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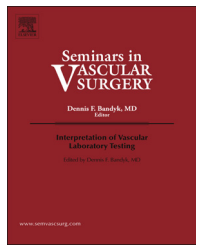

Current management of infected aortic grafts in patients with connective tissue disorders

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ABSTRACT

Patients with connective tissue disorder present a particular clinical challenge in the treatment of aortic graft infections. Specific complexities arise in patients with connective tissue disorders when reoperation for aortic graft infection is required. Herein we describe current management of infected aortic grafts in patients with connective tissue disorders using homograft and rifampin-coated graft replacements using in situ replacement therapy, which is associated with improved outcome compared to graft excision and extra-anatomic bypass.

1. Introduction

More than a century after Sir William Osler declared that "there is no disease more conducive to clinical humility than aneurysm of the aorta," aortic aneurysm pathology continues to challenge vascular surgeons [1]. With advances in operative technique and perioperative care of aneurysm patients, one could contend that aortic graft infection after aneurysm repair is now the test of the surgeon's humility [2]. Despite advances in endovascular techniques in patients with connective tissue disorders (CTDs), open repair of thoracoabdominal aortic aneurysms (TAAAs) continues to be the prevailing method of repair secondary to stent-graft–induced problems in the remaining aorta [3,4]. After open repair of TAAA, aortic graft infection rates range from 0.6% [5] to 1.7% over the long term [6]. These infections endure as remarkably lethal conditions, with reported mortality of up to 80% [6].

While much has been written about aortic graft infections and approaches to treatment in general, the literature on challenges and approaches to treatments of such infections, specifically in patients with CTD, is sparse. Most reports include these patients in series dominated by patients with atherosclerotic aneurysm etiology, and do not generally describe CTD-specific outcomes. Herein, we review the available series and approaches to treatment.

2. Treatment options

Nonoperative treatment may be the best option in patients with significant comorbidities, although patients with CTD tend to be, on average, younger and healthier when they undergo aneurysm repair compared to patients with atherosclerotic aneurysm etiology, and they are less likely to require nonoperative management. Such treatment is appropriate in selective situations and contraindicated when infected anastomotic aneurysms or pseudoaneurysms, graft-enteric or graft-bronchial fistulae, or invasive Gram-negative infection are present (Fig. 1A and B). Culture-specific lifelong antibiotics based on percutaneous perigraft fluid samples, drainage, or

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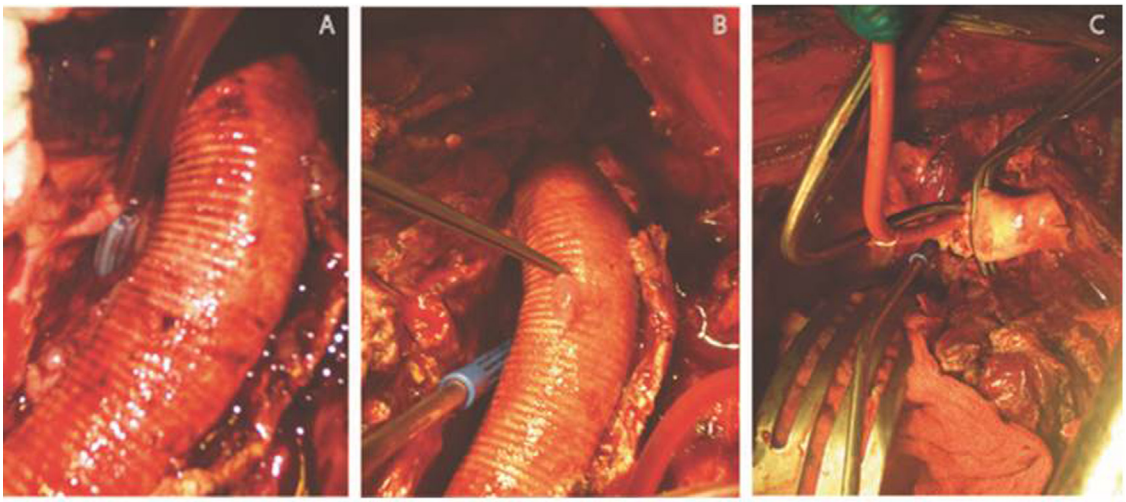

Fig. 1 – (A) Intraoperative photograph of a patient with aortoesophageal fistula after open thoracoabdominal aortic aneurysm repair, with suction tip in the fistula. (B) Intraoperative photograph of a patient with an aortobronchial fistula and respiratory secretions on the aortic graft. (C) Intraoperative photograph of aortic reconstruction using cryopreserved homograft under hypothermic circulatory arrest (C).

debridement of the infected space, and catheter-based antibiotic irrigation are critical elements of nonoperative management [7,8].

Operative treatment options include extra-anatomic bypass, in situ replacement with cryopreserved allograft, or antibiotic-impregnated prosthetic graft. Extra-anatomic axillofemoral bypass grafting has been reported, but may be inadequate to support lower-extremity and visceral perfusion and is associated with aortic stump blowout [9]. Extra-anatomic revascularization from the ascending to the abdominal aorta can also be considered, and requires a median sternotomy with the attendant risks of cardiopulmonary bypass and hypothermic circulatory arrest, but may be a superior option for extra-anatomic repair in younger CTD patients with aortic graft infection [10].

In situ aortic graft replacement with rifampin-soaked prosthetic graft or allograft and omentoplasty is another option (Figs. 1C and 2). In situ allograft replacement has been reported to be associated with better outcomes compared to extra-anatomic revascularization [11,12]. In situ prosthetic graft replacement when the new graft is impregnated with rifampin and covered by autogenous tissue, such as an omental flap, is associated with a lower re-infection rate than non-impregnated graft replacement [13]. Another option for in situ repair is autologous superficial femoral vein reconstruction, which has been reported in a patient with prior aortic patch repair for middle aortic syndrome [14]. However, due to the limited length of available femoral vein, the utility of this reconstruction is confined to patients with a circumscribed prior aortic repair, which is uncommon in patients with CTD, who usually require extensive aortic replacement secondary to degeneration of large segments of the aorta (Fig. 2A). Furthermore, such neo-aortoiliac system reconstruction may be associated with aneurysmal degeneration of the vein in patients with CTDs, especially in those with vascular Ehlers-Danlos syndrome. In Marfan and Loeys-Dietz syndromes, veins may be normal in tensile strength, but any evidence of venous varicosities would be a contraindication to using the vein for aortic reconstruction due to the long-term risks of aneurysmal degeneration of an abnormal vein under arterial pressure.

Reoperation for aortic graft infection in patients with CTDs is treacherous due to bleeding risk, and often prolonged secondary to its redo nature and the disintegrating effects of infection on surrounding tissue. Cardiopulmonary bypass with hypothermic circulatory arrest may be required for appropriate proximal control and renovisceral and spinal cord ischemic protection. Endovascular treatment may be expected to have fewer short-term risks and is a consideration. While no CTD-specific data are available, endovascular treatment of primary mycotic aortic aneurysms has been reported to be associated with 30-day mortality of 10% and late mortality of 10%. Persistent infection occurred in 23% of patients and was associated with higher mortality [15]. Preoperative aneurysm rupture and fever predicted persistent infection. One can consider using endovascular aortic aneurysm repair as a temporizing measure in an emergent rupture situation with patient in extremis.

3. Treatment outcomes

While sparse data exist regarding reoperations for TAAA graft infection in patients with CTD, more information is available on the outcomes in CTD patients who undergo such reoperations on more proximal aortic root composite valve graft reconstructions. In a single institution series in which 52% of patients had Marfan syndrome, 21% of patients needed a reoperation because of graft infection. Repair approaches included pseudoaneurysm repair with omental flap coverage of infected graft, and resection of infected graft and replacement with a new prosthetic graft or homograft with omental flap coverage [16]. This series reports perioperative mortality in the 2 patients who had removal and replacement of infected grafts and high rate of complications, without stratification by