A clinical application of the Omniflow II collagen-polymer vascular prosthesis in a polytetrafluoroethylene graft infection case

A Ozelci, U Yetkin, M Akyuz, O Aslan, I Yurekl?, A Gurbuz

Citation

Abstract
The Omniflow vascular prosthesis is a collagen--polyester composite which has been used successfully for peripheral arterial reconstruction. In this study we present a clinical application of the Omniflow II collagen-polymer vascular prosthesis in a polytetrafluoroethylene graft infection case

INTRODUCTION
Arterial reconstruction is the most important surgical strategy for patients with arteriosclerotic obstruction in the lower limbs. One of the most feared complications of the vascular bypass procedures using traditional prosthetic grafts such as polytetrafluoroethylene (PTFE) and polyethylene tetraphthlate (Dacron) is the appearance of infection after implant. Wound dehiscence with exposure of the lower anastomosis is a limb- and life-threatening complication of femorodistal bypass[1]. Virulent graft infections presenting with sepsis or anastomotic dehiscence should continue to be treated with total graft excision[1].

CASE PRESENTATION
Our case was a 62-year-old male. He had undergone right femoropopliteal bypass surgery with 6 mm ringed polytetrafluoroethylene graft 6 months ago. One month after the surgery he had undergone another procedure for hematoma extraction at femoral region. This time he was admitted to our hospital with complaint of protrusion of the synthetic graft from the skin over the midportion of the subcutaneous tunnel for 10 days, probably secondary to destruction of the cutaneous tissue overlying the graft (Figures 1&2).

Following the hospitalization blood and wound tissue cultures were obtained and parenteral antibiotherapy of broad spectrum was initiated. He was diagnosed as graft infection and taken to the operating room. First of all, his infected graft was extirpated (Figure 3).
The tunnel where the PTFE graft was extirpated from was irrigated with diluted antibiotic solutions. Then, a new tunnel was prepared, located more laterally. Afterwards, distal and proximal anastomoses of the collagen-based composite biosynthetic graft of Omniflow II Vascular Prosthesis-Straight (Bio Nova International Pty Ltd 751-640:REF,CE0197) were completed after preparation of the graft (Figures 4&5).
Figure 4
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Postoperative period was event-free. Distal pulses of the right lower extremity were manually pulsatile and in equal amplitude with those of the contralateral extremity during both early and late period. No complications related to the wound and tunnel region were observed throughout early and late postoperative period and our patient is still under periodical outpatient follow-up.

DISCUSSION

The search for an ideal vascular prosthesis to bypass peripheral vascular obstructive lesions is necessary where autologous tissues are either unavailable or unsuitable. Polymers such as Dacron and polytetrafluoroethylene (PTFE) have been used in high flow states with relative success but with limited application at lower flow states. In view of the advances in tissue engineering, this makes possible the creation of an ideal off-the-shelf bypass graft.

Long-term explant analysis of a biosynthetic composite vessel, the Omniflow Vascular Prosthesis I, has previously shown sound structural durability. An important determinant in defining durability has been the evaluation of the degree of persistence of the original biological components and the augmentation by new tissue. The development of a panel of specific monoclonal antibodies to collagens, that allow detection of new host collagen among the original collagens of the prosthesis has been a key factor. Using immunohistology with specific monoclonal antibodies, types I and III collagens were found to be the major components throughout the prosthesis. Type VI collagen was also present but was mainly associated with cells, particularly around the polyester mesh and silicone interfaces. While elastin was absent, two elastic tissue microfibrillar proteins were present uniformly throughout the structure. Immunohistology, using a monoclonal antibody specific for type III collagen, and chemical analysis, indicated that there was high proportion of type III collagen in the grafts, particularly in the region surrounding the mesh fibers. The novel explant analyses serve as a good predictive indication to the in vivo performance of the device and would be useful in rapid monitoring of further modifications to this vessel or to other collagen-based prostheses.

Vascular prostheses Omniflow II which are available only recently and should be used for vascular reconstructions for arterial obliterations. The Omniflow Vascular Prosthesis (OVP) is a truly integrated bio-synthetic composite of polyester mesh and ovine connective tissue components. In animal and human studies, the prosthesis has demonstrated long-term patency rates comparable and often better than alternate surgical replacements, with minimal aneurysmal or thrombotic problems.

In the study of Wermeister et al, samples of an ovine collagen-polyester composite device suitable for peripheral revascularization, the Omniflow Vascular Prosthesis, have been retrieved for morphological and immunohistological analyses during and up to 4 years of implantation in a dog aortoiliac by-pass model. The prosthesis explants were shown to retain their structural integrity, with no aneurysmal formation and with little thrombus accumulation.

Omniflow, the ovine biosynthetic prosthesis, has significantly improved surface and mural properties over previous attempts at producing prostheses for vascular reconstruction. Immunohistological studies on samples recovered from dogs after 4 years show that the original ovine collagen is still present after 4 years, and it is further augmented by the deposition of new, host-derived connective tissue.

In the experimental study of Ratto et al, tubular segments of 35 x 8 mm made of (1) tanned ovine collagen and integral polyester mesh, either of the first (Omniflow I) or second generation (Omniflow II), or (2) polytetrafluoroethylene (e-PTFE), have been sutured in the infrarenal inferior vena cava of pigs, and removed 1 hour, 7, 14, 28, 56 and 112 days after implantation. The patency rate of biosynthetic grafts was higher than that of e-PTFE grafts. These results indicate that biosynthetic prostheses may be suitable vascular substitutes in low flow and low pressure systems.
In conclusion; the main factors to be considered when choosing a prosthesis are patency, susceptibility to infection and formation of aneurysms. The low infection rate and very slight danger of aneurysm, the long-term results suggest that the ovine collagen prosthesis can be recommended for use[12].

References
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Author Information

Ahmet Ozelci
Specialist in Cardiovascular Surgery, Department of Cardiovascular Surgery, İzmir Atatürk Training and Research Hospital

Ufuk Yetkin
Clinic Deputy Chief in Cardiovascular Surgery, Department of Cardiovascular Surgery, İzmir Atatürk Training and Research Hospital

Muhammet Akyuz
Resident in Cardiovascular Surgery, Department of Cardiovascular Surgery, İzmir Atatürk Training and Research Hospital

Ovunc Aslan
Resident in Cardiovascular Surgery, Department of Cardiovascular Surgery, İzmir Atatürk Training and Research Hospital

Ismail Yurekli
Specialist in Cardiovascular Surgery, Department of Cardiovascular Surgery, İzmir Atatürk Training and Research Hospital

Ali Gurbuz
Clinic Chief in Cardiovascular Surgery, Department of Cardiovascular Surgery, İzmir Atatürk Training and Research Hospital