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Editor's Choice — Treatment of Aortic Prosthesis Infections by Graft Removal and In Situ Replacement with Autologous Femoral Veins and Fascial Strengthening

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WHAT THIS PAPER ADDS

Currently there is no consensus for the best treatment in cases of aortic graft infection. This study shows that graft removal and in line autologous deep vein reconstruction is a valid option with acceptable post-operative mortality, a very low re-infection rate, and good graft patency rates even in cases of aorto-enteric fistulas.

Introduction: Aortic prosthetic graft infection (AGI) is a major challenge in vascular surgery. Eradicating the infection requires prosthetic material removal, debridement, and lower limb revascularization. For the past 15 years, we have used femoral veins for aorto-iliac reconstruction and tensor fascia lata to strengthen the upper anastomosis.

Objective: The purpose of this single institution retrospective study is to present results regarding in situ replacement of infected aortic grafts with autologous femoral veins (FVs).

Methods: From October 2000 to March 2013, patients treated for AGI with graft removal and autologous FV reconstruction at Helsinki University Hospital were included. Primary outcome measures were 30 day mortality, long-term treatment related mortality, and re-infection rate. Secondary outcome measures were long-term all cause mortality and event free survival (graft rupture, re-intervention, major amputation).

Results: During a 13 year period 55 patients (42 male, 13 female) were operated on using a venous neo-aorto-iliac system for AGI. The mean follow up was 32 months (1—157 months). The 30 day mortality rate was 9% (5) and overall treatment related mortality 18% (10). All cause mortality during follow up was 22 (40%) and overall Kaplan—Meier survival was 90.7% at 30 days, 81.5% at 1 year, and 59.3% at 5 years. Graft rupture occurred in three (5%) cases, two of which were caused by graft re-infection (4%). Four patients required major amputation, one of them on arrival and three (5%) during the post-operative period. Nine (16%) patients needed interventions for the vein graft, and two graft limbs occluded during follow up.

Conclusion: In situ reconstruction for aortic graft infection with autologous FV presents acceptable rates of morbidity and mortality, and remains the treatment of choice for AGI at Helsinki University Hospital.

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INTRODUCTION

Aortic graft infection is the most dreaded complication in vascular surgery, carrying a mortality rate of 25—60% and a limb loss rate of up to 25%.[1—4] Despite antibiotic prophylaxis and meticulous technique, 0.6—4.5% of aortic prostheses become infected.[4—7] To eradicate the infection, the prosthetic graft must be explanted and debrided while maintaining the lower limb arterial circulation. Graft excision and revascularization with axillo-bi-femoral bypass has been the "gold standard", but due to high complication rates, in situ reconstructions are gaining popularity.[8—10] The goal of using antibiotic bonded prostheses, cryopreserved allografts, or autologous femoral vein (FV) grafts for revascularization is to provide better graft durability and limb salvage, fewer re-infections and thereby better long-term survival and quality of life.

The aim of this study is to report a single center's results in treating aortic graft infection (AGI) with graft excision and in situ revascularization with an autologous venous neo-aorto-iliac system (NAIS).

MATERIAL AND METHODS

Patients treated surgically for AGI at Helsinki University Hospital between October 2000 and March 2013 were

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analyzed retrospectively. Only patients treated with NAIS were included in the study. Data on the study patients were collected from a computerized database and manually from patient charts.

Data for demographic parameters, associated co-morbidities, indications for the primary procedure, clinical presentation, C-reactive protein (CRP), surgical management, bacteriological culture, post-operative complications, and follow up details were collected. Data on surgical management included location of the aortic clamp, type of vascular reconstruction, presence of aorto-enteric erosion/fistulae (AEF), and any concomitant gastrointestinal procedure, operative time, and blood loss. Post-operative data were collected on complications and 30 day mortality. During the follow up, limb swelling, limb salvage, durability of venous grafts, re-infection rate, and overall mortality were evaluated.

Pre-operative workup

All patients, except one emergency case, had pre-operative contrast enhanced computed tomography angiography (CTA) and/or magnetic resonance imaging (MRI) carried out for AGI diagnosis. In cases of doubt, an indium-111 tagged leukocyte scan was used in 15 cases and ^{18}F-fludeoxyglucose positron emission tomography/CT in five cases for confirmation. Femoral veins were evaluated with duplex ultrasound pre-operatively for assessing the diameter ($\geq$6 mm) and excluding post-thrombotic changes or anomalies. Early in the series, the ankle brachial index for assessing lower limb perfusion was established, but since 2011 all patients have been scanned with either magnetic resonance angiography (MRA) or CTA when distal pedal pulses were missing. Elective patients had pre-operative visits with an anesthesiologist and internist for cardiopulmonary risk assessment, and additional cardiopulmonary workup was carried out before surgery when necessary. The highest value of CRP between primary symptoms and final diagnosis was collected as a biological sign of severity of the infection. The second value of CRP was collected on the day of NAIS reconstruction. Antimicrobial therapy was started pre-operatively based on bacteriological cultures if available, or empirical cefuroxime and vancomycin were administered. When AEF was diagnosed, metronidazole was added.

Diagnosis was based on clinical symptoms, blood samples, and positive findings in at least one imaging modality. The diagnosis was confirmed intra-operatively, when infected fluid around the prosthetic graft was present or the graft was dissected loose from surrounding tissues by infection.

Operative technique

For NAIS, FVs were harvested from popliteal fossa to femoral confluence, leaving the deep FV patent for venous drainage. Side branches were ligated and secured with clips. The first 20 grafts were used in a reversed manner; later on veins were everted and valves excised under direct vision. In most cases, grafts were split proximally and sewn together to match the aortic diameter in a "pantaloon" configuration with 4-0 polypropylene suture. Simultaneously, an infected graft was exposed by a midline (n = 44) or thoraco-lumbar incision (n = 11) and anastomoses were identified. After heparinization the aorta and graft limbs were clamped, grafts were excised, and clearly infected tissue was debrided. The proximal anastomosis of NAIS was reinforced with a piece of tensor fascia lata (Figs. 1 and 2). If there was obvious pus present, the tunnels were flushed with hydrogen peroxide and saline before a new graft was inserted. In a vast majority of cases, distal anastomoses were performed in the groin and covered with a sartorius myoplasty. In a few cases of graft limb shortage, the limb was continued with a saphenous spiral graft or the anastomosis was done more proximally to the iliac artery while closing the femoral artery with a venous patch. When AEF was present, intestinal resection or suture repair was performed by a gastric surgeon. The NAIS was covered with retroperitoneal tissue or omentoplasty and drains were left into the abdominal cavity and to both sartorius muscle pockets.

Figure 1. Harvested piece of tensor fascia lata.

Post-operatively, low-molecular-weight heparin was administered and intermittent pneumatic pumps were used to prevent thromboembolic complications and excessive swelling due to FV harvest.

Statistical analysis

Continuous variables are expressed as mean (SD, range) or median. Univariate analysis was performed to analyze the

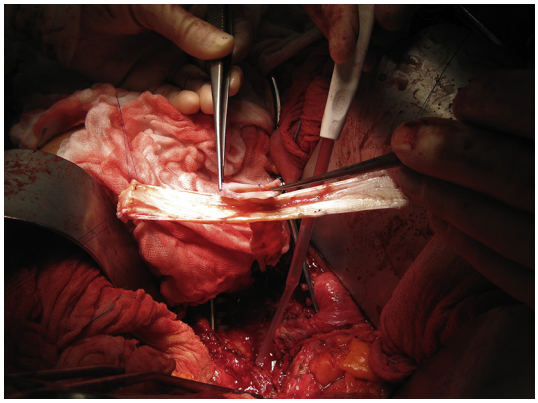

Figure 2. Proximal anastomoses of a neo-aorto-iliac system is reinforced with tensor fascia lata.