artery (PRCA) (Fig. 1). The deep brachial artery supplies the radial collateral artery, which divides into the anterior radial collateral artery and posterior radial collateral artery. The PRCA is a terminal branch and can be safely harvested. A flap width of up to 6–8 cm may be harvested and permit primary closure

without a skin graft [3]. The PRCA descends millimeters away from the humerus, supplying the skin of the lateral arm through perforators in the lateral intermuscular septum. The anterior radial collateral artery does not supply the flap, and is often seen between the brachialis and brachioradialis muscles, along the course of the radial nerve. The mean diameter of the PRCA is 1.55 mm [4]. Venous drainage of this flap is via two vena comitantes, with a mean diameter of 2.5 mm [5].

There are two sensory nerves associated with the lateral arm flap, the posterior cutaneous nerve of the arm (PCNA) and the posterior cutaneous nerve to the forearm (PCNF). The PCNF travels through the intermuscular septum along the axis of the pedicle but does not enter the flap or supply sensation to the flap. Distal branches of the PCNF can be harvested and utilized as vascularized nerve grafts. On the other hand, the PCNA pierces the fascia of the lateral arm flap as it provides sensory innervation to the lateral arm flap. Both the PCNF and the PCNA are branches of the radial nerve and must be identified and divided so that the radial nerve is left in situ. As the nerve descends in the arm, it wraps around the posterior aspect of the humerus in the spiral groove and travels inferiorly, in a medial to lateral orientation. The radial nerve can be identified in the distal portion of the humerus, where it is reliably between the brachialis and brachioradialis muscles. The radial nerve should always be identified and preserved during the

Abbreviations: PCNA, posterior cutaneous nerve of the arm; PCNF, posterior cutaneous nerve of the forearm; PRCA, posterior radial collateral artery; ALT, anterolateral thigh; BMI, body mass index; SMIF, submental island flap; SCAIF, supraclavicular flap; PMF, pectoralis major flap

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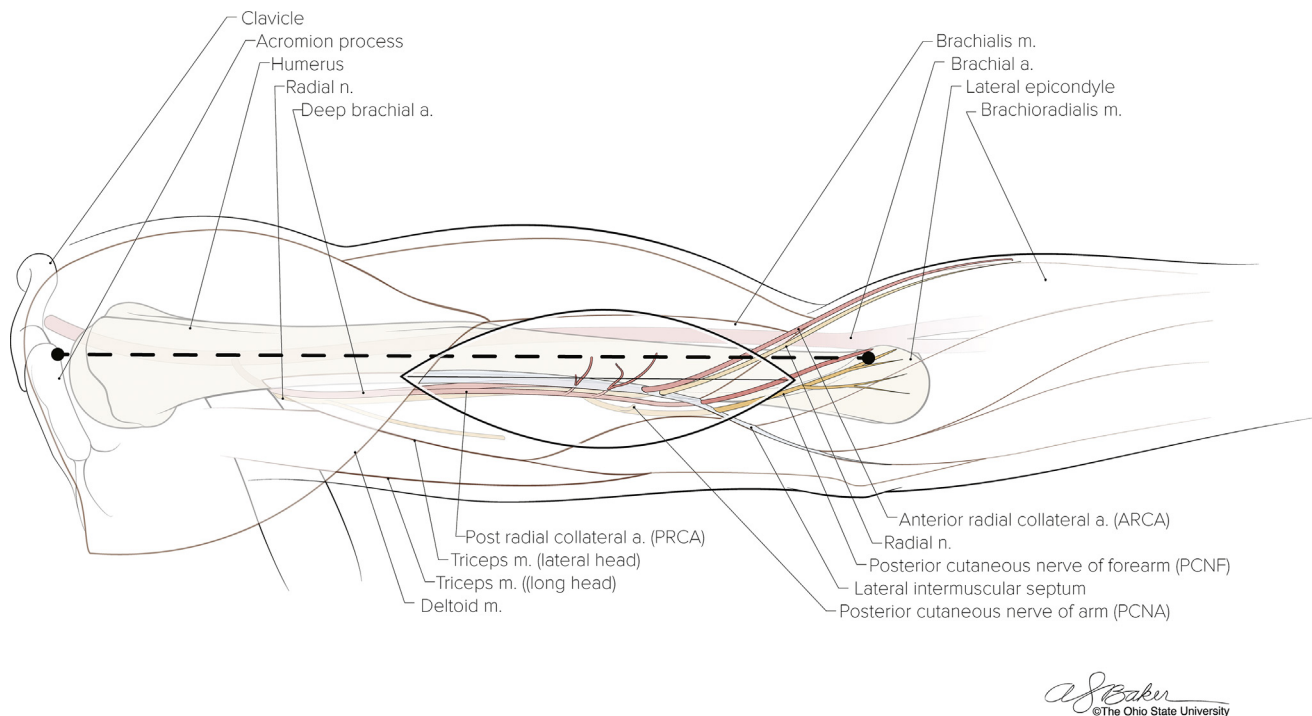


Fig. 1. Topographical anatomy of the lateral arm donor site. The axis of the posterior radial collateral artery is 1 cm posterior to a line drawn from the acromioclavicular joint to the lateral epicondyle.

harvest of this flap because of its proximity to the pedicle.

Flap harvest

The patient is positioned with the arm internally rotated, with the medial epicondyle of the humerus resting against the axilla and the palm of the hand resting on the abdomen. The important landmarks for this flap harvest are the deltoid insertion and lateral epicondyle of the humerus. A line is drawn between the deltoid insertion and the lateral epicondyle of the humerus. If the deltoid insertion cannot be palpated, the acromioclavicular joint may be used as a landmark. The lateral intermuscular septum containing the septocutaneous perforators from the posterior radial collateral artery is 1 cm posterior to this line (Fig. 1). A Doppler probe may be used to identify perforators. While a tourniquet may be used for this flap, the authors prefer to harvest without the use of a tourniquet, which aids perforator visualization.

The posterior incision is made through skin, adipose tissue, and through the fascia overlying the triceps muscle (Fig. 2). Subfascial dissection is performed to the lateral edge of the lateral head of the triceps muscle, and at this point the septocutaneous perforators can be identified (Fig. 2). These perforators can be followed to the posterior radial collateral artery. At this point, the pedicle can be dissected from the posterior approach, ligating arterial branches to the triceps muscle and releasing the artery from the humerus. The distal septum can be cut sharply off the humerus at this juncture or delayed until the anterior approach is completed. Next, the anterior incision is made through skin, adipose tissue, and to the level of the brachialis and brachioradialis fascia. If a vascularized donor nerve is desired, the posterior cutaneous nerve of the forearm can be identified distally in the subcutaneous tissue and fascia anterior to the lateral epicondyle. Once the pedicle is landmarked from the posterior approach, dissection from the anterior approach proceeds until the pedicle is exposed from the anterior approach. This typically requires harvesting a small cuff of the brachioradialis muscle, because the muscle originates from the intermuscular septum (Fig. 3). The pedicle is then ligated distally, and dissected from distal to proximal taking care to cut the septum directly off the humerus to avoid injury to the pedicle. The brachialis and brachioradialis are

retracted apart and the radial nerve is identified. It is important to identify and protect the radial nerve as the pedicle dissection proceeds from distal to proximal and the pedicle is separated from the nerve. The posterior cutaneous nerve of arm, a nerve branch of the radial nerve, is identified as it enters the fascia and subcutaneous tissue of the flap, and provides sensation to the flap. The lateral head of the triceps and the deltoid are retracted as the desired pedicle length is obtained as it passes in the spiral groove and the pedicle is ligated proximally (Fig. 4).

Literature review and pooled analysis

A scoping review of the literature in the bibliographic databases in PubMed/MEDLINE was performed, focusing on the use of the lateral arm free flap for head and neck reconstruction, identified a number of key publications [6–9]. This was complemented by a snowballing technique, reviewing the references of several key publications to capture any key publications missed in our literature review as well as utilizing the Related Citations feature in PubMed/MEDLINE; therefore, identifying 17 key references which described in detail the use of this versatile free flap for head and neck reconstruction (Table 1) [6–22]. Lastly, the senior authors (M.O., T.N.T.) provided feedback on any landmark papers they felt should be included in the scoping review. A formal systematic review was not performed and is beyond the scope of this manuscript. A pooled analysis of the success rate of this flap was also calculated as a summary statistic. Flap indications, donor site complications, and other notable findings are identified from each manuscript.

Search strategy

A scoping review was conducted using the PubMed database (1947 to present). The database was searched for English-language studies between the database start date and September 2017 using the key words (*lateral arm flap OR arm free flap OR lateral arm free flap*) AND (*head and neck cancer*). The date of the last search was September 1, 2017. Before reviewing any articles, a number of techniques were used to ensure that all the relevant references were included in our search

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