

LETTER TO THE EDITORS

## Bovine pericardium for multiple artery reconstruction in kidney transplantation

Andrea Lauterio<sup>1</sup> , Riccardo De Carlis<sup>1,2</sup>, Stefano Di Sandro<sup>1,3</sup>, Fabio Ferla<sup>1</sup>, Alessandro Giacomoni<sup>1</sup>, Ornella Rossetti<sup>1</sup> & Luciano De Carlis<sup>1,4</sup>

1 Division of General Surgery & Abdominal Transplantation, ASST Grande Ospedale Metropolitano Niguarda, Milan, Italy

2 Departments of Surgical Sciences, University of Pavia, Pavia, Italy

3 Department of Experimental Medicine, University of Pavia, Pavia, Italy

4 School of Medicine, University of Milano-Bicocca, Milan, Italy  
E-mail: andrea.lauterio@ospedaleniguarda.it

Dear Editors,

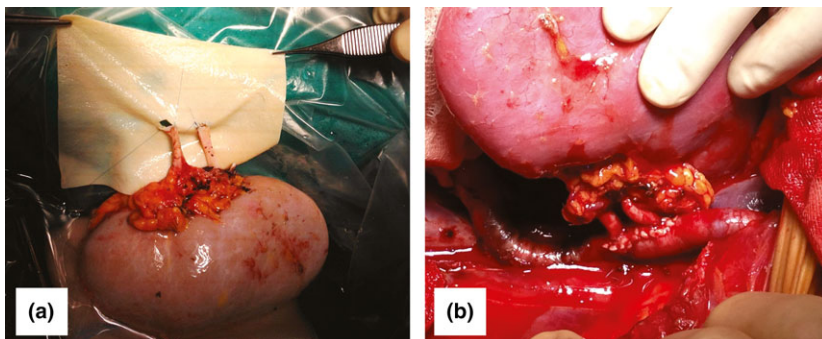
Multiple arterial reconstructions are often required in kidney transplantation (KT), and a variety of reconstruction strategies and implant techniques have been described [1,2]. When an aortic Carrel patch cannot be safely used in older deceased donors with severely atherosclerotic aortas, or in living donor kidney procedures, multiple artery reconstruction may represent a surgical challenge requiring time-consuming technical solutions. Glutaraldehyde-treated bovine pericardium (BP) is one of the preferred biological materials in cardiovascular and thoracic surgical procedures [3] and was recently used for major venous reconstruction in oncological liver and pancreatic surgery [4,5].

BP's xenogeneic origin raises a number of immunological concerns, such as xenogeneic antigen epitopes (alpha-GAL epitopes), one of the main triggers of an immune response [6]. However, the use of chemically treated BP represents the clinical standard and the glutaraldehyde-fixing process should eliminate any

antibody-mediated reaction to the relevant epitopes. Despite the potential advantages of using biological tissues like BP in terms of handling and a lower risk of infection and thrombosis compared to synthetic patching materials, little is known about their use in transplantation [2,7,8].

We report on the use of a glutaraldehyde-treated BP patch for reconstruction of multiple renal arteries procured from three elderly deceased donors with two arteries in which the aortic patch was judged too risky to use, and from five living donors (two distant small arteries in four cases, and three arteries in one). During bench surgery, the renal arteries were anastomosed to the BP patch using 7–8/0 prolene sutures in interrupted or running fashion according to the vessel diameter and were parallel to each other to avoid the risk of kinking (Figure 1). There were no acute or late complications related to graft thrombosis or infection, and the patch had a long-term patency demonstrated by Doppler ultrasound up to 36 months after we first used it in KT. No long-term anticoagulation was required.

Commercially available BP is an acellular material mainly composed of collagen. Its 0.5 mm thickness makes the patch easy to perforate with a vascular punch to create the new arterial ostium and easily trimmed and tailored to match the shape and size of the recipient arteries with minimal suture line bleeding after graft revascularization. In the case of small polar arteries, implanting each artery with separate end-to-side



**Figure 1** (a) Two renal arteries were anastomosed to the BP patch using 7/0 prolene sutures in running fashion and were parallel to each other. (b) The BP patch was anastomosed side-to-side to the right external iliac artery.

anastomoses to the iliac artery can be more technically challenging and time-consuming than single anastomoses between the patch and the recipient iliac artery. Multiple arterial anastomoses inevitably require more anastomotic warm time before reperfusion, leading to a prolonged warm ischaemia time. According to other reports describing a novel technique to reconstruct single renal arteries to the branches of the procured recipient internal iliac artery on the back table [2], the main advantage of our technique is that difficult anastomoses can be easily performed under hypothermic conditions with no concerns about surgical time.

Our preliminary experience is promising and confirms that BP could be a safe and feasible alternative to other synthetic materials currently in use such as ultra-thin Dacron or polytetrafluoroethylene patches, avoiding long-term anticoagulant therapy. Among the different venous patches currently available for multiple

artery reconstruction, the BP patch is easier to handle than living donor gonadal vein, especially in male donors with small veins.

In addition to banked or freshly procured vascular grafts from deceased donors, BP offers a new ready-to-use approach to complex surgical reconstruction of multiple renal arteries in both living and deceased donor KT. Although no forms of immunological rejection have been observed in our limited experience, questions related to chronic immunological events using BP remain. Further research into how to enhance the biomechanical and immunogenic characteristics of this attractive material and its long-term patency are needed before BP is made available for widespread use in KT surgery.

### Conflict of interest

The authors declare no conflict of interest.

## REFERENCES

1. He B, Mitchell A. A novel technique for reconstruction of multiple renal arteries in live donor kidney transplantation: a case report and literature review. *Transplant Proc* 2012; **44**: 3055.
2. Firmin LC, Nicholson ML. The use of explanted internal iliac artery grafts in renal transplants with multiple arteries. *Transplantation* 2010; **89**: 766.
3. Xin L, Yuanyuan G, Ziegler KR, *et al*. Current usage and future directions for the bovine pericardial patch. *Ann Vasc Surg* 2011; **25**: 561.
4. Jara M, Malinowski M, Bahra M, *et al*. Bovine pericardium for portal vein reconstruction in abdominal surgery: a surgical guide and first experiences in a single center. *Dig Surg* 2015; **32**: 135.
5. Pulitan Pulitanó C, Crawford M, Ho P, *et al*. The use of biological grafts for reconstruction of the inferior vena cava is a safe and valid alternative: results in 32 patients in a single institution. *HPB (Oxford)* 2013; **15**: 628.
6. Hulsmann J, Grun K, El Amouri S, *et al*. Transplantation material bovine pericardium: biomechanical and immunogenic characteristics after decellularization vs. glutaraldehyde-fixing. *Xenotransplantation* 2012; **19**: 286.
7. Berardinelli L, Beretta C, Giussani A. Living donor transplantation of kidneys with fibromuscular dysplasia: indications, surgical techniques and long term results in 11 cases. *J Nephrol Therapeutic* 2012; **S4**: 008.
8. Yiannoullou P, van Dellen D, Khambalia H, *et al*. Successful management of a ruptured mycotic pseudoaneurysm following pancreas transplantation using bovine pericardial patch: a case report. *Transplant Proc* 2014; **6**: 2023.