Retroauricular subcutaneous Dacron tunnel for extracranial-intracranial autologous vein bypass graft

Technical note

YOSHIKAZU OKADA, M.D., TAKEshi SHIMA, M.D., MASAHiro NISHIDA, M.D., AND KANJI YAMANE, M.D.

Department of Neurosurgery, Chugoku Rousai Hospital, Kure, Japan

The authors describe the application of a Dacron tube as a retroauricular subcutaneous tunnel in extracranial-intracranial autologous vein bypass graft.

KEY WORDS • autologous vein graft • EC-IC bypass • Dacron graft • subcutaneous tunnel

A UTOLOGOUS vein bypass grafts have been used in the surgical treatment of ischemic cerebrovascular disease. One of the most important reasons for use of this method is to achieve a patent vein graft, which is closely related to technical problems such as donor-recipient size disparity, anastomotic distortion, inappropriate graft route, and surgical manipulation during harvest and preparation of the vein segment. Sundt and Sundt pointed out the importance of gentle manipulation to minimize intimal damage during the preparation of vein grafts. Puca, et al., reported a method of hydrostatic dilatation of venous autograft for limiting trauma to the vessel wall. They dilated venous grafts hydrostatically using normal heparinized saline at room temperature with a constant pressure of 80 to 100 mm Hg. With the introduction of these meticulous techniques a method of venous preparation seems to be established, but the problems inherent in a subcutaneous tunnel, such as compression, twisting, and/or kinking of the graft, have not been solved. One previously reported method of preventing twisting of vein grafts was to mark the anterior adventitial surface of the vein in situ with a pen, but this was not enough to eliminate continued problems.

We have developed a new technique using a stable subcutaneous Dacron tunnel that relieves complications such as twisting and compression of vein grafts within the subcutaneous tunnel.

Operative Technique

A vein segment approximately 20 cm in length, obtained from the region above the ankle to below the knee, was prepared. Flow was maintained through the vein while tributaries were ligated and divided between 3-0 silk sutures. The isolated vein was perfused with cold heparinized saline (5000 IU/500 ml) and leakages were closed with 6-0 nylon sutures. During these preparations, the vein was meticulously handled to avoid intimal damage and to prevent possible subsequent thromboembolism.

Figure 1 shows our method of external carotid artery (ECA)-superior cerebellar artery (SCA) autologous vein bypass graft for vertebrobasilar insufficiency. After exposure of the cervical carotid vessels, we approached the SCA subtemporally on the affected side through an osteoplastic temporal craniectomy. A subcutaneous tunnel was formed with a dissector from the cranial incision to the cervical incision behind the ear. Care was taken in enlarging the tunnel of the galeal fascia at the base of the skull with scissors. A Dacron tube 6 mm in diameter and 10 to 15 cm in length was placed in the subcutaneous tunnel (Fig. 1A). The vein graft was passed through the Dacron tunnel to lie in approximation with the SCA. Fortunately no resistance was met during the procedure, thus avoiding inadvertent twisting or kinking of the graft in the tunnel (Fig. 1B). Cortical anastomosis was performed in a standard end-to-side fashion,
namely, the proximal end of the vein graft to the ambient portion of the SCA. The length of the vein graft was adjusted at its distal end, at the level of the ECA. A smooth round opening 4 to 6 mm in diameter was created with a vascular punch in the ECA 1 to 2 cm distal to the bifurcation. The distal end of the vein graft was also anastomosed to the ECA in an end-to-side fashion (Fig. 1C). Before bypass flow was restored, the air was removed through a tube that was cannulated into a branch of the vein through which air was removed before flow was restored. C: The vein graft is first anastomosed to the SCA and then to the ECA.

Postoperative angiography revealed excellent patency of the vein bypass graft between the ECA and the SCA (Fig. 2). This retroauricular subcutaneous Dacron tunnel method has been applied in 15 extracranial-intracranial (EC-IC) bypass procedures with vein grafts, and all bypasses were demonstrated to be patent on postoperative angiography.

Discussion

The three major problems associated with autologous vein grafts for EC-IC bypass are 1) acute angulation of the graft in the cervical area and/or compression of the vein at the mastoid process; 2) the size discrepancy between recipient vessels and vein grafts; and 3) intimal damage of vein grafts during preparation. It has been suggested that early failure in EC-IC vein bypass graft most often occurs as a direct result of poor orientation of the vein graft in the subcutaneous tunnel. This complication might be overcome by positioning the vein graft in the axis of head rotation, resulting in less displacement of the graft following movement of the head. The retroauricular bypass route between the common carotid artery and the cortical artery has been reported to be in the axis of head rotation. Additionally, it may be advisable to use a method that will reduce compression, twisting, and kinking in the subcutaneous tunnel. We successfully used a Dacron tube to construct a stable and linear subcutaneous tunnel. Dacron grafts have been safely used as prostheses in general vascular surgery, even in highly mobile regions such as the iliofemoral and axillofemoral anastomoses. Our application of a subcutaneous Dacron tunnel appears to reduce or
avoid complications related to the subcutaneous tunnel, which in turn contributes to preventing early occlusion of the autologous vein graft in EC-IC bypass.

References

Manuscript received August 4, 1993. Accepted in final form December 13, 1993. Address reprint requests to: Yoshikazu Okada, M.D., Department of Neurosurgery, Chugoku Rousai Hospital, 1-5-1 Hirotagaya, Kure 737-01, Japan