

Use of a Pedicled Adipose Flap as a Sling for Anterior Subcutaneous Transposition of the Ulnar Nerve

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In patients with primary cubital tunnel syndrome, we hypothesize that using a vascularized adipose sling to secure the ulnar nerve during anterior subcutaneous transposition will lead to improved patient outcomes. The adipose flap is designed to surround the ulnar nerve with a pliable, vascularized fat envelope, mimicking the natural fatty environment of peripheral nerves. This technique may offer advantages in securing the anteriorly transposed ulnar nerve and reducing instances of postoperative perineural scarring. Patients experience good functional outcomes; most experience resolution of symptoms. (*J Hand Surg Am.* 2014;39(3):552–555. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)

Key words Adipose, flap, neuropathy, transposition, ulnar.

IN THE UPPER EXTREMITY, cubital tunnel syndrome is the second most common compression neuropathy after carpal tunnel syndrome.¹ Primary cubital tunnel syndrome is characterized by focal medial elbow pain, paresthesias, and dyesthesias that radiate along the volar ulnar forearm into the little finger and ulnar aspect of the ring finger. In addition, patients with advanced cubital tunnel syndrome commonly exhibit intrinsic muscle weakness.

Traditionally, there are 5 surgical options for ulnar neuropathy at the elbow. Subcutaneous transposition is the most popular.^{2–6} This technique involves restraint of the transposed nerve by a fascial slip that is created by elevation of a flap of flexor pronator origin fascia. This fascia is then passed over the transposed nerve and sutured to adjacent flexor fascia. There is wide variability in design of the fascial flap, and failure has been attributed to the development of perineural scarring or creating another constriction.^{7–12}

To enhance the benefits of subcutaneous transposition, the senior author uses a vascularized adipose pedicle from the anterior skin flap to secure the nerve. This flap restrains the ulnar nerve in a tension-free position, provides a vascular and pliable adipose bed that encircles the nerve to reduce adherence, and permits gliding. The use of fat flaps in nerve entrapment syndromes has been successfully employed in the treatment of recurrent carpal tunnel syndrome with the hypothenar fat pad flap.¹³ The senior author has been performing this ulnar nerve transposition for over a decade without secondary surgery or nerve subluxation. All patients reported improvement in symptoms, with a 94% rate of satisfaction.

INDICATIONS

Surgery is indicated for moderate to severe cubital tunnel syndrome, either primary or revision, in which conservative therapy has failed. This procedure is also indicated in the treatment of acute elbow trauma or after elbow contracture release.

CONTRAINDICATIONS

This procedure is contraindicated in the few patients with insufficient subcutaneous fat or when the limb has had severe global scarring.

SURGICAL ANATOMY

The subcutaneous layer of the medial elbow has sufficient adipose tissue to create a roughly 12 × 4-cm

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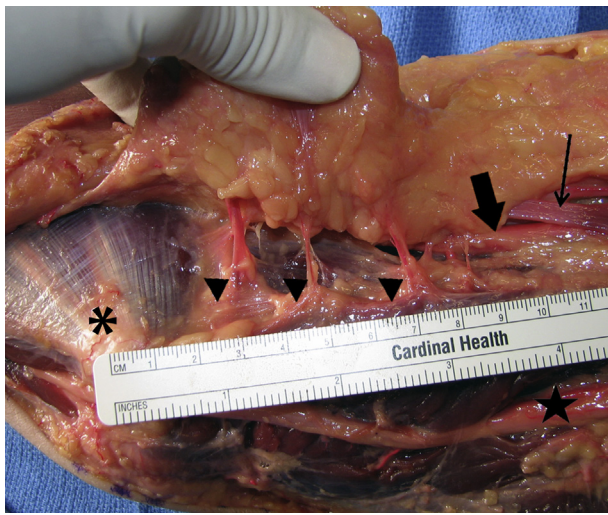


FIGURE 1: Latex arterial injection into the brachial artery (thick arrow) illustrating the numerous perforating arterial branches (arrowheads) arising from a branch of the brachial artery providing a vascular supply to the anterior fat pad (elevated at top of image). The brachial vein (thin arrow), ulnar nerve (star), and flexor-pronator mass (asterisk) are also visualized.

flap with an axial vascular pedicle to encircle the nerve and provide restraint against posterior subluxation. After the flap is raised, there is adequate remaining fat to supply the skin vitality and promote primary healing. Latex arterial injection into the brachial artery was performed on 5 fresh-frozen cadaveric specimens to evaluate the vascular supply of this adipose layer (Fig. 1). Dissection of this adipose flap demonstrated multiple arterial branches to the fat pad arising from a proximal ulnar branch off the brachial artery. This series of segmental vessels arising off a branch of the brachial artery supplied a large area of fat pad. We concluded from these dissections that this adipose flap has a rich arterial vascular supply that traverses an area large enough to supply coverage to the transposed ulnar nerve.

SURGICAL TECHNIQUE

Exposure and decompression of ulnar nerve

The patient is positioned supine with the affected arm on a hand table in abduction and external rotation to allow access to the medial epicondyle. A sterile tourniquet is placed on the upper arm and the limb is prepped and draped in standard fashion. A posteromedial incision, parallel to the intermuscular septum, is created over the medial epicondyle and extended from 10 cm proximal to 4 cm distal (approximately two thirds above and one third below the elbow). Blunt dissection under loupe magnification is continued through the subcutaneous layers. The ulnar nerve is

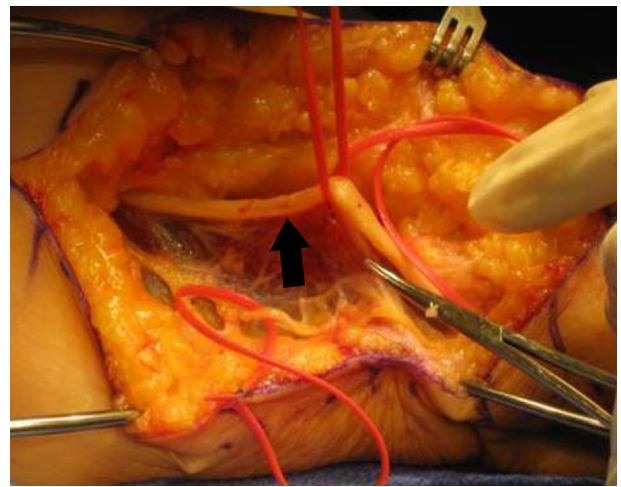


FIGURE 2: The ulnar nerve (arrow) is decompressed along its length around the elbow. The surgeon should maintain the vascular mesentery to prevent stripping of the extrinsic blood supply to the nerve.

identified proximally at the arcade of Struthers, posterior to the medial intermuscular septum in the medial triceps, and is carefully dissected along its entire visible length in an antegrade direction, while preserving epineurial vascular mesentery. The dissection continues with division of the arcuate ligament to the bifurcation of the flexor carpi ulnaris muscle (Fig. 2). Here, motor branches of the ulnar nerve are identified and preserved. The medial intermuscular septum is identified and excised to prevent secondary compression after transposition. After mobilization, the ulnar nerve is transposed anterior to the medial epicondyle.

Mobilization of adipose flap

An adipose flap, with its vascular pedicle intact, is then elevated from the subcutaneous tissue of the anterior skin overlying the nerve (Fig. 3). This fat sling prevents subluxation of the nerve and does not kink or prevent nerve slide during elbow motion. The fat is elevated with the pedicle visible, and there is always (Fig. 4) sufficient subcutaneous tissue nourishing the anterior skin. This dissection is visualized with a known pedicle artery and vein (Figs. 5, 6) Care must be used when dissecting the adipose flap because branches of the medial antebrachial cutaneous nerve will be adjacent to the dissection (Fig. 7). The pedicle will allow encircling of the ulnar nerve with the fat flap without tension on vessels or nerve.

Transposition of adipose flap

The pedicle is then gently wrapped around the nerve (Fig. 8) in a posterior-to-anterior direction and sutured to itself, creating a tunnel of adipose tissue

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