Aortic treatment of native infection by reconstruction with the Omniflow II biologic prosthesis

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ABSTRACT

Aortic infection is a challenging condition. Fortunately, surgical revision of infected aorta with in situ reconstruction can provide long-term cure. The material for aortic repair remains an area of debate. The Omniflow II (LeMaitre Vascular, Burlington, Mass) prosthesis is a biosynthetic graft made to resist long-term degeneration and allows growth of host tissue with reduction of the risk of arterial infection. It has already been used for peripheral bypass with very low infection rates. Herein, we describe an original case of first-line native aorta replacement by a straight Omniflow II biologic prosthesis for infected aortic aneurysm. (J Vasc Surg Cases and Innovative Techniques 2018;4:296-300.)

Keywords: Aorta; Infection; Biosynthetic graft

Aortic infection is a challenging condition.[1] Long-term antibiotherapy can result in relapse of infection.[2] In contrast, surgical revision is the best solution but is associated with early mortality rates of 7% to 18%.[3] It is difficult to choose the material for aortic repair. The material for aortic repair remains an area of debate. The use of autologous veins increases procedure time and morbidity.[4] Cryopreserved arterial allografts are a good alternative but are not always available and can be associated with false aneurysm, thrombosis, and acute or chronic rejection. Finally, antibiotics of silver-coated prosthetic grafts can be used off the shelf but are associated with higher reinfection.[5] On the whole, no ideal conduit exists. The Omniflow II (LeMaitre Vascular, Burlington, Mass) prosthesis is a biosynthetic graft with a synthetic layer of polyester within an ovine collagen matrix linked by glutaraldehyde. This composite was designed to allow ingrowth of host tissue with a long-term resistance to degeneration. Preclinical studies have demonstrated that the collagen will be covered with host tissue.[6] It has already been used for peripheral bypass with very low infection rates.[7-10] Herein, we present a case of first-line native aorta replacement by a straight graft Omniflow II biologic prosthesis for infected aortic aneurysm. The patient's consent was obtained.

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CASE REPORT

The patient, a 69-year-old man, presented with risk factors of hypertension, active smoking, preobesity, myocardial infarction, and chronic pancreatitis. He was diagnosed with a 27-mm ectasia of the abdominal aorta for which biannual surveillance was recommended.

Four months later, he consulted his general practitioner for phlegmy diarrhea without fever evolving for 15 days as a result of egg ingestion. Fecal cultures were positive for *Campylobacter*, and serologic test results for *Salmonella* were in favor of an old contamination so that the patient underwent 15 days of ciprofloxacin treatment.

Two weeks later, the patient was admitted for urinary globe retention consequent to codeine treatment while he was still taking ciprofloxacin. A computed tomography (CT) scan showed a 36-mm infrarenal abdominal aortic aneurysm with mural thrombus. The patient was then admitted to the department of medicine, where serologic tests found hepatitis A immunoglobulin M antibody; metronidazole was then added to ciprofloxacin, and the patient was discharged. At the end of the treatment, the patient had recurrent abdominal pain that resolved after 8 days.

Six months after the initial visit to his cardiologist, ultrasound examination found an increasing infrarenal abdominal aortic aneurysm diameter reaching 41 mm with surrounding hematic image; the CT scan showed a 53-mm saccular aneurysm expanding on 5 cm with images of recent dissection and infiltration of surrounding tissues without active bleeding or bowel ischemia signs (Fig 1). On admission, he presented with abdominal pain without fever; biologic analysis showed an inflammatory syndrome without leukocytosis. Regarding all the data, the diagnosis of mycotic aneurysm was selected, so the patient was scheduled for emergency surgery.

Surgical technique. Under median laparotomy, all infected tissues were excised. A purulent collection and infected tissue were sent for bacterial analysis. Two Omniflow II straight 8- × 150-mm vascular prostheses were prepared. A 16-mm straight graft was created by spatulating two 8-mm grafts and anastomosing them with Prolene 5-0 (Fig 2). The neotubular

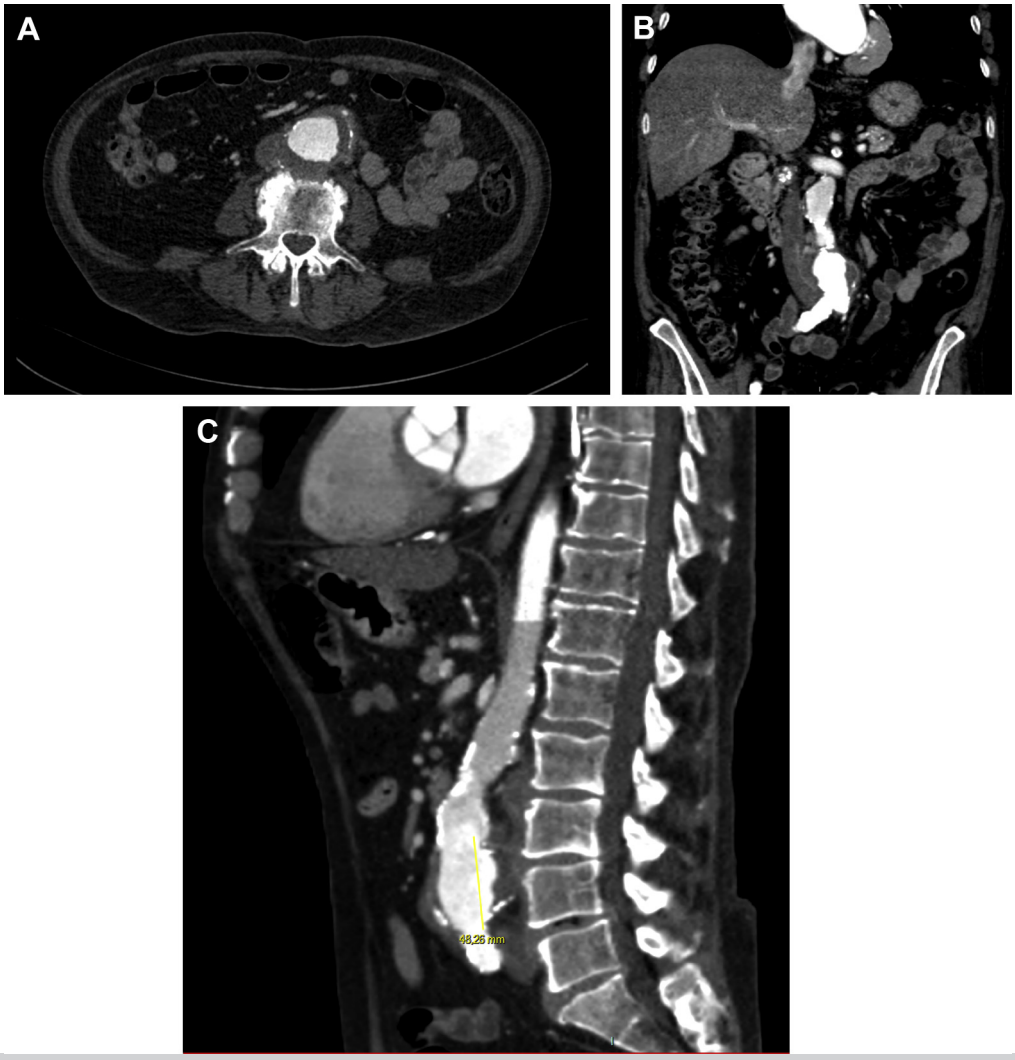

Fig 1. Preoperative computed tomography (CT) scan in transverse, coronal, and sagittal views showing a 53-mm infrarenal abdominal aortic aneurysm extending to the iliac bifurcation suggestive of a mycotic aneurysm.

Omniflow II vascular prosthesis was then anastomosed to the infrarenal and distal aorta just above the iliac bifurcation with Prolene 5-0 running suture (Fig 3). Aortic clamping time was 115 minutes, and operative time was 272 minutes.

In the intensive care unit, intravenous administration of tazobactam and vancomycin was initiated. The patient was extubated on postoperative day 1, and the inflammatory syndrome declined. Bacteriologic examination findings were negative, as was a 16S RNA search for *Salmonella* and *Campylobacter*. However, it was decided to establish 6 weeks of treatment against *Campylobacter* as it has a strong affinity for the aorta.

The patient was discharged on postoperative day 15 and prescribed ciprofloxacin for 4 weeks as is usually done in our institutional protocol. The findings on the control CT scan at 1 month and the 3-month echography study were normal (Fig 4), as were the findings at the 6-month visit.

DISCUSSION

Aortic infection is a challenging situation for which various treatment strategies exist.[11] Antibiotherapy fails to resolve infection in the majority of cases. Surgery is limited to excision of infected tissues. To prevent reinfection, the use of autologous vein, antibiotics, or silver-coated grafts and arterial allografts is possible. However, in clinical studies, no substitute is superior to another. Furthermore, antibiotic-impregnated grafts have worse results than biologic grafts.[12] More and more studies emphasize the low complication rates with autologous femoral veins and cryopreserved arterial allografts (graft occlusion in 7% and 4% of cases, graft infection in 0% and 4% of cases, and graft degeneration in 0% and 7% of cases, respectively).[13] In real life, recovery of femoral veins leads to higher morbidity, whereas arterial allografts are not always available.

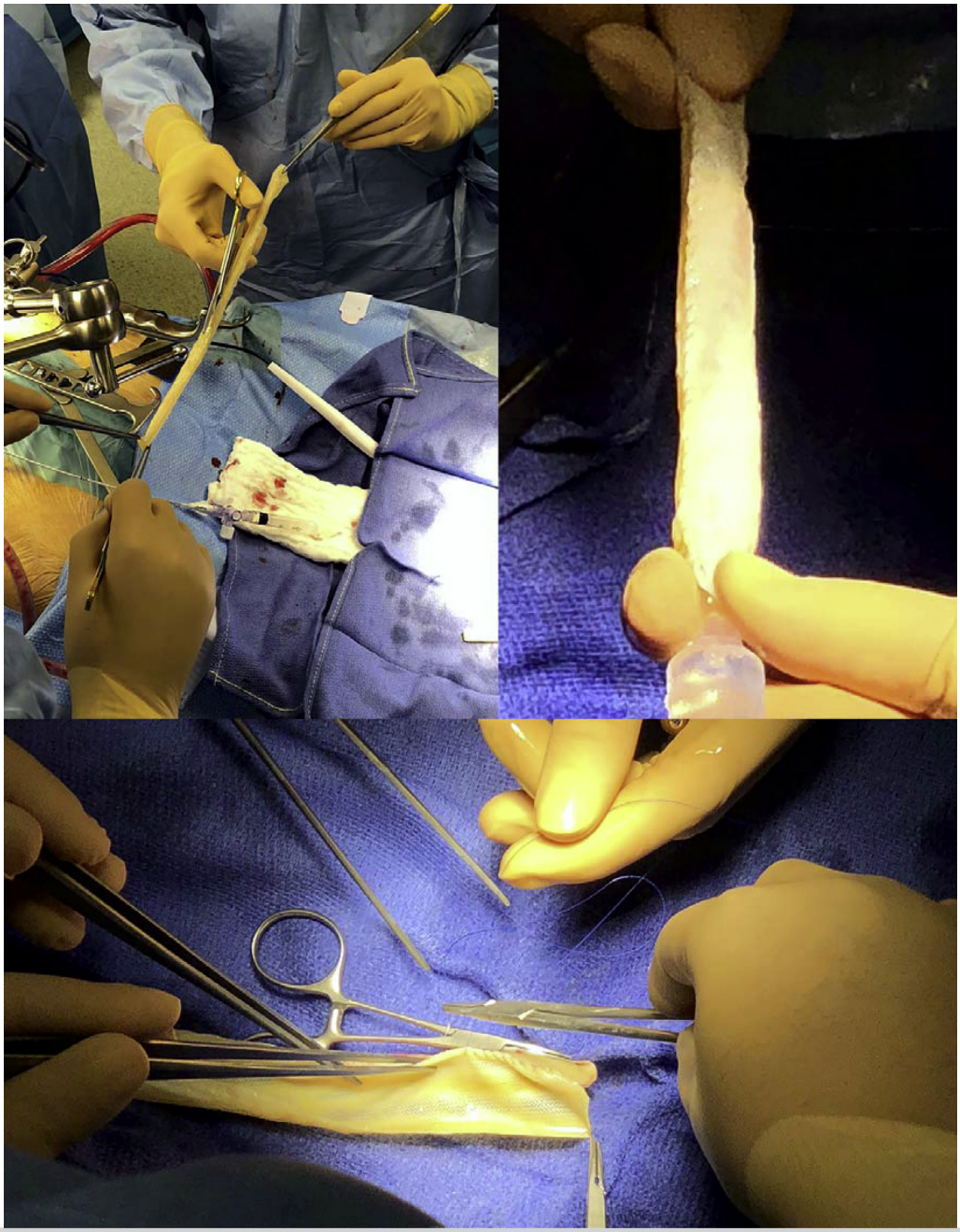

Fig 2. Operative field showing preparation of the straight tubular graft.

The Omniflow graft was in the beginning used for arteriovenous shunt surgery and infrainguinal bypass, with low infection rates and high long-term patency. However, it is more susceptible to methicillin-resistant *Staphylococcus aureus* than the polytetrafluoroethylene prosthesis as demonstrated in an animal study.[14] Nevertheless, the Omniflow graft is still used in cases of infected bypasses[15]; indeed, cryopreserved allografts are associated with mechanical complications, such as early rupture.

Cryopreserved allografts have a low risk of reinfection but have been associated with degenerative complications, such as early graft rupture, which can reach 11%.[16] Such complications have never been described with the Omniflow II prosthesis, with series reporting long-term aneurysmal degeneration in 0% to 1% of cases.[17]

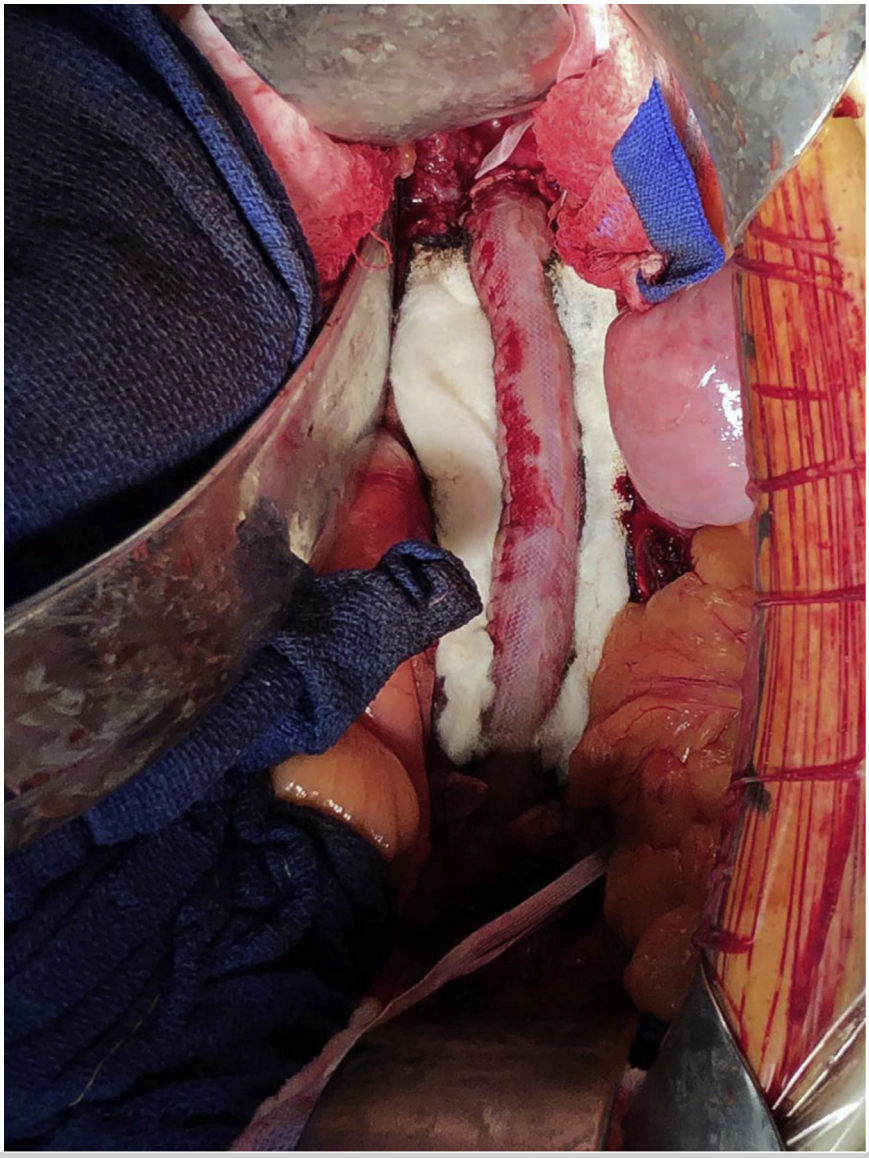

Fig 3. Final result with the Omniflow II graft anastomosed end to end to the aorta.

Rapid tissue integration and neovascularization of the graft wall as a result of the unique porosity and "natural" environment for immigrating host cells play key roles in the superior resistance to reinfection. We cannot answer the question of whether neointima formation implies that endothelialization of the graft surface happens, but there is some evidence that neovascularization can occur, and examination of explanted human Omniflow II prostheses showed signs of neovascularization.[18] The concomitant antibiotic therapy should be aligned with the specific microbial spectrum found. Aortic infection diagnosis is still difficult. Opposite to the imaging studies, tissue cultures were negative, as can frequently happen.[19] The optimal imaging modality has yet to be defined, even if positron emission tomography-CT is often associated with low fluorodeoxyglucose uptake in case of infection. It would have been interesting to see a probable fluorodeoxyglucose uptake, but we did not perform positron emission tomography-CT as the operation was rapidly performed after diagnosis of aortic infection. Postoperatively, we initiated acetylsalicylic acid at 75 mg/d; however, there are neither clinical data nor manufacturers' recommendations on anticoagulation or antiaggregation management. There is a necessity to generate data on this topic, especially from elective bypass surgery series using biosynthetic material.

Herein, we report an interesting case of biosynthetic aorta reconstruction with the Omniflow II graft resulting

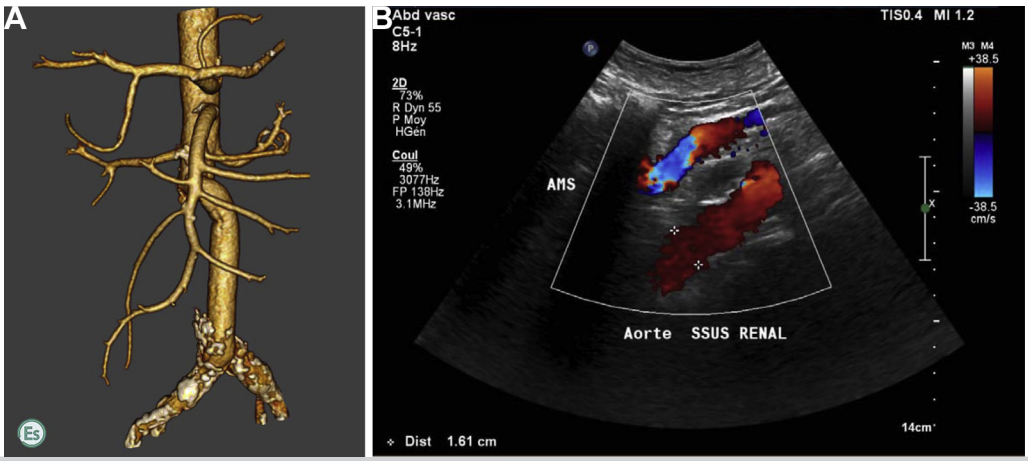

Fig 4. A, Three-dimensional reconstruction of the control computed tomography (CT) scan at 1 month. **B,** At 3 months, echography showed good patency of the graft and proximal and distal anastomoses. *AMS*, Superior mesenteric artery; *SSUS*, suprarenal aorta.

in infection control. A long follow-up is mandatory before its widespread use. Its off-the-shelf availability makes it an excellent alternative in emergency cases.

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