Successful treatment of an infected new vascular graft

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Abstract

A 71-year old male who underwent total aortic arch replacement using a newly developed uncoated vascular prosthesis (Triplex®) developed postoperative mediastinitis due to a methicillin-resistant Staphylococcus infection. The Triplex® vascular prosthesis has a unique three-layer structure with a non-porous elastomer middle layer material and has several advantages over more traditional prosthesis, namely, good manipulability, good patency, dilatation resistance, and low inflammatory tissue reaction. This is the first reported case of a postoperative prosthesis infection that was successfully treated by omentum wrapping and closed irrigation with triphenylmethane dye. Bacterial cultures of blood samples were negative throughout the course of treatment, and 8 months after the initial operation. Computer tomographs revealed no evidence of infection or anastomotic pseudoaneurysms. In conclusion, the combination of omentum wrapping and the closed irrigation procedure using triphenylmethane dye can be considered to be an effective treatment for Triplex® graft infection.

Keywords: Graft infection • Triplex • Omentum wrapping • Triphenylmethane dye

INTRODUCTION

Prosthetic graft infection is associated with non-neglectable morbidity and high mortality [1]. Triplex® (Terumo, Tokyo, Japan) is a newly developed, large diameter graft that is sealed with a non-biodegradable coating material. We report the first successfully treated case of postoperative infection of this prosthesis caused by methicillin-resistant Staphylococcus (MRS) species and discuss the combination of treatment of an omentum flap implantation and closed irrigation treatment with triphenylmethane (gentian violet) dye.

CASE REPORT

A 71-year old male with aortic arch aneurysm with a minor axis diameter of 79 mm underwent total aortic arch replacement using a new uncoated four-branched Triplex® prosthesis in August 2011. During extracorporeal circulation, hypothermic circulatory arrest and selective cerebral perfusion methods were used. The lowest bladder temperature was 26°C, aortic cross-clamping time was 279 min and selective cerebral perfusion time was 152 min.

White blood cell counts returned to a normal range on the fourth postoperative day (POD), however, serum C-reactive protein (CRP) level remained high between 13 and 14 mg/dl. On the 11th POD, a brown liquid was observed seeping out of the sternum wound. A re-exploration operation was performed on the 14th POD and the patient was diagnosed with postoperative mediastinitis. After the removal of a fibrin clot and tissue masses attached to both the mediastinum and the vascular graft, the surgical field was irrigated with a saline solution. After the local debridement, 0.1% gentian violet solution was applied to the anastomoses of the aorta, arch vessels and the main body of the vascular graft. Omentum was placed around the graft and in the mediastinal dead space. Omentum covered proximal three quarter of the prosthetic graft, however, did not reach to the distal anastomosis. An irrigation tube was placed between the omentum and the vascular prostheses. One drainage tube (BLAKE® Silicon Drains, Ethicon, Inc., USA) was placed on the rear side of the arch vessels distal to the anastomosis. Another drainage tube was also inserted into the left pleural cavity, and the sternum wound was closed. Bacterial culture revealed MRS from the stumps of the fourth branch of the prostheses graft which had not been used for anastomosis and from the surface of the prosthesis and mediastinal collected fluid.

Continuous closed irrigation with a 0.02% gentian violet solution (2000 ml/day) was continued for 3 days, followed by intermittent irrigation with the same solution (500 ml × 2/day) for 5 more days. Subsequent intermittent irrigation with saline (500 ml × 2/day) was performed for a further 5 days with regular bacterial culture of the drained fluid. Sternal transection occurred on the 10th day after the second operation, and sternum re-fixation was carried out. This third operation revealed no mediastinal infection, and bacterial cultures taken from the operative field were all negative. Vancomycin was administered for 28 days, followed by linezolid for a further 35 days. Blood cultures were all negative throughout the course of treatment. The serum CRP level returned to normal on the 30th day after the third operation (Fig. 1).
Eight months after the initial operation, computer tomography (CT) revealed no evidence of re-infection (Fig. 2), and CRP values stayed normal. Periodical evaluation using CT and blood examination are scheduled at least twice a year.

**COMMENT**

Triplex®, which was released in December 2008, has a unique three-layer structure. The outer and inner layers of the vascular graft are made of porous Knitted Dacron, which is designed for easy penetration of surrounding cells and tissues after implantation. The middle layer is a highly elastic non-porous elastomer (elastic plastic). Multicenter clinical trials in Japan showed good manipulability, good patency, excessive dilatation resistance and little inflammatory reaction. The main characteristic of this new graft is the non-biodegradable coating material of the middle layer. Tabata et al. reported reduced duration of mediastinal drainage after thoracic aortic surgery, and promotion of early discharge.

Conventionally, postoperative graft infection needs the excision of the infected graft. However, several graft cases have been reported where the graft did not need to be extracted. In the case of Dacron graft infection, the efficacy of rifampicin, povidone-iodine or gentian violet has been reported. In this case, gentian violet solution was utilized during the operation and postoperatively. Gentian violet is known to be a potent antibacterial agent for gram-positive bacteria, including MRS and methicillin-resistant *Pseudomonas aeruginosa*. The advantages of this agent in comparison with povidone-iodine include the lack of local irritant action, the deposition on necrotic tissue and no attenuation of the sterilization effect even in the presence of serum. For Triplex® graft infection, rifampicin is not effective and alcohol-based disinfectants are not used because of the possibility of damage to the elastomer layer.

The disadvantage of gentian violet solution is high viscosity even at low concentrations. Gentian violet solution sometimes caused obstruction of the drainage tubes during intermittent irrigation. In addition, the fluid collected was not suitable for bacterial culture due to the presence of the gentian violet. In this case, the drainage tube was cleaned with a saline solution, and bacterial culture was conducted using irrigated saline.

We adopted both continuous irrigation treatment and omentum wrapping in the re-exploration operation. Continuous irrigation treatment might prevent the omentum from provoking proper migration of new, vascularized tissue into the graft. We aimed the sterilization around the graft just after surgery. After the expiration of continuous irrigation, we expected the neoangiogenesis by omentum.

In conclusion, the combination of omentum wrapping and the closed irrigation procedure using gentian violet is considered to be an effective treatment for infection of the Triplex® graft.

**Conflict of interest:** none declared.

**REFERENCES**