The use of bovine pericardial patch for vascular reconstruction in infected fields for transplant recipients

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Infectious vascular complications affecting transplant recipients may lead to severe morbidity and graft loss. This is a retrospective review of vascular repair with bovine pericardial patch (BPP) in infected fields for immunosuppressed patients. BPP was used as either a patch or an interposition graft. Five cases of arterial reconstruction in infected fields using BPP were performed. There were no complications related to bleeding, thrombosis, or recurrent infection. In our limited experience, the use of BPP as a vascular patch is successful, and it represents an alternative when vascular reconstruction is needed in the context of infected fields. (J Vasc Surg Cases and Innovative Techniques 2017;3:47-9.)

Infectious vascular complications presenting after kidney or pancreas transplantation may represent a threat to the transplanted organ or to the recipient's limb and life.[1] These critical situations occasionally require vascular resection and complex vascular reconstruction.[2] We present five cases of vascular reconstruction using bovine pericardial patch (BPP) for infected fields in immunosuppressed transplant patients. All patients signed a consent form for this study.

METHODS

From 2013 to 2015, five transplant recipients underwent vascular reconstruction with BPP in the setting of infectious vascular complications. Two of them required a simple patch and the other three required a tubular interposition graft to re-establish the continuity of the affected vessel. A retrospective analysis of the surgical technique and patient outcomes was conducted.

Description of the technique. Vascu-Guard (Synovis, St. Paul, Minn) is prepared from bovine pericardium that is cross-linked with glutaraldehyde. Before use, the bovine pericardium had to be immersed and agitated for a minimum of 3 minutes in a sterile basin containing 500 mL of sterile physiologic saline (0.9% NaCl). The 500-mL rinse solution may have contained one of the following antibiotic treatments: ampicillin and gentamicin, bacitracin, cefazolin, cefotaxime, neomycin, and vancomycin.

We used the bovine pericardium from which we formed a tube graft to do an interposition graft of the iliac artery. The formation of the graft was done with 6-0 running Prolene suture and then two end-to-end anastomoses; the proximal anastomosis was made between the external iliac artery (EIA) and the bovine pericardium graft with 6-0 running Prolene suture, and the distal anastomosis was made between the tube graft and the distal iliac artery, also with 6-0 running Prolene suture. An average of 10 minutes was the time for the tubular graft preparation. Unfortunately, any unused pieces of Vascu-Guard could not be resterilized or reused and were discarded.

CASE REPORTS

Case 1. A 61-year-old woman developed candidemia after kidney transplantation. The diagnosis of mycotic pseudoaneurysm of the right EIA associated with impaired kidney graft inflow was made. During surgery, 4 cm of the EIA was resected, and the kidney graft was explanted. Bovine pericardium was used to form a tube matching the diameter and length of the resected vessel. This graft was used as an interposition graft to restore the continuity of the EIA. Cultures of the aneurysm wall were positive for *Candida albicans*. The patient received 6 weeks of fluconazole and piperacillin-tazobactam. Four months after this event, the patient received a second kidney transplant and resumed immunosuppression.

Case 2. A 47-year-old female kidney recipient suffered chronic rejection and graft failure. She underwent successful retransplantation 5 years later. She presented with severe chronic pain, and pelvic magnetic resonance imaging demonstrated a complex cystic replacement of the failed graft. During the surgery, a voluminous abscess originating from the failed kidney graft was identified. Complete evacuation mandated resection of 5 cm from the right EIA. Bovine pericardium was used to construct a custom-made interposition tube graft to reconstruct the artery. Cultures of the abscess sample were positive for *Escherichia coli*. The patient was treated with levofloxacin and trimethoprim-sulfamethoxazole for 6 weeks.

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Case 3. A 40-year-old female pancreas recipient developed chronic rejection and graft failure 5 years after transplantation. She developed severe native hydronephrosis as a result of compression from the failed fibrotic pancreas graft. During surgery, a chronic abscess that originated from the enteric anastomosis was found to involve the arterial anastomosis. For complete excision of the graft, the anterior wall of the right common iliac artery had to be resected. The defect on the artery was closed with a simple BPP. Cultures of the abdominal fluid were positive for methicillin-resistant *Staphylococcus aureus* and anaerobes (*Bacteroides*). She received vancomycin for 1 week and then clindamycin during 5 more weeks.

Case 4. A 43-year-old male kidney transplant recipient had an arteriovenous graft (AVG) in his right thigh before transplantation. He presented with a large abscess, with draining sinus involving the AVG and right common femoral artery. Emergent complete AVG excision was done. BPP was used to close the defect of the anterior wall of the artery. Cultures of the graft tissue were positive for methicillin-resistant *S. aureus*, *Streptococcus mitis*, and anaerobes (*Bacteroides*). He received clindamycin for 6 weeks.

Case 5. A 48-year-old man underwent simultaneous pancreas and kidney transplantation. The postoperative course was complicated with graft pancreatitis and dehiscence of the duodenal stump, causing mycotic pseudoaneurysm at the arterial anastomosis. Graft pancreatectomy was performed. The segment of the EIA that was involved was resected (5 cm). Bovine pericardium was used to create a tube, and the iliac artery was reconstructed with this graft. Cultures of the abdominal fluid were positive for *E. coli*, *Proteus*, and *Enterococcus*. He was treated with piperacillin-tazobactam for 6 weeks.

No major complications were seen in the postoperative period in any of the patients. There were no early or late complications related to patch bleeding, thrombosis, or recurrent infection in any case. Patients were not maintained on anticoagulation. The median follow-up was 16 months (range, 6-31 months). Follow-up Doppler ultrasound images were available for review, and no signs of thrombosis or stenosis were demonstrated. All the patients remained asymptomatic during a cumulative follow-up of 80 months and were maintained on standard immunosuppression.

DISCUSSION

Nearly all infections involving vascular fields mandate removal of the infected graft, and the repair of the resulting vascular defects is challenging. Synthetic grafts can be used, but the presence of infection is always a concern, and autogenous or allogeneic biologic tissues are preferred for reconstructing vessels when infection is present.[3-5]

When total graft excision is required, identifying and harvesting appropriate autogenous material for closure of the arteriotomy can be challenging. Autologous vein grafts have been described as an efficient alternative, but many patients, especially those on hemodialysis, may have limited vein available, and sometimes if a portion of vein is found, it is often thin.[6] They also involve a longer surgery time and another focus of infection and complication after surgery compared with BPP.

Deceased donor vascular grafts have also been used from the same or a third-party donor.[7-9] Unfortunately, cadaver vascular allograft may not be available at the moment of urgent need.

Bovine pericardium has been associated with lower risk of infection and thrombosis compared with synthetic materials; furthermore, it does not require long-term anticoagulation.[10-12] The patch material has proved durable in arterial applications, most commonly as a patch for carotid endarterectomy.[10,13] There are several case reports of BPP used for cardiac and pulmonary reconstruction in infected fields, and they have shown good outcomes and durability.[14,15] The low rate of definitive infection linked to BPPs has suggested that BPPs may be resistant to infection and therefore might be an appropriate material to use in the presence of infection.[16]

This is a small series of case reports in which BPP was successfully used to repair large defects of iliac arteries in the context of infectious complications in immunosuppressed patients. Even though the use of BPP in vascular graft infection is known, there is nothing published about the use of this material in transplant recipients. Transplant patients represent a high-risk population for infections mainly because of the immunosuppression, among other reasons. Because of this, we chose a therapy that we believed involved a lower risk of infection than with a prosthetic graft. Use of autologous grafts in these patients would be likely to significantly increase the operative time and to subject another site to the risk of infection. In addition, cadaveric arterial or venous grafts may not be available and take longer to prepare, whereas BPP is more likely to be rapidly accessible.

CONCLUSIONS

Our initial experience with BPP suggests that it provides a useful option in treating infected vessels in immunocompromised transplant patients who are at high risk for ongoing or recurrent infection.

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