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IDEAS AND INNOVATIONS

Reconstructive

Splinting Technique for Venous Anastomosis in Lower Limb Free Flap Reconstruction

Haitham A. Khashaba, FRCS*
Muhammad F. Khadim, FRCS†
Thomas W. Chapman, FRCS‡

Summary: Lower limb reconstruction of the distal third following tumor extirpation or trauma is a complex procedure. The use of free flaps to cover lower limb defects is a common practice in our department. Vascular kinking or compression resulting in thrombosis is the leading cause of venous congestion and free flap failure in lower limb reconstruction. We describe a simple and inexpensive technique to avoid venous kinking during microvascular anastomosis in free flap reconstructions in the lower leg, which has proved safe in a cohort of patients. *(Plast Reconstr Surg Glob Open 2020;8:e3108; doi: 10.1097/GOX.0000000000003108; Published online 23 September 2020.)*

INTRODUCTION

Lower limb reconstruction of the distal third following tumor extirpation or trauma is a complex procedure. The paucity of the soft tissue and skin in the lower third often dictates that soft tissue and skin are brought in from other sites of the body. As a result, the use of free flap reconstruction has become the mainstay of treatment of defects in the distal third of the leg.[1,2]

The use of free flaps to cover lower limb defects whether fasciocutaneous (eg, anterolateral thigh, scapular and parascapular) or muscle flaps (eg, gracilis, latissimus dorsi) is a common practice in North Bristol Trust, with an average pedicle length of 8–10 cm and a vessel diameter of 1–2 mm.[3,4] Anastomosis in this unit is usually performed to the posterior tibial artery and in an end-to-side fashion. Due to the superficial nature of the recipient vessels at this level, often not much pedicle length (about 4–5 cm) is required; however, shortening the pedicle can reduce the vessel diameter significantly. This makes microsurgery more challenging and increases the risk of vessel mismatch. Preserving extra length, however, leaves a tortuous loop with the risk of kinking or compression of the vein. Vascular kinking or compression resulting in thrombosis is the leading cause of venous congestion and flap failure.[5–7]

We present a novel technique of splinting the venous anastomosis using its arterial counterpart to keep it patent and avoiding kinking.

*From the *University Hospital of North Durham, Durham, United Kingdom; †Hull University Teaching Hospital, United Kingdom; and ‡Southmead Hospital, North Bristol NHS Trust, Bristol, United Kingdom.*

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TECHNIQUE

The venous end-to-end anastomosis is fashioned (either to the deep or to the superficial system). This produces a loop in the vein, which can kink at its apex. The flap artery is then passed through the loop and anastomosed end to side to the donor artery distal to the venous anastomosis level (Figs. 1, 2). This artery keeps the venous loop open and limits the risk of collapse and kinking. The pulsations of the artery and its muscular wall may be considered the reason behind the success of this technique (Fig. 3). The authors have used this technique in over 120 cases with no venous congestion complications (ie, venous congestion requiring return to theaters, use of leaches, or resulting in a partial flap loss).

DISCUSSION

Free flap reconstruction for large lower leg defects has become the standard treatment in the United Kingdom.[8] Flap pedicle kinking and twisting are generally avoided by anatomically positioning the pedicle and the anastomosis,[6] which might not be possible in cases of trauma, as defects

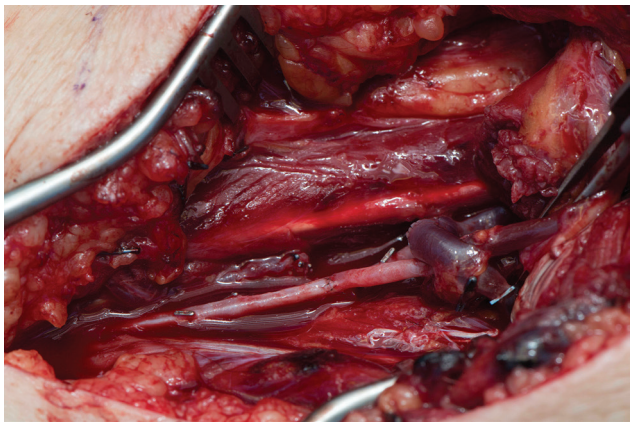

Fig. 1. End-to-side anastomosis of the artery is performed proximally. The venous end-to-end anastomosis is performed to create a gentle loop, which is kept patent by the artery muscular wall and pulsations.

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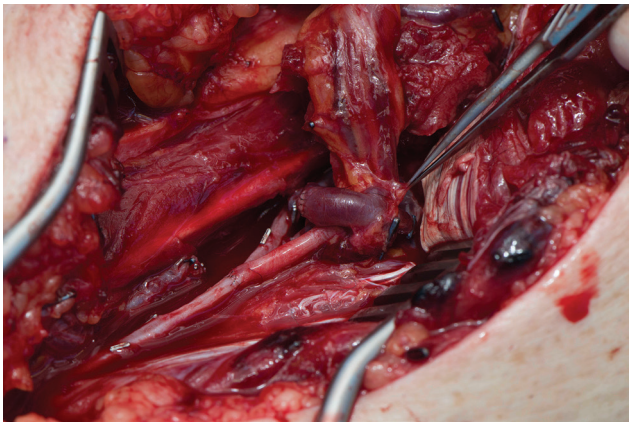

Fig. 2. Another view of the artery, as it passes through the venous loop and anastomosed end to side proximal to the venous anastomosis. The arterial anastomosis splints the venous loop, preventing it from collapsing or kinking.

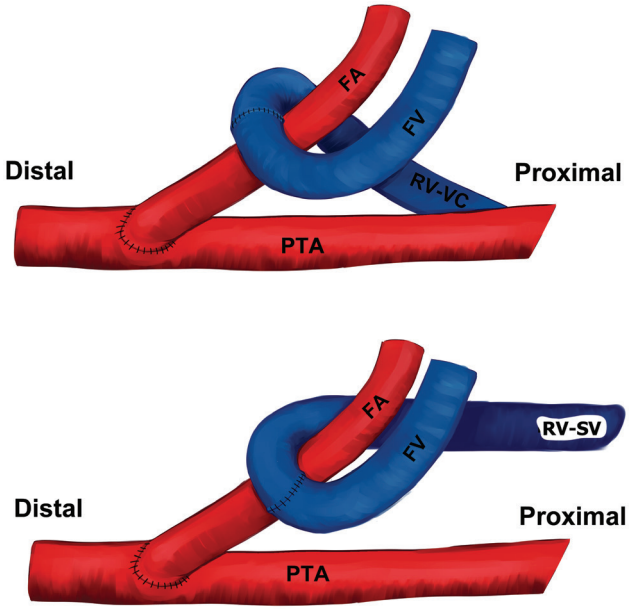

Fig. 3. A schematic digital drawing of the technique. The flap artery is passed through the gentle loop of the vein to keep it patent and prevent it from collapsing. FA, flap artery; FV, flap vein; PTA, posterior tibial artery; RV-SV, recipient vein-saphenous vein; RV-VC, recipient vein-venae commitantes.

are not preplanned. The superficial nature of the vessels distally may lead to excessive length, which may not be trimmed shorter due to reduced vessel diameter, and so subsequent tortuous course becomes prone to kinking.[7] Several techniques have been developed by head and neck surgeons and in lower limb reconstruction following tumor extirpation to avoid this potential problem by use of fibrin-based tissue glue[9] or a ringed Gore-tex vascular tube.[10]

Our technique is simple, inexpensive, and uses no foreign material. It provides a safe and simple way to splint the venous anastomosis.

Haitham A. Khashaba, FRCS
Plastic Surgery and Reconstructive Department
University Hospital of North Durham
County Durham and Darlington NHS Trust
50 Foxfield Close, Kenton Bankfoot
Newcastle Upon Tyne NE13 8AY, United Kingdom
E-mail: oak_80@hotmail.com

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