On-line Case Report

Dual ipsilateral renal transplantation from a non-heart-beating donor

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A case is described where both kidneys from non-heart-beating (expanded criteria) donors were dual transplanted ipsilaterally. Although both kidneys passed viability tests on the Newcastle machine preservation system and biomarkers' evaluation, there were logistical issues where the cold ischaemic time was too protracted necessitating the transplantation of both kidneys into one recipient. The recipient had satisfactory outcome with the Cockcroft-Gault creatinine clearance of 72.47 (36.29 ml/min individual kidney glomerular filtration rate) suggesting beneficial use of sub-optimal organs to improve outcome.

Key words: Renal transplantation – dual renal transplant – non-heart-beating donation

The shortage of kidney donors is a major limitation for renal transplantation. Current statistics suggest a wide gap between demand and supply of organs for transplantation.¹ Non-heart-beating donors are an alternative supply and, therefore, potentially could allow a significant expansion of transplant numbers. Kidneys from such donors have been exposed to a significant ischaemic insult which can be profound enough to prevent the organ from ever working. Therefore, transplant units need to identify only those kidneys that will work to avoid transplanting those that will not.² Assessment of non-heart beating donor (NHBD) kidneys for viability is achieved by machine perfusion. Sub-optimal kidneys from such donors could possibly be transplanted as a pair into one recipient. However, the terminal history of the donor is obviously common to both kidneys. Therefore, if one kidney fails there must be a high chance that the other kidney would also fail. To transplant one kidney into each side of the abdomen from

the same donor means that a subsequent transplant, if neither work, would be more difficult.

We describe a case in which, although both kidneys passed their viability tests, there were logistical issues where the cold ischaemic time was too protracted necessitating the transplantation of both kidneys into one recipient. In this case, both kidneys were transplanted in the same side preserving the opposite side for a future transplant should that ever become necessary.

Case report

Donor's history

The donor was a 52-year-old male who had had an elective prosthetic hip arthroplasty 6 weeks prior to his death. There was no significant past medical history and his serum creatinine was 103 mmol/l 6 months prior to death. Six weeks after surgery, he suddenly collapsed at

Table 1 Timing sequence

Event	Timing
Time of circulatory collapse	0
Start of paramedic CPR	8 min
Arrival at hospital	23 min
Cessation of resuscitation	55 min
Perfusion established	1 h 11 min
Potential recipient called in after satisfactory viability tests	13 h 10 min
Cross match send	14 h 40 min
Cross match result back with one positive match for T cells on FACS	18 h 40 min

home from a pulmonary embolus. Paramedic cardio-respiratory resuscitation was initiated on site but he was pronounced dead on arrival in the accident and emergency department. At this point, the transplant co-ordinator was informed as he was a Maastricht category II non-heart-beating donor.

After femoral cannulation and perfusion with streptokinase and hypertonic citrate solution, consent to kidney donation was sought.

Donation and processing of the donated kidneys

Kidneys were procured using the *en-bloc* technique.⁴ Organs were tested for viability by the Newcastle machine preservation system and biomarkers were evaluated.⁵ Both kidneys passed their viability tests and two potential recipients were called for transplant. Prior to transplantation, the recipients were tested for donor-specific antibodies by crossmatch. One of the patients was found to have donor T-lymphocyte-specific antibodies and, therefore, could not receive a transplant. As the cold ischaemic time was quite protracted by this point and to send for more recipients would further prolong this, we decided to offer the second potential recipient both kidneys (Table 1). Kidneys from non-heart-beating donors are very sensitive to prolonged cold ischaemia and we try to minimise this period to less than 24 h. This recipient was a 44-year-old male with end-stage renal failure secondary to IgA nephropathy and the mismatch between him and the donor was 1-2-1.

The operative procedure

A 'J' incision was made in the right iliac fossa. The iliac vessels, lower part inferior vena cava (IVC) and aorta were all dissected and slung. The right kidney was implanted first with the renal vein anastomosed end-to-side to the recipient IVC and the renal artery anastomosed to the aorta. After the clamps were released and haemostasis was achieved, the left kidney was transplanted. This kidney was transplanted

Figure 1 Operative technique.

with the renal vessels anastomosed end-to-side to the external iliac vessels (Fig. 1). Ureters were anastomosed separately into the bladder using an extravesical approach.

Postoperative progress

Initial immunosuppressive management was with prednisolone 20 mg once a day, mycophenolate mofetil 500 mg twice a day, and two 20 mg doses of basiliximab at day 0 and day 4. Postoperative perfusion scans revealed good flow (Fig. 2) and dialysis was required on days 1, 2, 4, and 7. Heparin was administered as an infusion for the first week as is standard practice in Newcastle. A biopsy at 7 days revealed acute tubular necrosis; however, from that point the patient was free of dialysis. At day 38 post-transplant, his serum creatinine was 116 mmol/l (Fig. 3).

Discussion

Since the initial report of dual renal transplantation using adult kidneys in 1996,⁶ a review of the UNOS data for dual

Figure 2 DTPA scan showing good perfusion in both kidneys.

renal transplantation has demonstrated excellent long-term outcome.⁷ Dual renal transplantation has been reported where kidneys were transplanted either bilaterally or ipsilaterally.^{8,9} Most cases of dual renal transplant were performed with kidneys from cadaveric heart-beating donors. In these cases, dual transplantation was considered when organs were considered to be sub-optimal, with low creatinine clearance or having been turned down from other centres.^{10,11} The definition of marginal kidneys suitable for dual transplantation was described by earlier American series and includes donors over the age of 55 years, admission creatinine clearance of less than 90 ml/min and a history of hypertension.¹² Such specifications are controversial, particularly for European practice.

Kidneys retrieved from non-heart-beating donors are more likely to suffer from ischaemic damage. Therefore, in this situation, dual transplantation should probably have a more defined role, particularly in the UK at a centre which uses non-heart-beating donor kidneys. Amongst other factors that can influence outcome is the duration of cold storage. In our institution, we try to minimise the cold ischaemic time to less than 24 h as kidneys from non-heart-beating donors are particularly sensitive to this.¹³ In addition, evidence of cellular

Figure 3 Reciprocal creatinine plot

damage by elevated enzyme levels in perfusate could also be relevant. Therefore, determining when dual transplantation could be more appropriate, though relatively easy to define at a single centre, would be more difficult for multiple centres. However, no matter what the criteria were, the final stable glomerular filtration rate (GFR) should be closer to a good single transplant than a dual healthy graft. In this case, the Cockcroft-Gault clearance was 72.47 (36.29 ml/min individual kidney GFR) and this would suggest our decision was correct.

Conclusions

The use of marginal donors particularly from non-heart-beating donors, where primary non-function is a distinct possibility, means that a double primary non-function could seriously jeopardise subsequent transplants if performed bilaterally. Therefore, ipsilateral renal transplant should be the procedure of choice for kidneys from such donors as it leaves one side undisturbed for any subsequent graft.⁹

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