



Dual Kidney Transplantation From Pediatric Donors to Adult Recipients

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ABSTRACT

Background. The organ shortage is a global problem. A potential approach to expanding the deceased donor pool is to harvest organs from pediatric patients.

Methods. Seven cases of dual kidney transplantation from pediatric donors to adult recipients were performed between 2012 and 2014 in our center. The proximal end of the donor aorta (AO) was anastomosed to the right common iliac artery or external artery. The proximal end of the donor inferior vena cava (IVC) was anastomosed to the right external iliac vein. Recipients received basiliximab or antithymocyte globulin as induction therapy, followed by tacrolimus, mycophenolate mofetil, and prednisone. Prophylactic anti-coagulation was not universal in our study.

Results. During the 21-month study period, both patient and graft survivals were 100%. No patient showed thrombotic complications. Complications included an acute rejection episode in 1 patient, urine leakage in 2, and anticoagulation related hemorrhage in 1. All recipients had excellent graft function with normal serum creatinine ranging from 0.49 to 1.45 mg/dL and estimated glomerular filtration rate ranging from 56.89 to 145.27 mL/min/1.73 m².

Conclusions. Dual kidney transplantation from pediatric donors to adult recipients is a promising way to expand the donor pool. Using the proximal end of the AO/IVC for anastomosis brings satisfactory results.

KIDNEY TRANSPLANTATION is the optimal treatment choice for patients with end-stage renal disease. It is associated with an improved quality of life and improved survival among these patients. However, there remains a disparity between the demand for and the supply of organs for kidney transplantation. China has made great progression in building a new organ donation system, and since 2010 donation from pediatric donors has occurred occasionally. Transplanting kidneys from pediatric donors to adult recipients was a way to expand the donor pool. Herein we have reported our experience of dual kidney transplantation from pediatric donors to adult recipients.

MATERIALS AND METHODS

From December 2012 to September 2014, 7 cases of dual kidney transplantation were performed at our center. All renal grafts were recovered from pediatric donors and allocated by the online distribution system. The causes of death among the pediatric donors

included infantile hepatitis syndrome, craniocerebral trauma, sudden cardiac arrest, clozapine intoxication, and hand-food-mouth disease (HFMD). The donors' age ranged from 6 to 37 months, and their body weight ranged from 6 to 11.5 kg. The recipients ranged in age from 24 to 44 years and weighed from 42.8 to 66 kg (Table 1). All transplantation procedures and the present study were approved by the institutional ethics committee. Written informed consent was obtained from all patients and their family members.

All procured organs were preserved by static cold storage. Average warm ischemic time was 13 minutes; cold ischemic time ranged from 3 to 8 hours. Bench surgery was performed routinely.

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Table 1. Demographic Data of Pediatric Donors and Adult Recipients

Case	Donor				Recipient			
	Gender	Age (mo)	Body Weight (kg)	Cause of Death	Gender	Age (y)	Body Weight (kg)	Primary Disease
1	Male	11	7.5	Infantile hepatitis syndrome	Female	39	47	Glomerular nephritis
2	Male	23	11	Craniocerebral trauma	Male	42	61	Snake gall poisoning
3	Female	6	6	Sudden cardiac arrest	Female	29	50.5	IgA nephropathy
4	Male	24	11.5	Craniocerebral trauma	Male	24	66	Glomerular nephritis
5	Male	24	11	Hand-foot-and-mouth disease	Male	41	63	Unknown
6	Male	12	8	Craniocerebral trauma	Male	44	51.9	Glomerular nephritis
7	Male	37	11	Clozapine intoxication	Female	29	42.8	Glomerular nephritis

All nonrenal tributaries of the donor aorta/inferior vena cava (AO/IVC) were ligated. The distal ends of the AO/IVC were cut short and oversewn with continuous running sutures (case 1–4 and 6). In case 5, the posterior wall of the AO was cut open longitudinally owing accidentally (like it is always done in adult liver-kidney graft separation); moreover, a tiny defect was found in the opening of the right renal artery. In case 7, the orifice of the superior mesenteric artery was found between the openings of the left and right renal arteries. When the liver and kidneys were separated, the superior mesenteric artery was kept with the liver graft; thus, a large defect remained in the aortic conduit of the en bloc kidneys. To solve these problems, we split the en bloc kidneys and performed single kidney transplantation sequentially in the ipsilateral iliac fossa. An aortic carrel patch was kept for anastomosis.

All of the kidney transplantations were performed extraperitoneally in the right iliac fossa. In dual en bloc kidney transplantation, the proximal end of the donor IVC was anastomosed end-to-side to the recipient's right external iliac vein, using 6–0 continuous absorbable sutures. Meanwhile, the proximal end of the donor's AO was anastomosed end-to-side to the recipient's right common iliac artery (cases 1 and 2) or right external iliac artery (cases 3–6), using 6–0 continuous absorbable suture (Fig 1). In dual splitting kidney transplantation (cases 5 and 7), left kidney transplantation was performed first—the vein of the left kidney was anastomosed end-to-side to the recipient's right external iliac vein and the artery of the graft was anastomosed end-to-end to the recipient's right internal iliac artery. The graft attained immediate perfusion after vascular reconstruction. Right kidney transplantation was performed second. The vein of the right kidney graft was anastomosed end-to-side to the recipient's right external iliac vein, and the artery of the graft was anastomosed end-to-side to the recipient's right external iliac artery (Fig 2). Among the 7 cases, 2 ureteroneocystostomies were performed separately by the extravesical technique, using 5–0 interrupted absorbable suture. Double-J stents were routinely placed in the ureters and removed transurethrally on posttransplant day 9.

Induction therapy including basiliximab (cases 3, 4, 6, and 7), or antithymocyte globulin (cases 1 and 5; Table 2), followed by tacrolimus, mycophenolate mofetil, and prednisone. In case 2, no induction therapy was used owing to ideal HLA matching (0 mismatch) and negative panel-reactive antibodies.

In cases 1, 2, 3, and 5, low-molecular-weight heparin (LMWH) was administered to prevent local formation of thrombus. Cases 4, 6, and 7 received no prophylactic anticoagulation therapy (Table 2). No thrombotic complications were observed. Systolic arterial pressure was controlled below the level of 120 mm Hg to prevent hyperfiltration injury that might lead to progressive glomerulosclerosis or proteinuria.

RESULTS

All renal grafts functioned immediately. No patient showed any thrombotic complications. During the 21-month study period, patient and graft survival were both 100%.

In case 3, the patient experienced a sudden decline in urine secretion and increase in serum creatinine (SCr) on post-transplant day 2. Color Doppler ultrasonography revealed an increased intrarenal resistant index of 0.92, implying a possible new-onset, acute rejection episode. The patient refused a graft biopsy, but agreed to undergo diagnostic

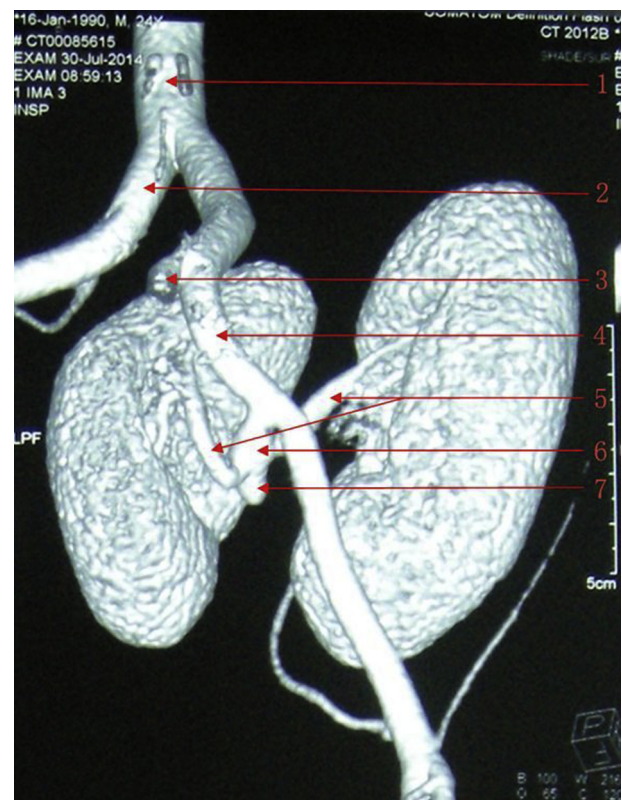


Fig 1. Three-dimensional reconstruction of pediatric dual en bloc kidney transplantation. 1, abdominal aorta; 2, left common iliac artery; 3, right internal iliac artery; 4, right external iliac artery; 5, left/right renal artery; 6, AO of the en bloc kidney; 7, blind end of the graft AO.

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