Brief Report

Bovine ureter graft for haemodialysis access surgery*

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Bovine ureter SynerGraft (SG) (CryoLife, Inc.) has been recently introduced into haemodialysis access surgery. It is a non-glutaraldehyde fixed acellular collagen and elastin matrix conduit that may withstand arterial pressures. There has only been one published report in humans with this graft for vascular access, except for a canine model which Matsuura et al. reported [1]. In this study, we report the early and mid-term outcome of bovine ureter as a haemodialysis access graft in chronic haemodialysis.

Four female patients with an average age of 44.5 years (range 25–67 years) underwent surgery in November 2004, using the bovine ureter SynerGraft (CryoLife, Inc.) as a conduit for haemodialysis access surgery. The operations were indicated in these patients, as they had no suitable superficial venous system to create an arteriovenous fistula; they also had previously failed arteriovenous fistulas and expanded polytetrafluoroethylene (ePTFE) grafts in several different locations. The patients were evaluated with Doppler ultrasound which revealed normal deep venous system. All the patients were informed about the graft and written consents were taken prior to the operation.

The operations were done under axillary block. The xenografts were implanted between the brachial artery and the axillary vein in two patients, and between the radial artery and the deep brachial vein in two patients. After systemic heparinization, the graft was anastomosed to the artery in an end-to-side fashion, using a running 6/0 polypropylene suture. The artery was declamped to fill the graft. The graft was passed through the tunnel and the venous anastomosis was done using the same suturing technique. Heparin was not neutralized after the anastomosis.

All grafts were allowed for a 6-week maturation for the remodelling of the vascular prosthesis prior to haemodialysis. The grafts were accessed three times a week for haemodialysis.

All grafts implanted were patent on the first post-operative day. One of the grafts between the brachial artery and the axillary vein failed at the end of the second month after four times of haemodialysis. A severe aneurysm and pseudoaneurysm formation occurred in the other graft after a fifth intervention for haemodialysis. This required total excision of the graft and saphenous vein interpositioning to the brachial artery. At the end of the third month, both of the grafts between the radial artery and the brachial vein were patent and the patients had had several haemodialysis sessions. However, these grafts also failed at the end of fifth and sixth months. A recently occluded graft was re-operated for thrombectomy, but it re-occurred in the first post-operative day. The patency rates of the grafts by means of graft location are seen in Table 1.

Matsuura et al. [1] found the 6- and 12-month primary patency rates of the bovine SG as 72.6 and 58.6%, respectively, compared with 6- and 12-month primary patency for ePTFE conduits of 57.4 and 57.4%, respectively in the canine model. They reported that the conduit had shown fibroblast cell migration and proliferation with incorporation into the surrounding subcutaneous tissue and elongated cells expressing the contractile protein smooth muscle actin at the end of 10 weeks. They also demonstrated procollagen synthesis in the fully colonized graft matrix after 24 weeks. They concluded that bovine SG might be a potential new biological haemodialysis conduit [1]. The high patency rate in the aforementioned study may be because the grafts had been sham-accessed once weekly. Our study population had three haemodialysis sessions per week. Another point is that a true and pseudoaneurysm formation of the graft in one of our cases may mean that the maturation of the graft had not been completed in the first 6 weeks.

Darby et al. [2] reported the primary patency, assisted-primary patency, secondary patency and
freedom from infection as 29, 49, 81 and 95% respectively at 1 year. In 19 of the 25 cases, a total of 49 procedures were required to maintain or re-establish patency. They concluded that bovine ureter graft might be advantageous to other biological grafts, as it had wall compliance properties that might limit myointimal hyperplasia, a substantial wall thickness to avoid dilatation, ability to repair wall damage from needling and ability to remove infection from needle tracts. Hence, they also reported two cases with graft dilatation [2]. Potential differences in surgical approach between this study and ours were that they used brachial artery and femoral artery as inflow vessels, and that they did not use systemic heparinization. However, the grafts showed worse prognosis in the brachial artery position in our cases.

The present study is the second human trial of the bovine ureter graft. Our limited study population revealed a worse prognosis than the aforementioned studies. For a better conclusion as to whether the bovine ureter graft can be an alternative for the access problem, further studies are necessary.

### References

2. Darby CR, Roy D, Deardon D, Cornall A. Depopulated bovine ureteric xenograft for complex haemodialysis vascular access. *Eur J Vasc Endovasc Surg* 2005; Epub ahead on print

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### Table 1. Post operative follow-up: Implantation sites, patency rates and complications

<table>
<thead>
<tr>
<th>Patient</th>
<th>Implantation Site</th>
<th>Patency</th>
<th>Complication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Radial artery–brachial vein</td>
<td>5 months</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>Radial artery–brachial vein</td>
<td>6 months</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td>Brachial artery–axillary vein</td>
<td>8 weeks</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>Brachial artery–axillary vein</td>
<td>7 weeks</td>
<td>Aneurysm and pseudoaneurysm formation</td>
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