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Protective effect of vasodilators in donors requiring pressor support

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Renal dose dopamine given to organ donors improves renal blood flow and therefore should theoretically improve the quality of the renal grafts and increase the incidence of immediate graft function (IGF). Allografts which function immediately have a better long-term survival [1].

Dopamine, in doses of less than 4 μg/kg per min, acts directly on receptors in blood vessel walls in the splanchnic bed causing vasodilation. In contrast, dopamine given at doses of greater than 4 μg/kg per min to hypotensive donors to elevate the systemic blood pressure has a direct adrenergic effect and causes vasoconstriction. This vasoconstriction when combined with the reperfusion injury which occurs after transplantation may jeopardize the chance of the graft functioning immediately. We studied 31 consecutive donors to see if those donors requiring pressor support (dopamine) to maintain systemic blood pressure had a lower incidence of IGF and whether this could be modified by giving the donor vasodilator drugs during procurement of the organs.

Key words: Renal transplantation – Organ donation – Dopamine

Patients and methods

The study group comprised 31 consecutive organ donors. Conventional methods for monitoring and managing the donors were used and, in particular, the donors were given dopamine if the systemic pressure fell below 90 mm Hg despite adequate ventilation and fluid replacement. The dose of dopamine was titrated against its pressor effect on the donor.

The period between the certification of brain death and procurement of the organs was less than 12 h in all donors. The procurement of the kidneys was performed by the same donor team with an *en bloc* removal of the kidneys, aorta and vena cava.

The 31 donors were randomly assigned to receive intravenous vasodilators or not. Phenoxybenzamine 100 mg was given at the start of the operation, and verapamil 5 mg and regitine 10 mg just prior to cross-clamping the aorta. The kidneys were perfused with Euro-Collins solution and stored on ice until transplanted. IGF was defined as adequate renal function such that the patient did not require dialysis in the first postoperative week.

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Results

The demographic data of the donors is shown in Table 1. The group of ten donors who received vasodilator drugs had a slightly greater average donor age, a greater male to female ratio, a greater number of grafts perfused in situ, a slightly longer cold ischaemic time, and a greater number of donors requiring dopamine support than the control group not given vasodilators.

The incidence of IGF after transplantation was 81 % in the kidneys procured from donors treated with vasodilators drugs and 52 % in the control group who did not receive vasodilator drugs (Table 2). The survival at 3 months of grafts from donors treated with vasodilator drugs was 94 % and of grafts from the control group was

Table 1. Demographic data of the donors in the vasodilator group and the control group

	Vasodilator group	Control
Number	10	21
Sex (M/F)	9/1	16/5
Perfusion		
in situ	4	3
ex situ	6	18
Organs procured		
kidneys only	6	14
multiple	4	7
Cold ischaemic time (h)	21	18
No. requiring dopamine support	5 (50%)	8 (39%)

Table 2. Incidence of immediate graft function (IGF) and 3-month graft survival in the grafts from donors receiving vasodilators and those not receiving vasodilators

	Vasodilator group	Control
Number of grafts	16	25
Immediate function	13 (81%)	13 (52%)
3-month graft survival	15 (94%)	20 (80%)

Table 3. Incidence of immediate graft function in the grafts removed from donors who required dopamine support and were given vasodilators

	Vasodilator group	Control
Donors needing dopamine support	5	8
Number of grafts	6	11
Immediate function	5 (83%)	2 (18%)

80% (Table 2). The beneficial effect of the vasodilator drugs was even more marked in the donors who required dopamine support. Of the grafts removed from donors who required dopamine support, 83% functioned immediately when vasodilator drugs were used compared with 18% when no vasodilator drugs were used ($P < 0.05$) (Table 3).

Discussion

One of the primary goals in renal transplantation is immediate function of the allograft. This can usually be expected in a well-hydrated, well-perfused living donor. However, with brain death, the many pathophysiological changes can effect the microcirculation and reduce the chances of IGF, especially if the donor requires dopamine support [2]. Dopamine is used in excess of 4 μg/kg per min to raise the blood pressure and does so by splanchnic vasoconstriction. The detrimental effects of vasoconstriction in the donor are aggravated by the reperfusion injury which occurs when the organ is transplanted. The reperfusion injury may be reduced by a number of drugs including diuretics, membrane stabilizers, nucleotide savers, scavengers, vasodilators and calcium channel blockers [5]. In this study, a combination of two vasodilators and a calcium channel blocker was used in the donor at the time of organ procurement.

The detrimental effect of dopamine has been shown experimentaly in a brain-dead pig model [3]. Furthermore, this effect could be reduced by pretreatment of the donor with tri-iodothyronine. Similarly, in clinical studies, acute tubular necrosis occurred in 50% of grafts if the donor received dopamine and 28% if they did not [4]. One-year graft survival was 27% for the grafts from dopamine-treated donors and 57% for the grafts from the donors not receiving dopamine [4].

In this study graft function was impaired when the donor had received dopamine. These effects could be reversed by the use of a combination of vasodilators and a calcium channel blocker given at the time of organ procurement. We recommend that all donors who require dopamine for pressor support be given vasodilators and a calcium channel blocker.

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