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Case Report

Successful hand salvage with free flap reconstruction in a limb with arteriovenous fistula

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ABSTRACT

Free flap reconstruction of a defect on an extremity with an arteriovenous fistula is a surgical challenge due to the unique hemodynamic characteristics of an arteriovenous fistula and its potential complications. There is a paucity of evidence in the literature describing free flap reconstructions adjacent to arteriovenous fistulae. We present a successful case of an 86-year-old man with end-stage renal disease who underwent an anterolateral thigh free flap reconstruction of a hand defect immediately adjacent to his pre-existing radiocephalic fistula.

The free flap recipient vessels used were the dorsal branch of the ulnar artery, a tributary of the basilic vein and a vena comitans. Recipient veins were carefully chosen based on intra-operative barometry. The free flap reconstruction showed no signs of venous insufficiency or compromise at any stage. The radiocephalic fistula was never disrupted, nor was there any complication regarding the arteriovenous fistula. The patient maintained his regular hemodialysis throughout his care with routine arteriovenous fistula access.

The patient was reviewed six months post-op with no complications and he had returned to living independently in his own home. From our experience of this case, pre-existing arteriovenous

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fistulae should not preclude patients from undergoing free flap reconstructions if indicated.

Introduction

Arteriovenous fistula (AVF) is the preferred option for vascular access in hemodialysis patients due to its lower complication rate and long patency rate.[1] However, AVFs are associated with many complications: thrombosis, stenosis, ischemia, aneurysm and infection.[2] Therefore management of an extensive defect in the same limb as an AVF is a significant surgical challenge. Currently there is a lack of evidence regarding the treatment of choice for complex reconstructions on an extremity with pre-existing AVFs. We present a case of an 86-year-old man with end-stage renal disease with an extensive defect on his left hand distal to his radiocephalic fistula. Successful free flap reconstruction was achieved using an anterolateral thigh (ALT) free flap. Microscopic end-to-end anastomoses were performed between the flap's vessels and the dorsal branch of the ulnar artery, a tributary of the basilic vein and a vena comitans. To the best of the authors' knowledge, there is currently only one reported case that describes a successful free flap reconstruction with the sacrifice of the AVF to provide the recipient vessel for anastomosis.[3] This is the first case report in the literature that describes a successful free flap reconstruction with preservation of the ipsilateral AVF.

Case report

An 86-year-old man was diagnosed with *Mycobacterium ulcerans* following a two-week history of an expanding ulcer on the dorsum of his left hand. He was known to have end-stage renal disease secondary to right nephrectomy for renal cell carcinoma and was hemodialysis dependent for the previous 5 months. A radiocephalic fistula in his distal left forearm was utilized for his dialysis. *M. ulcerans* was confirmed as the offending organism with a positive acid-fast bacillus culture for *M. ulcerans* and a positive *M. ulcerans* polymerase chain reaction.

After multiple debridements, failed simple reconstructive efforts and a prolonged period of antibiotics the patient was left with a complex defect to the dorsal left hand and wrist encroaching on the tissues directly adjacent to the AVF site.

Regional flap and pedicled groin flap was considered as the potential reconstructive options. However, although regional flap can utilize alternate blood supply, sufficient tissue coverage would be difficult to achieve. On the other hand, a pedicled flap would bypass the AVF and another vascular access would need to be created for ongoing hemodialysis. In our case, a free flap was considered due to its good tissue coverage and the potential preservation of the AVF. Anterolateral thigh flap was thought to be the most appropriate option, as the contralateral radial forearm free flap would require incapacitation of both arms post-operatively.

Reconstruction was undertaken using an ALT free flap. Given the presence of the AVF, it is noted that no tourniquet was used in any procedures. At the time of free flap reconstruction, his defect measured approximately 15 cm $\times$ 20 cm with exposed extensor tendons, cutaneous nerve branches and extensor retinaculum (Figure 1A). The metacarpophalangeal joints (MCPJ) were open and further radical debridement and skin grafting was not a viable option. The extensor tendons were preserved during the procedure.

A risk of flap congestion due to high venous pressure in the efferent AVF venous system was a concern, so intra-operative venous pressure transduction was used prior to flap harvest and transfer. Pre-operatively a venous recipient pressure of less than 30 mmHg was determined as a requirement for safe free tissue transfer. In this case a normal caliber vein was selected and transduced intraoperatively,