Appraisal of the Free Ulnar Flap Versatility in Craniofacial Soft-tissue Reconstruction

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Summary: The unique anatomical characteristics of the forearm region make it especially popular as a free flap donor site for craniofacial soft-tissue reconstruction. The free ulnar forearm flap is less hirsute and allows for better concealment of donor site scar as compared with its radial counterpart. Despite these factors, the free radial forearm flap remains more popular among reconstructive surgeons. Through the presented case series, we hope to emphasize the versatile nature of the free ulnar forearm flap in addressing various craniofacial soft-tissue defects. Following institutional review board approval, a retrospective review of the senior authors’ clinical experience performing microvascular free ulnar forearm flap reconstruction of craniofacial soft-tissue defects was performed. A total of 10 patients were identified through our review. Soft-tissue defect locations included lower eyelid (n = 2), tongue and floor of mouth (n = 2), palatopharyngeal area (n = 1), nose (n = 1), and palate (n = 1). Trauma was the most common defect etiology (n = 5), followed by malignancy (n = 4), and iatrogenic injury in 1 case. All patients demonstrated good aesthetic and functional outcomes related to vision, speech, and oral intake at follow-up when applicable. The free ulnar forearm flap is a versatile reconstructive option that can be used to address a wide spectrum of craniofacial soft-tissue defects and offers numerous advantages over its radial counterpart. (Plast Reconstr Surg Glob Open 2018;6:1863; doi: 10.1097/GOX.0000000000001863; Published online 5 September 2018.)

INTRODUCTION

The forearm region is a popular flap donor site for craniofacial soft-tissue reconstruction.1,2 Song et al.3 initially described the utility of the free radial forearm flap, whereas the free ulnar forearm flap (FUFF) was described in 1984 by Lovie et al.4

Proponents of the radial flap cite hand ischemia as a concern after elevation of the FUFF in individuals with an ulnar dominant blood supply.5 Advocates of the FUFF have challenged this belief, with evidence showing no functional or vascular compromise to the hand following flap elevation.6 Moreover, many authors argue that the FUFF is less hirsute, allows better concealment of donor site scar when the arm is in repose by the side and improved donor- and recipient-site aesthetic outcomes.6–8

In this study, we describe the senior author’s experience (E.D.R) in utilizing the FUFF in craniofacial soft-tissue reconstruction and highlight its versatile nature.

METHODS

A retrospective review of the senior author’s (E.D.R) experience reconstructing craniofacial soft-tissue defects using the FUFF at the New York University Langone Health System was performed. The study was approved by the New York University School of Medicine Institutional Review Board, and authorization for use of patient photographs was obtained.

Flap Harvest Surgical Technique

The flap is outlined on the nondominant upper extremity by using a hand-held Doppler to locate the ulnar vascular pedicle while palpating the Flexor Carpi Ulnaris (FCU) muscle and tendon. The pedicle is located deep to the FCU muscle and enters the flap at its central portion. Following skin incision, dissection proceeds in a subprafascial plane from radial to ulnar sides using needle electrocautery. This prevents tenting of the tendons deep to the muscular fascia and maintains a thin flap. When the central segment of the flap is reached, dissection transitions to the deeper layer until identification of the pedicle deep to the FCU muscle. The forearm distal crease is a common site of skin graft breakdown following donor-site coverage and is avoided during flap harvest. Division of the distal segments of the ulnar artery and venae com-

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tantes are performed, and attention is turned to identification of the nearby ulnar nerve. Reflection of the ulnar aspect of the flap from the FCU muscle allows better exposure of the pedicle and nerve. Dissection near the ulnar nerve is performed using bipolar electrocautery to avoid iatrogenic injury. The skin incision is then extended over the entire length of the pedicle outline to allow retrograde dissection and separation of the pedicle from the ulnar nerve. The pedicle typically travels in a more radial position, while the nerve lies more ulnar as the dissection proceeds proximally along the forearm.

The pedicle usually measures 10–12 centimeters. Donor-site closure is performed with a full-thickness skin graft with care to approximate the forearm muscles in a manner to protect the underlying ulnar nerve.

**RESULTS**

Ten patients were identified through our review. Patient and surgical details are listed in Table 1.

**Selected Case Reports**

**Patient 8**

A 54-year-old female who suffered from left periorbital injury as a teenager after being struck by a car. She complained of chronic eye dryness and corneal irritation due to lagophthalmos, periorbital soft-tissue hollowness, and lower lid entropion. She had undergone multiple reconstructive facial and periorbital procedures, which only provided temporary relief. She underwent release of the lower eyelid cicatricial entropion, followed by left periorbital reconstruction with a FUFF without complications (Fig. 1).

**Patient 9**

A 46-year-old female who previously underwent resection of a palatal mucoepidermoid carcinoma, followed by unsuccessful reconstruction with a facial artery musculomucosal flap. She presented with a large central palatal defect and speech difficulties. She initially underwent coverage of her palatal defect with a FUFF. She subsequently developed a small oronasal fistula for which she underwent a rotation- greater palatine artery myomucosal flap (Fig. 2).

**DISCUSSION**

The concern regarding hand ischemia following elevation the FUFF has recently been challenged, with evidence demonstrating no motor, sensory, or vascular disturbances.6 Multiple studies have suggested that the radial artery carries more blood at the level of the wrist than the ulnar artery.9–11 It is still critical, however, to perform an Allen’s test to determine the dominant blood supply to the hand before flap elevation. Both flaps have comparable dissection times, are thin, pliable, allow sensory reinnervation, and possess long vascular pedicles and reliable perfusion, all of which have contributed to their popularity.2,7,12–14 However, the FUFF is less hirsute and allows improved concealment of the donor site surgical scar when the upper extremity is in repose by the side of the body.3,6–8 Additionally, the defect resulting from FUFF harvest exposes flexor muscles, as compared with flexor
tendons during elevation of the radial flap, which may lead to fewer donor-site complications and more optimal graft take with the FUFF following skin grafting. These advantages have driven the senior author (E.D.R) to favor the FUFF over its radial counterpart.

Use of the FUFF has previously been described in head and neck, tongue, pharyngoesophageal, floor of mouth, forehead, periorbital, eyelid, lip, nasal, cheek, lower limb, upper limb, and penile reconstruction. The reliable vascularity of the FUFF make it particularly useful when reconstructing craniofacial soft-tissue defects, which commonly involve hostile, previously irradiated wound beds. The thin and pliable nature of the flap is also an important consideration, as other popular reconstructive options such as the anterolateral thigh flap, may pose anastomotic challenges in surgical fields with limited exposure and will require at least 1 secondary debulking procedure in most cases to enhance aesthetic outcomes.

Reported flap loss rates following FUFF are generally low. Through a comprehensive literature review, Antony et al. advocate that it provides an excellent alternative to the free radial forearm flap, offers numerous advantages, and should be considered as a preferred flap in head and neck reconstruction. The flap loss rate was reported to be 3.2%, and the FUFF was preferred over its radial counterpart due to decreased hirsutism in 61% of cases and better cosmetic outcomes in 91% of cases.

In our series, all patients who did follow-up demonstrated satisfactory aesthetic and functional outcomes related to vision, speech, and oral intake when applicable.

CONCLUSIONS

The FUFF anatomical features combined with ease of concealment of the donor site, and versatile nature make it a preferred option in craniofacial soft-tissue reconstruction.
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