

Application of Perforator Flap Anatomy in the Design of Interposition Arterial Bypass Grafts in Hypothenar Hammer Syndrome

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Learning Objectives

The reader will be able to design interposition bypass grafts for hypothenar hammer syndrome based on the perforator flap arterial anatomy of the DIEA and LCFA systems

Introduction

- ❖ Hypothenar hammer syndrome (HHS) is an uncommon vascular condition in which the ulnar artery undergoes repetitive trauma leading to eventual aneurysm and/or thrombosis
- ❖ Interposition vein grafts across the occluded segment have been the mainstay of treatment but cardiac surgery literature demonstrates improved long-term patency rates in radial artery grafts compared to vein graft
- ❖ Potentially, arterial grafts may provide a better alternative to vein grafts in hypothenar hammer syndrome
- ❖ There have been a few case reports reporting the use of arterial grafts in vascular and plastic surgery literature; however, lack of "expendable" arteries remains a limiting factor as the radial artery is not an option in this condition
- ❖ Knowledge of perforator free flap anatomy (DIEP and ALT) has enabled the possibility to design various configurations for arterial grafts from common donor sites
- ❖ The characteristics of these donor arterial vessels may provide additional advantages over vein grafts

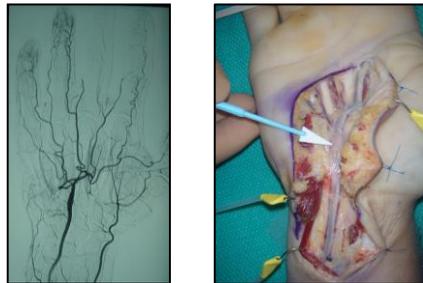


Figure 1 and 2: Pre-operative angiogram demonstrating ulnar artery aneurysm of right hand in male carpenter with emboli to index and middle finger. Intra-operative dissection showing extent of disease from distal forearm to involvement of numerous common digital arteries and palmar arch.

Purpose

Determine whether arterial interposition bypass grafts harvested from commonly used perforator free flap sites, DIEP and ALT, offer an advantage over vein grafts in the treatment of hypothenar hammer syndrome

Methods

Retrospective review of all patients undergoing ulnar artery bypass grafting for hypothenar hammer syndrome since 2008 by a single surgeon was performed

Results

- ❖ 5 patients presented with HHS between 2008-2014
- ❖ All male; ages 39-70
- ❖ All patients underwent ulnar artery bypass grafting using an arterial graft
 - ❖ Arterial grafts:
 - Deep inferior epigastric artery – DIEA (N=4)
 - Descending branch of lateral circumflex femoral artery - LCFA (N=1)
- ❖ Anastomosis site:
 - Proximal:
 - ❖ Ulnar artery (N=5)
 - Distal:
 - ❖ Palmar arch and CDA ring/small and CDA middle/ring (N=2)
 - ❖ CDA ring/small and palmar arch (N=3)
- ❖ All arterial bypass grafts have remained patent to date with a mean follow-up of 14 months as demonstrated on Allen's testing and post-op angiogram
- ❖ All patients have had resolution of symptoms and all donor sites healed uneventfully; 1 patient (LCFA) complains about paresthesia along the donor site scar
- ❖ No complications associated with hernia formation or muscle weakness at donor site

Cases

Case 1: 52 year old male right hand

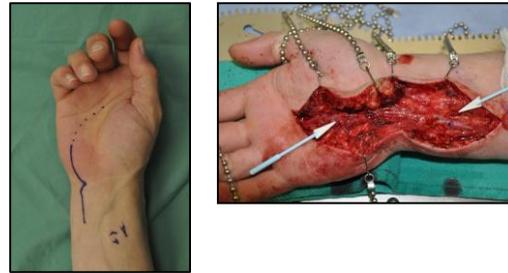


Figure 3 and 4: Surgical incision used and dissection of diseased vessel with markers showing extent of disease process



Figure 5: Diseased segment of ulnar artery cut out involving CDA ring/small and UDA small



Figure 6 and 7: LCFA donor site. Descending branch of LCFA has multiple 1-2 mm perforators entering RF or VL than can also be harvested with the main vessel

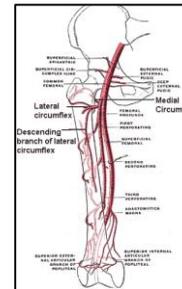


Figure 8: LCFA arterial graft anastomosed proximally to UA and distally to CDA of ring/small and palmar arch

Case 2: 39 year old right hand



Figure 9: Acute occlusion of ulnar artery at the wrist

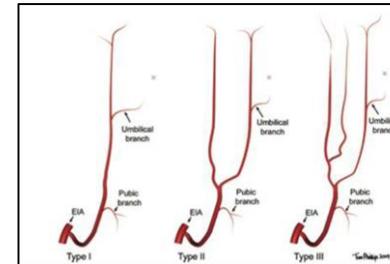


Figure 10: DIEA anatomy; type II present in 56% with a medial and lateral row. Both medial row and lateral rows can be harvested along with main DIEA trunk allowing for numerous configurations of anastomosis distally



Figure 11: Post op with DIEA graft to ulnar artery proximally and CDA D4/D5, D3/D4 and palmar arch

Discussion

Preferred arterial grafts:

❖ LCFA descending branch:

- ✓ Obese patient
- ✓ Ventral hernia
- ✓ Single distal anastomoses

❖ Thoracodorsal:

X Never due to need to position patient in lateral decubitus

❖ DIEA:

- ✓ Multiple distal targets required requiring reconstruction of arch
- ✓ Need for versatile configurations
- ✓ Thin patient
- ✓ Female patient as better donor site scar

Conclusions

- ❖ Arterial bypass grafts harvested from donor sites commonly used for free flaps provides an alternative to vein grafts
- ❖ Numerous advantages:
 1. Better tissue handling
 2. Better size match at proximal and distal anastomosis sites
 3. Increased branching patterns to allow for numerous end-to-end distal anastomoses
 4. Improved long-term patency rates and decreased stenosis rates maybe due to lack of intimal hyperplasia