CASE REPORT

Treatment Options in the Management of Abdominal Aortic Aneurysm in Patients with Renal Transplant

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Introduction

An increasing number of vascular disorders occur in patients with renal transplant because of accelerated atherosclerosis process associated with uraemia despite a functional transplant,¹ the expansion of kidney transplantation to high risk and old patients with underlying atherosclerotic disease, and the ever-advancing age of the recipients.²⁻⁴ The occurrence of abdominal aortic aneurysm (AAA) in this patient population poses a problem of the preservation of renal function during the aortic reconstruction which led to the introduction of several methods to avoid ischaemic and reperfusion injury to the transplanted kidney (Table 1). We report our experience in the management of patients with functioning renal transplant undergoing AAA repair.

Patients

From August 1995 to March 1998, three male patients with functioning renal transplant were admitted in the Division of Vascular Surgery, Helsinki University Central Hospital, Helsinki, Finland, for the management of asymptomatic infrarenal abdominal aortic aneurysm (AAA). They had a kidney transplantation anastomosed to the right internal iliac vessels, 8 months, 62 months, and 105 months before aortic operation, respectively. Chronic glomerulonephritis was the cause of renal failure in two patients, while polycystic renal disease was the cause in the third patient. One patient has had acute myocardial infarction 12 years before and another patient had two episodes of left iliacofemoral-popliteal venous thrombosis probably due to compression by a polycystic left kidney. At the time of AAA repair, the preoperative serum creatinine was normal or at the upper limit of the normal values in all three patients (range, 85–116 μmol/l; n.v.: 55–115 μmol/l). Ultrasonography, angiography and CT scan were performed in all cases confirming an AAA with a maximum transverse diameter of 5.0 cm, 6.1 cm, and 6.5 cm, respectively.

Techniques

The patient with polycystic kidney disease underwent resection of the left kidney which weighed 2.8 kg. Then, a temporary extracorporeal 6 mm PTFE bypass graft was performed between the stump of the left renal artery and the right common femoral artery in order to provide retrograde blood flow to the renal

Table 1. Treatment options for protection of the transplanted kidney during AAA repair.

<table>
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<th>Technique</th>
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<tr>
<td>Permanent axillo-unifemoral bypass*</td>
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<tr>
<td>Temporary axillo-unifemoral bypass⁶⁷</td>
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<tr>
<td>Axillofemoral shunt⁴</td>
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<td>Aortofemoral shunt⁵</td>
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<td>Femorofemoral extracorporeal circulation¹⁰⁻¹²</td>
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<td>Perfusion cooling¹²</td>
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<td>General hypothermia³</td>
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*No aortic reconstruction.
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the renal transplant during aortic cross-clamping, as measured at the groin with the distal outflow arteries clamped. An aortic reconstruction to the right common iliac artery and the left common femoral artery was carried out with a bifurcated 16/8 mm prosthetic graft. The inferior mesenteric artery was anastomosed to the graft. The temporary bypass was then removed.

In the third patient, the AAA was found to be suitable for endoluminal stent grafting repair (Fig. 1). A Vanguard bifurcated prosthesis was inserted through bilateral femoral approaches and a Vanguard tapered extension was then inserted in the left common iliac artery to avoid any endoleak. Endarterectomy of the right common femoral artery was done to remove atherosclerotic stenosing lesion. Since the endarterectomised arterial wall was thin and weak, a prosthetic bypass graft between the external iliac and the common femoral artery was carried out.

Results

In no patient did the serum creatinine increase during the 24-hour postoperative period (range, 84 to 113 \( \mu \text{mol/l} \); n.v.: 55–115 \( \mu \text{mol/l} \)). A slight increase of creatinine serum level was observed in two patients on the second (129 \( \mu \text{mol/l} \)) and 15th postoperative day (122 \( \mu \text{mol/l} \)), respectively, but the renal transplant function was otherwise normal.

Acute ischaemia of the left lower extremity due to intimal dissection of the common femoral artery occurred in the third patient five days after endoluminal stent grafting repair of the AAA. Thrombectomy and endarterectomy of the left common femoral artery were performed with successful restoration of the blood flow to the lower extremity. The patients were discharged after a mean postoperative in-hospital stay of between 8 and 18 days.

Discussion

Successful surgical repair of AAA in patients with a functioning renal transplant has been reported without any form of renal transplant protection. It has been suggested that either collateral blood flow or short ischaemia time can avoid any injury of the transplanted kidney. Modifications of the aortic reconstruction technique have also been introduced. Lacombe described the “double proximal clamping” technique which involves the placement of two proximal aortic clamps to allow division of the AAA neck.

Fig. 1. Angiography showing the right renal transplant and an AAA which was suitable for endoluminal stent-grafting repair.
providing blood flow to the transplanted kidney by the lumbar, inferior mesenteric, and iliac arteries during the proximal aortic anastomosis. Then, if the aneurysm does not involve the origin of the transplant artery, the prosthesis is anastomosed to the iliac artery proximally to the artery of the transplanted kidney. When the aneurysm involves the origin of the transplant artery, an anastomosis between this artery and the prosthesis is carried out. The prosthesis is clamped distally to the renal artery and revascularisation of the lower extremity is then performed. Matley and Immelman first performed the anastomoses between the limbs of the prosthesis and the femoral arteries and then completed the proximal aortic anastomosis. The authors suggested that this method allows renal transplant perfusion by retrograde blood flow via both the external iliac arteries and reduced the ischaemia time. Preoperative hydration and volume expansion, and intraoperative mannitol and furosemide, may further minimise the risk of graft loss or acute tubular necrosis. The proposers of these “straight” methods suggested that the use of protective shunt or bypass may increase the risk of haemorrhagic or infectious complications without any advantages in terms of renal transplant protection. However, the number of reported cases is small, and we suspect that some unsuccessful cases might remain unreported. In fact, most of authors have described aortic reconstruction with the use of some form of preservation technique (Table 1) so as to allow for the possibility of unexpected technical difficulties and to avoid any operative risk in poorly functioning renal transplants. Furthermore, protective methods are worth while in the case of ruptured AAA. In our experience, the use of a temporary bypass resulted in a technically easy AAA repair in two cases. In one of them, the left renal artery after resection of the polycystic kidney was used as inflow artery to spare the axillary artery from any arteriopathy. Interestingly, we were able to perform the first ever reported endoluminal stent grafting repair of an AAA in a patient with a functioning renal transplant. Kuo et al. have previously reported an endovascular stenting procedure following renal transplantation in a young patient with a stenosing lesion of the suprarenal abdominal aorta.

In conclusion, when technically feasible, endoluminal repair of an abdominal aortic lesion should be considered as the treatment of choice, as it does not require any form of renal transplant protection. A temporary extra-anastomotic shunt maintains renal transplant perfusion when conventional AAA repair is required.

References


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