SHORT REPORT

Femoro-popliteal Below Knee Bypass with a Cryopreserved Saphenous Vein Homograft Sheathed with Biocompound Tubing

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Introduction

Aneurysmal degeneration of autologous saphenous vein (ASV) used in femoro-distal revascularization is a fairly frequent but not always predictable event and involves a high risk of thrombosis of the bypass itself. Treatment involves repair, removal and replacement or endovascular treatment. If replacement is necessary for revascularization with the distal anastomosis below the knee, results with heterologous grafts are disappointing. More favourable results can be achieved with cryopreserved homologous veins (CHV) or arterial allografts. However, a high rate of early aneurysmal degeneration is described in most published series. A method is now available for sheathing and reinforcing CHV with a highly flexible metal braided tubing. This prevents aneurysmal degeneration and allows CHV to be used. This report describes the replacement of an aneurysmally degenerated ASV bypass with a CHV which was reinforced with biocompound tubing.

Case Report

A 40-year-old male with a history of heavy smoking (40 cigarettes/day) and systemic arterial hypertension underwent a below-knee femoropopliteal bypass with “in situ” saphenous vein due to critical ischemia of the lower limb in 1993.

Subsequent followup confirmed good reperfusion of the lower limb and relief of the symptoms. Serial follow-up using duplex ultrasound showed patency of the bypass but with a significant, progressive increase in the vein diameter after 24 months. Control angiography showed a patent popliteal artery. Surgery was planned for elective removal of the bypass. When the patient was admitted to hospital, he complained of pain in the lower limb. Duplex examination revealed a thrombosis, making replacement of the aneurysmal segment of the graft urgent. For the replacement a segment of CHV with a length of about 40 cm and a caliber of 5 mm was used. Sheathing with the biocompound tubing was performed on the bench (Fig. 1). An expandable, non-compliant balloon catheter with a diameter of 5.5 mm was inserted into the lumen of the vein, throughout its length (Fig. 2). A highly flexible metal tubing was then applied on the outside of the vein using a special release set (Fig. 3). The balloon catheter was then inflated, thus pushing outwards the tributaries of the CHV. Then the braided tubing was adapted to the irregular surface of the CHV by slight smoothing out towards both ends and both were bonded together by applying fibrin sealant (Tissucol, Fig. 4).

After polymerization of the fibrin sealant, the balloon catheter was deflated and removed. The ready-to-use biocompound prosthesis retains the flexibility of the vein and at the same time it does not obstruct penetration of the needle when suturing the anastomosis.

After removal of the aneurysmally degenerated bypass, a new below-knee femoropopliteal bypass was constructed. When the patient was discharged, the
The bypass was patent with good relief of clinical symptoms. Duplex follow up at 2 years confirmed patency of the bypass without aneurysm formation.

Discussion

The problem facing the vascular surgeon in the event of failure of a bypass for peripheral revascularization...
is often very complex, and particularly troublesome if the patient has a fairly long life expectancy. Treatment options include the use of another segment of autologous vein or a cryopreserved arterial or venous segment or the use of synthetic grafts. None of these alternatives is particularly satisfactory.

There are many important problems relating to the use of CHV. The available literature regarding use of CHV in surgery for peripheral arterial reconstruction shows that there is a marked tendency for aneurysmal dilation, up to 58% after 3 years. The primary and secondary patency rate of CHV bypasses rises up to 53% after 5 years. On the other hand secondary patency rate of 36% after one year are quoted.6

In this context, the biocompound type of prosthesis, used in ectatic or unmistakably varicose autologous saphenous vein, represents an alternative. In heart surgery, the biocompound graft has already been used with satisfactory results for a number of years. The results of long term patency appear to be similar to those observed for the native saphenous vein (68.7% for native vein compared with 68.3% for the biocompound graft).7

The application of this method to surgery for distal revascularization of the lower limbs has so far only been described sporadically. The technique used by us was similar to that used for cardiac procedures. The biocompound hybrid prosthesis technique was found to be safe and simple. The technical result was good, and so was the short-term clinical result. The association of CHV with biocompound tubing may lead to better long-term patency as well as reducing the dilation problems that are frequent when CHV is used alone. Furthermore, experimental studies showed that external support of the vein wall reduces medial and intimal proliferation, thus reducing the possibility of the appearance of neointimal hyperplasia which represents one of the most frequent causes of failure of a venous bypass.8

In this particular young patient with a limited amount of autologous vein available for other uses (aorto-coronaric bypass or femoro-popliteal below-knee bypass), we considered it advisable to bond the biocompound tubing with a cryopreserved homologous saphenous vein.

This technique is still in the initial stages and requires evaluation with regard to time as well as numbers; but it may be a practical alternative for complex peripheral revascularization in the future.

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References


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