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Surgical Strategy to Transplant the Same Kidney in Two Patients

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Abstract

This report describes an unsuccessful living kidney transplantation, where the 12-year-old female recipient, who received the kidney from her mother, died on the post-operative day 2, due to cerebral ischemia and became a brain-death donor.

The family agreed to a multi-organ donation since the previously transplanted kidney was highly performing. Few reports were available in the literature about heart and liver grafts reused from a brain dead recipient, but we could not find any data about similar cases regarding kidney grafts. Our concerns were both on the surgical technical problems of the graft harvesting and transplantation and on the immunological response of the new recipient to the chimeric kidney.

Case Report

A 12-year-old girl suffering from Bardet-Biedl syndrome (obesity, psychomotor retardation, pigmentous retinitis, esadattilia, renal impairment) was admitted to our hospital to receive a renal transplantation from living donor (mother). She had undergone a kidney transplantation 11 years before for polycystosis with preservation of the native kidneys. She subsequently developed a chronic nephropathy following the arterial stenosis of the transplanted kidney, which was unsuccessfully treated with angioplasty.

On the scheduled day, she underwent living kidney transplantation from her 43-year-old mother. The blood group of the recipient was AB positive with the following HLA tiping: HLA-A 01,24; HLA-B 51,52; HLA-DRB 13,15. The blood group of the donor was B positive, with the following HLA tiping: HLA-A 24,32; HLA-B: 35,51; HLA-DR: 11,13. The crossmatch was repeated three times and always reulted negative.

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The left kidney harvested with the retro-peritoneal approach [1,2] was derived from her mother and was preserved in hypothermic solution (Celsior). The vascular anastomosis was performed in a standard fashion: termino-laterally on the external iliac vein and artery [3,4]. The graft reperfusion occurred after 110 minutes of cold ischemia and intra-operative diuresis was observed. A ureteral-vesical anastomosis was performed according to Gregoir technique on double J stent [4,5].

The immunosuppressive regimen in the first post-operative day was Basiliximab 20 mg after the reperfusion, 4 mg of Tacrolimus every 12 hours and 500 mg of steroids [6,7].

The post-operative course was characterized by a prompt recovery of renal function in terms of good diuresis and seric creatinine and urea respectively of 2.2 mg/dL, and 130 mg/dL.

On the second post-operative day, the recipient suddenly went into deep coma; she was re-intubated and a CT scan of the head showed an ischemic area in the cerebellar right hemisphere **(Figure 1)**. An angiography was then performed, which showed no intra-cerebral vascular flow. After the assessment of brain death according to the national legislation [8] and after the family consent to donation, she underwent organ procurement.

Among the neurologic complications after organ transplantation, cerebral hemorrhage may develop and the transplanted recipient may become a brain-death donor [9-13] however usually organs other than the transplanted ones are considered for a new transplantation.

In such case, the transplanted kidney was properly working and we believed correct to consider it for transplantation. Moreover, the parents of the girl were kindly encouraging us to go on with a further donation of the donated kidney with the intent to obtain a successful transplantation from the living donation.

Our concerns about this type of procedure were mainly about surgical technical and immunological aspects. No solid and reliable reports from the scientific literature were available in order to guide our decision-making process. We discuss in the following sections the problems we met and our proposed solutions.

Eventually, the kidney was transplanted on a 53-year-old man after 13 hours of cold ischemia. A standard immunosuppressive regimen was used: induction with Thymoglobulin and steroids, and maintenance therapy with tacrolimus and mycophenolic acid. His renal function recovered progressively without necessity of hemodyalisis and the patient was discharged in good condition after 17 days without any severe surgical complication.

Surgical strategy

The first surgical problem we met was about the procurement of the transplanted kidney together with the other organs (heart and liver). Usually in order to perfuse all the abdominal organs (liver, kidney, pancreas and small bowel) with the hypothermic solutions, a cannula is placed in the abdominal aorta at the level of the inferior mesenteric artery, which is legated as to reduce the dispersion of the solutions. In the present case, we needed to perfuse the transplanted kidney, which had the vascular anastomoses at the level of the left external iliac vessels. Furthermore, the calibre of the iliac arteries was too small and it could not ensure an adequate perfusion to the liver and the transplanted kidney.

Therefore, we decided to cannulate the aortic arch in order to perfuse the celiac axes and the left iliac artery. We proceed with a standard technique of liver procurement [14] and the transplanted kidney was procured together with the iliac vessels of the recipient where the anastomoses were performed (**Figure 2**). The ureter was disconnected at the level of the vescical anastomoses and during the bench surgery, the iliac vessels of the recipient and the left artery and vein of the living kidney were prepared for the transplantation leaving the previous vascular anastomoses untouched.

Our concerns were on the length of the graft vessels, we decided therefore to preserve the previous vascular anastomoses.

The vein anastomoses of the second kidney transplant was performed between the right external iliac vein of the second recipient and a vein patch of the iliac vein of the first recipient maintaining the vein anastomoses of the living graft (**Figure 3**).

Thereafter we checked the best position for the arterial anastomoses to avoid any kinking of the vessels; then we closed the distal part of the external iliac artery of the first recipient with a running suture of 6-0 prolene, close to the previous anastomoses with the artery of the living graft. We then performed the arterial anastomoses of the second transplant between the right external iliac artery and the proximal part of the iliac artery of the first recipient (**Figure 3)**.

In conclusion, we used the first recipient iliac vessels as interposition grafts to perform the second transplant with the living graft and in this way the vascular anastomosis were performed in a standard fashion: Termino-laterally on the external iliac vein and artery of the second recipient.

At the end of the procedure, we checked the anastomoses and we re-perfused the graft after 40 minutes of warm ischemia time.

The ureter of the graft showed an adequate bleeding, suggesting satisfactory perfusion, so we performed a standard ureteral-vesical anastomosis according to Gregoir technique on double J stent.

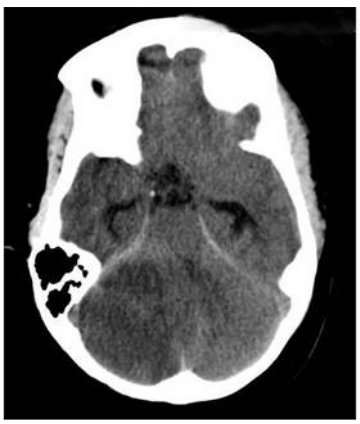

Figure 1: CT scan of the head taken from the girl recipient of the living donor kidney, showing the cerebral hemorrhage in the right cerebellar hemisphere.

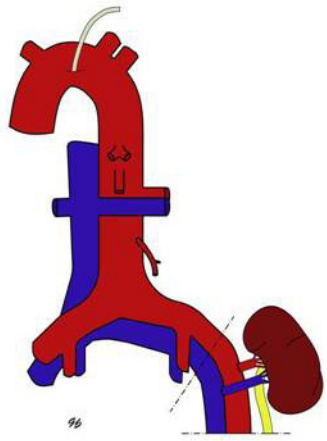

Figure 2: Technique of liver and transplanted kidney procurement. The perfusion was placed in the aortic arch and the transplanted kidney was procured together with the iliac vessels of the recipient.

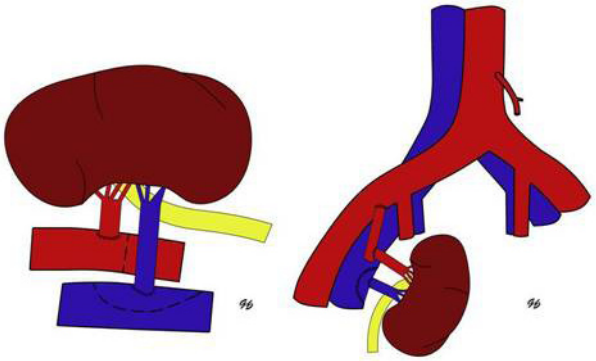

Figure 3: Preparation of the graft during the bench surgery and implantation of the graft using the first recipient iliac vessels as interposition grafts to perform the second transplant.

Immunological Problems

Usually, in our transplant centre according to the local transplant organization (AIRT), kidneys from deceased donor are allocated according to the following criteria: blood group identity, age (delta age inferior to 15 years), better HLA match (at least 1 match in HLA-antigen class I and 1 match in HLA-antigen class II), negative T cell cross match [15-17].

The immunological problems we met were about the allocation criteria for this organ and the possible increased immune response it could trigger in the second recipient.

First, we decided to re-transplant the kidney among adults instead of the pediatric patients because of the adult age of the mother and the kidney. Then we chose to select patients among recipients in the AB blood group waiting list, as the deceased donor, in order to minimize the risk of rejection from preformed antibody. Next we decided to use mother 's HLA typing instead of girl's typing in order to optimize the tolerance towards the graft.

Accordingly, to the above described decisions the kidney from the girl was allocated to a 53-year-old man with a polycystic kidney disease in hemodialysis. The blood group was AB positive and the HLA typing the following: HLA-A: 1,24; HLA-B: 63,39; HLA-DR: 11,13. A negative T cells cross match was verified.

No rejection episodes were observed, the "reused" graft had a prompt recovery with a serum creatinine level of 1.3 mg/dl at discharge and at the last follow up (6 months after the transplantation). Immunosuppression was Thymoglobulin 1 mg/kg (75 mg) for 3 administration (day 0, 3 and 5), steroids (metilprednisolone 500mg day 0, 125 mg day 1 and 2, 80 mg day 3 and 4, 60 mg day 5 and 6, 40 mg day 7 and 8, then orally prednisone 20 mg/day tapered to 5 mg/day at day 30), tacrolimus 0,2 mg/kg/day to achieve troght level of 10-15 ng/ml in the first month then 5-8 ng/ml, mycophenolic acid 1440 mg/day up to day 14 then 720 mg/day.

A few conditions may have promoted the good graft recovery in the second recipient. First the benign nephropathy of the two recipients (polycystosis) have allowed a better tolerance to the new graft in both cases. Secondly although the graft experienced a double ischemia and reperfusion trauma, the addition of the two events may have been not as detrimental, since the procedure of living donation for the first transplantation assured a minimal cold ischemia time to the graft. Finally, the immunosuppression administered to the first recipient before the brain death might have blunted the ischemia and reperfusion injury on the kidney [18,19].

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