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Recipient Vessel Dissection Technique in Diabetic Foot Patients with Perivascular Fibrosis

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Abstract

Diabetic foot ulcers are becoming more prevalent, and microsurgical free flaps are gaining popularity in salvaging the foot after postdebridement. The perivascular fibrosis around the recipient vessels often makes the dissection of vessels difficult. In this article, we describe a technique of dissection in such situations where fibrosis and dissection of vessels are fraught with danger. In the period from November 2020 to May 2023, 72 free flap reconstructions of the diabetic foot were done at our institute using this technique, with a success rate of 95.8%.

Keywords

- vessel
- dissection
- perivascular fibrosis
- free flap
- microsurgery
- dabetic foot
- reconstruction

Foot ulcers are a common and serious complication of diabetes. If not appropriately treated, these could lead to amputation of the lower limb. After debridement, the ensuing raw areas may need soft-tissue cover to salvage the foot.[1,2] Microsurgical free flaps are increasingly used to solve the problem.[3,4] An often-experienced problem is the dissection of sufficient length of recipient vessels due to perivascular fibrosis. Repeated episodes of inflammation and cellulitis, which occur due to infection of the ulcer, lead to accumulation of edema fluid rich in proteins, which, when settled, causes fibrosis.[5] The easily separatable perivascular planes are obliterated, and the fibrotic tissue surrounds both the artery and the venae comitantes as a whole, appearing like a cocoon. Attempts to dissect the plane between the artery and the vein could result in injury to the vessels. Another problem is the difficulty in achieving control of the small branches of the arteries and interconnecting vessels between the venae comitantes. This fibrosis can cause vessel narrowing and stiffening, impairing blood flow to the affected area and decreasing the success rate of the free flap reconstruction procedure.

At our institute, from November 2020 to May 2023, 72 free flap reconstructions of the diabetic foot were done with a flap success rate of 95.8%. Preparing the recipient site vessels form the most complex and crucial part of these procedures. The first step in preparing the recipient vessels is separating an adequate length of the arteries and veins. Compared to posttraumatic free flap reconstruction of the foot, reconstructing the diabetic foot poses a unique challenge in recipient site vessel preparation due to perivascular fibrosis. Instead of attempting to separate the vein and the artery by dissecting in the plane between them, we prefer dissecting the plane over the artery. Fine sharp-tipped scissors are used for the dissection. A snip is made in the fibrous cocoon over the artery with the scissors. Through a series of sharp and blunt dissection, the plane between the fibrous cocoon and the adventitia of the artery is exposed. Now the artery becomes distinct from the layers of the fibrous cocoon. Once this plane is reached, it is extended along the longitudinal axis of the artery, and the fibrous layer over the artery is cut depending on the length of the vessel required. The

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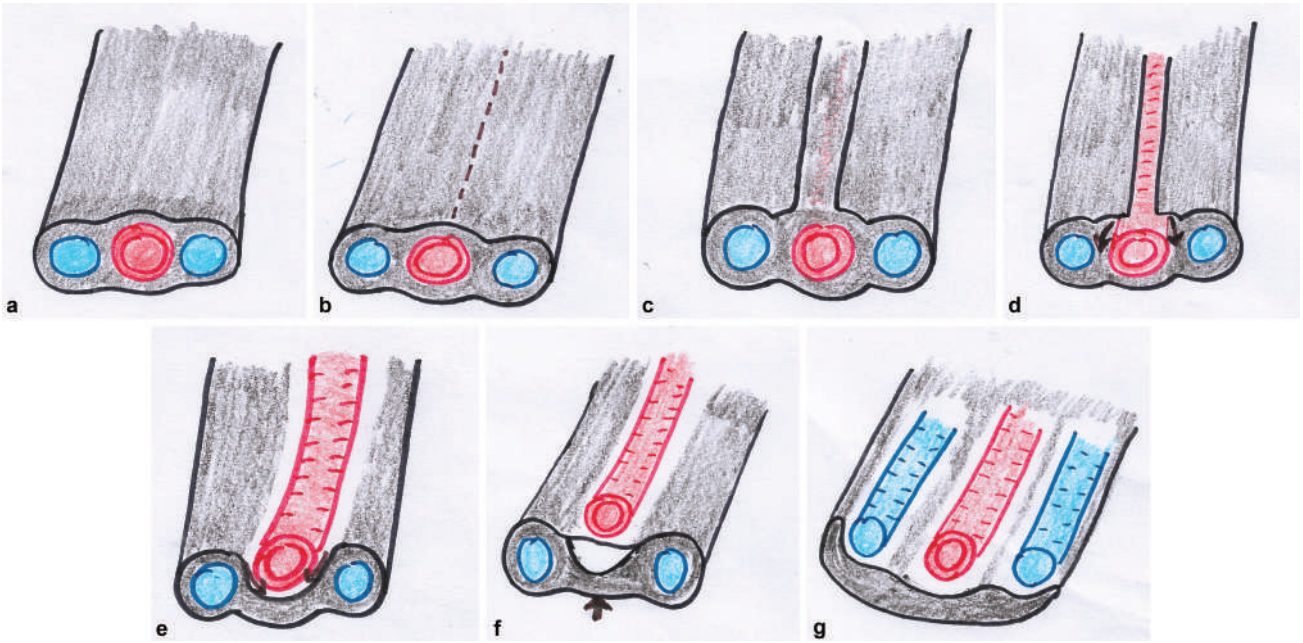

Fig. 1 (**a**) Artistic illustration of vessels encased in a fibrotic cocoon. (**b**) *Dotted lines* over the artery indicating the line of dissection. (**c**) The fibrotic cocoon is dissected till the adventitia of the artery is exposed. (**d**) The dissection proceeds on either side of the artery. (**e**) The dissection further proceeds to the deeper plane around the artery. (**f**) The artery is entirely freed from the fibrotic cocoon. The venae comitantes are separated through dissection of the fibrotic tissue in between them. (**g**) The artery and the venae comitantes are separated safely from the fibrotic cocoon.

superficial plane is chosen as there are few or no branches that emerge in this superficial plane. Now the dissection is carried out on either side of the artery. The branches emerging from the arteries are clearly visualized as the artery is released from fibrosis, making it easy for the branches to be coagulated or clipped. This allows the artery to be easily separated from the fibrous cocoon. After an adequate length of the artery is separated, attention is directed toward isolating the venae comitantes from any other vessels. Moreover, the venae comitantes also simultaneously separate from the artery during the course of dissection, thus making it easy for the surgeons to dissect the veins (►**Fig. 1**; ►**Video 1**, available in online version only). The surgeon must be gentle and persistent, making slow progress in dissecting the fibrosed vessels. Also, we isolate and keep the subcutaneous veins we encounter, the saphenous vein, and its tributaries as a backup in case the venae comitantes are severely fibrosed and difficult to dissect or adequately dilatable with heparin saline.

Video 1

Video demonstrating the technique used by the authors in recipient vessel dissection in diabetic foot patients with perivascular fibrosis. Online content including video sequences viewable at: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0043-1775870.

We attempted free flap reconstruction in 73 patients with diabetic foot ulcers. One patient had a single-vessel limb with severe fibrosis, and the authors could not dissect the vessels. The procedure had to be abandoned. In the rest of the 72 cases, this technique was successful. This technique can also be used in other situations where fibrosis and dissection of vessels are fraught with danger.

Conflict of Interest
None declared.

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