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Renal transplantation in patients with abdominal aortic aneurysm—a new surgical approach

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Abstract An increasing number of abdominal aortic aneurysms occurs in renal failure patients because of an accelerated atherosclerosis process associated with uraemia. When technically feasible, endovascular repair of an abdominal aortic lesion should be considered as the treatment of choice. If a surgical repair is suggested, there are several options to select from. Since November 1999, we performed simultaneous aortic reconstruction using fresh arterial allograft and kidney transplantation in five uraemic patients with asymptomatic abdominal aortic aneurysm. The operative and post-operative course of four patients

passed without major complications. One patient had ischaemic colitis early after the operation, which required a partial resection of the colon. One patient died 6 weeks after the operation due to non-vascular causes. In conclusion, the advantage of our single-phase procedure is that both diseases are treated simultaneously during a single hospital stay. Moreover, with our procedure, the risk of vascular graft infection in patients with chronic immunosuppression is low.

Keywords Kidney transplantation · Arterial allograft · Abdominal aortic aneurysm

Introduction

The report of the first successful resection of an abdominal aortic aneurysm greatly influenced vascular surgeons throughout the world [1]. It is less known, however, that Charles Dubost had used for the reconstruction a graft of human aorta that had been preserved for 3 weeks. At present, abdominal aortic aneurysm is seen with increasing frequency in patients waiting for kidney transplantation. If an endovascular stent graft cannot be used, surgical arterial reconstruction using a vascular prosthesis with kidney transplantation, performed at one session or separately after an interval, is suggested [2]. Another option is to perform both procedures at one time using a fresh arterial allograft and kidney from the same donor [3].

Materials and methods

As of November 1999, we performed simultaneous aortic reconstruction and kidney transplantation in five uraemic patients with asymptomatic abdominal aortic aneurysm. Before being accepted as a transplant candidate, each patient underwent a complete vascular check-up that included ultrasonic scanning and CT angiography (Fig. 1). For reconstruction we used fresh arterial graft (thoracic or abdominal aorta), which was harvested during multi-organ harvesting. A match in the blood groups between donor and recipient was required, as was a negative cross-match. The graft was perfused and stored under the same principles as the other organs harvested (Table 1). Cold ischaemia times for the arterial allograft and kidney did not exceed 24 h and 26 h, respectively.



Fig. 1 CT angiogram demonstrating an aortic aneurysm

Three patients were operated on from a left-side oblique laparotomy, extraperitoneally, and, following aneurysm reconstruction, had their kidney graft transplanted into the left iliac fossa. In two patients aortic repair was undertaken from a mid-line incision, with the kidney placed intraperitoneally. Postoperative care included blood loss replacement and administration of broad-spectrum antibiotics. All patients were immunosuppressed with triple therapy consisting of cyclosporin or tacrolimus, mycophenolate mofetil (MMF) and steroids.

Results

The operation and postoperative course of four patients passed without major complications, and development of renal transplant function was immediate. One patient had ischaemic colitis early after the operation, which required a partial resection of the colon. One patient died 6 weeks after the operation due to non-vascular causes (Table 2). The other patients are postoperatively scheduled for regular follow-ups in our department at 3-month intervals. CT angiograms 1 year after each operation demonstrate standard findings (Fig. 2).

Discussion

Kidney transplantation is a routine treatment for renal failure today. Its excellent results have led to a progressive slackening of criteria for the basis on which a patient is put on the transplantation waiting list. Even advanced-age patients suffering from a number of secondary ailments are not contraindicated for the procedure. Recently, there has been an increasing number of patients that suffer from both renal failure and sclerotic changes of arteries. Following kidney transplantation, such patients require special attention. If a uraemic patient also suffers from an asymptomatic aneurysm of the abdominal aorta, there are several options to choose from.

Scott and Chuter reported the first endovascular placement of a bifurcated aortic stent graft in 1994 [4]. Most certainly, the most comfortable procedure from the patient's viewpoint is the insertion of a stent graft into the abdominal aorta, followed by renal transplantation [5]. For the time being, however, long-term findings concerning patients treated in the manner described

Table 1 Donors' characteristics (*M* male, *F* female, *K* kidney, *H* heart, *Lu* lungs, *L* liver, *UW* University of Wisconsin)

Donors	Age (years)/gender	Cause of death	Organs donated	Perfusion solution
1	19/M	Cranio-trauma	K, H, abdominal aorta and iliac arteries	Custodiol
2	44/F	Cranio-trauma	K, H, Lu, thoracic aorta	Custodiol
3	35/M	Cranio-trauma	K, thoracic aorta	Eurocollins
4	42/M	Cranio-trauma	K, H, L, thoracic aorta	UW
5	43/M	Cranio-trauma	K, H, thoracic aorta	Custodiol

Table 2 Recipients' characteristics (*F* female, *M* male, *Cr* creatinine)

Recipients	Age (years)/gender	Cold ischaemia (h) graft/kidney	Vascular procedure	Early complications	Follow-up (months)	Cr (micromol/l)
1	63/F	11/13	Aortobifem.	No	42	104
2	53/M	12/14	Aorto-aortalis	No	35	115
3	55/F	12/14	Aorto-aortalis	No	—	—
4	51/M	24/26	Aorto-aortalis	Ischaemic colitis	10	180
5	56/M	11/13	Aorto-aortalis	No	6	90



Fig. 2 CT angiogram demonstrating aortic reconstruction and kidney transplantation (1 arterial allograft, 2 renal graft)

above are not available. One major concern unique to these grafts is that of dislodgment or migration of the graft. Dislodgment that can result in proximal leaks, thereby worsening the aneurysm, is recognized as a potential problem with endovascular grafts. If there are anatomical or other reasons that render the stent insertion impossible, surgical treatment is suggested. Most frequently, the aorta is first reconstructed with the use of an artificial vascular prosthesis, and the renal transplantation follows later. The recommended interval between vascular reconstruction and subsequent transplantation is 6 weeks to 3 months [6, 7].

A less-often used option is to perform both surgeries at the same time. The first such case was described as early as 1977 [8]. The single-stage operation is advantageous in that it requires the patient to be hospitalized and anaesthetized just once, thus reducing costs. If the arterial reconstruction makes use of an artificial vascular prosthesis, the risk of infection is increased, particularly if complications such as haemorrhage or urinary fistula occur. On the other hand, an inherent disadvantage of

the combined surgery is that it depends on a suitable donor and is thus performed urgently, without any possibility for HLA typing to be considered.

Recently, there has been an increasing interest in arterial reconstructions using a fresh arterial allograft (FAG) [9, 10]. The trend is supported mainly by new immunosuppressive substances with a high anti-rejection effect and, at the same time, minimal side complications. It seems that these drugs could effectively suppress the rejection-related degeneration of the arterial allograft, so much feared in earlier times [11]. Compared with other replacements, the FAG has a number of theoretical advantages. In comparison with artificial vascular prostheses, FAGs seem to be more infection-resistant, although some works mention relatively good results in the treatment of an infected prosthesis using in situ reconstruction [12, 13]. Compared with a cryopreserved arterial allograft, the use of a FAG offers a greater chance of keeping the graft cells alive and maintaining the physical properties of the allograft, thus keeping the arterial patency for a long period of time [14].

Arterial graft harvesting is a well-proven part of multi-organ harvesting. In our set of patients, the cold ischaemia period of FAGs did not exceed 24 h. Recently, a combined liver and kidney transplantation, with simultaneous aneurysm repair using arterial allografts, was successfully performed [15]. There is hardly any doubt that a patient after a FAG reconstruction must be administered immunosuppressive drugs. The patients in our group, who have undergone simultaneous kidney transplantation, receive a combination of three immunosuppressive drugs, including cyclosporin (tacrolimus), MMF, and prednisone, which should prevent graft rejection, thus ensuring that the artery will remain patent for a long time.

In conclusion, kidney transplantation can be safely performed simultaneously with the reconstruction of an asymptomatic aneurysm of the abdominal aorta. The reconstruction procedure can make use of a fresh arterial allograft from the same donor. In general, the treatment of uraemic patients that also suffer from an abdominal aortic aneurysm brings about higher morbidity and mortality rates. In order for an optimum solution to be found, research in the field of vascular substitution must be continued, and the set of patients, and their long-term results, expanded.

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