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Dual renal transplant from a non-heart beating donor

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Abstract In September 1998, a 48 year old male underwent bilateral renal transplantation from a 51 year old non-heart beating donor (NHBD) with ischemic heart disease. The grafts exhibited delayed graft function, otherwise short term results have been good, with a three month serum creatinine of 80 µmol/l, three month GFR of 79 ml/min per

1.73m² BSA, and no episodes of acute rejection. We advocate dual transplantation when sub-optimal NHBD kidneys are otherwise in danger of being discarded.

Key words Non-heart beating donor · Asystolic donor · Marginal kidney · Dual transplant · Bilateral transplant · Renal transplant

Introduction

As we all know, the main impediment to renal transplantation is the shortage of donor organs. One of the alternatives to traditional organ donation is, therefore, the use of non-heart beating donor organs. However, concern has been raised as to the long-term outcome of these kidneys, especially when older donors (> 50 years) are used, or the cause of death is due to ischemic heart disease. Brenner [1] first put forward the notion that chronic nephropathy is due, at least in part, to non-immunological factors such as hyperfiltration in kidneys of small functional mass. Johnson [4] took this one step further, by suggesting that appropriate "nephron dosing" through the use of double kidney transplants from single donors may address some of these worries and result in acceptable renal function and improved long-term graft survival. We report a case where a 48-year-old male with end-stage renal failure (ESRF) received bilateral renal allografts procured from a NHBD.

Case report

A 48-year-old male with ESRF secondary to essential hypertension was admitted for renal transplantation from a NHBD. He had received haemodialysis for a period of 2 years preceded by

5 months of continuous ambulatory peritoneal dialysis prior to admission. There was no other relevant past medical history.

The donor was a so-called "marginal donor" of 51 years, who had died due to a probable myocardial infarction. Following unsuccessful cardiopulmonary resuscitation in the accident- and emergency department, the retrieval team was called, and in-situ cold perfusion of both kidneys, using Marshall's hyperosmolar citrate solution, was established by means of a femoral arteriotomy and catheterisation with a double balloon triple lumen catheter as previously described [7]. A plain abdominal radiograph was taken to confirm position ensuring effective cold vascular perfusion.

The donor was then taken to theatre, where both kidneys were procured and found to be of good size and colour. The initial warm ischemic time for both kidneys was approximately 25 min, with cold ischemic times of 940 min (right) and 1039 min (left).

As a further suitable recipient could not be found, either locally or nationally, a decision was made to transplant both kidneys into the same patient. The patient gave full, informed consent. At operation, bilateral iliac fossa muscle cutting incisions were made. Both external iliac arteries were tortuous but of good size. The left kidney was implanted into the right *iliac fossa*, and the right kidney into the left *iliac fossa*. The anastomosis time for the right kidney was 30 min and for the left 29 min. Both ureters were implanted using the onlay extravesical ureteroneocystostomy technique.

The patient was treated with one of our standard immunosuppressive regimens for NHBD recipients. This consisted of cyclosporine, azathioprine and prednisolone. Following pre-operative dialysis the patient's serum creatinine was 488 µmol/l and the serum potassium concentration was 4.8 mmol/l. Post operatively, the patient's serum creatinine was 718 µmol/l and plasma potassium concentration was 7.4 mmol/l. This large increase in serum po-

tassium concentration may be due, at least in part, to reperfusion of the increased mass of the previously ischemic renal tissue. The patient therefore required further haemodialysis to restore these indices to acceptable levels. As experienced with most (> 90%) of the recipients of a NHBD renal transplant in our centre, the graft displayed delayed graft function, and this patient required haemodialysis for a total of 16 days post-operatively.

A duplex scan on day 3 revealed good arterial perfusion of both kidneys. A renal biopsy was performed on day 6, as per protocol, which showed marked tubular necrosis with active regeneration, and no evidence of acute rejection. Significant urine production was noted on day 16 and on day 17, urine output in 24 hours approached 3 l, and serum creatinine started to plateau at approximately 650 µmol/l. The patient continued to produce large quantities of urine, compatible with the recovery phase of acute tubular necrosis. On day 19, the patient was discharged from hospital with a serum creatinine of 663 µmol/l having been dialysis-independent for 3 days. Apart from a prolonged healing period for the muscle splitting incisions, the post-operative course was unremarkable.

Short term follow-up has been promising, with a 1-month creatinine of 181 µmol/l and a 3-month creatinine of 80 µmol/l compared with means of 391 µmol/l and 215 µmol/l respectively, in the 69 NHBD recipients performed in the same centre from 1992 to the present day. Normalised GFR at 3 months was 79 ml/min per 1.73m² BSA, which again compares favourably to the single NHBD recipients, whose mean normalised GFR at 3 months is 37.4 ml/min per 1.73m² BSA. In the first three months post transplant, this patient did not experience any episodes of acute rejection.

donors has fallen from 25% of all donors in 1988 to 19% in 1997 [6]. A decline in the number of deaths due to intracerebral haemorrhage in the 15–64 age-group in England and Wales of 57%, from 5,609 in 1976, to 2,405 in 1996 [6] has also had an impact. Reports from other countries, notably the work by Dafoe [3] in the United States, have shown promising results of dual renal transplantation with expanded criteria donors.

As we strive to expand the donor pool dual transplantation with NHBD kidneys is worthy of consideration. Kootstra [5] and our own unit [2] have already shown acceptable results with NHBD grafts, but it may be that when the grafts are from sub-optimal donors, as in this case, when the kidney was from a relatively old donor with ischemic heart disease that dual transplants should be considered.

Wound healing with bilateral iliac fossa incisions was delayed in this case, and the midline transperitoneal approach taken by Dafoe [3], which seems to reduce morbidity, may be a better alternative. Another of the worries with dual transplantation has been the increased immunogenic material that is transplanted, which theoretically could lead to increased episodes of acute rejection. In this single patient, this proved not to be a problem, as the patient experienced no episodes of acute rejection in the first three months.

In conclusion, early results have been promising, and compare favourably to those of single NHBD recipients. We await longer-term results with interest, to see if the long-term graft survival is also improved. We would advocate that dual transplantation should be considered when sub-optimal NHB donor kidneys are otherwise in danger of being discarded.

Discussion

Renal transplantation continues to be the most effective treatment for ESRF. However, traditional cadaveric donor sources continue to decline. For example, in the United Kingdom the proportion of road-traffic accident

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