

SINGLE CENTER EXPERIENCE OF EN BLOC KIDNEY TRANSPLANTATION AND REVIEW OF LITERATURE

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Cadaveric renal transplant was started at King Faisal Specialist Hospital and Research Centre in January 1987. As the number of end-stage renal disease patients requiring transplant was steadily increasing, and the shortage of organs was becoming more severe, we began using cadaveric pediatric kidneys in 1989. When the age of the donor was less than three years, we used both kidneys together (en bloc) for one recipient.

Materials and Methods

From 1989 to 1997, we performed seven en bloc transplants from cadaveric donors aged between seven months and three years. Five of the seven patients were adults, and two were pediatric recipients. It was the second transplant in the first three recipients. The donor aorta and vena cava were sewn at their proximal ends. The distal end of the aorta was anastomosed to the external iliac artery and the vena cava to the external iliac vein. The ureters were sutured to make a single opening and anastomosed to the bladder as extravesical ureteroneocystostomy (Figure 1).

All the patients except Case numbers 3 and 7 received quadruple sequential therapy ALG or ATG, prednisone, cyclosporin or FK506 and Imuran or Mycophenolate Mofetil (MMF). The monoclonal antibody OKT3 was used for steroid-resistant rejection. FK506 was used as first-line treatment, or as rescue therapy in resistant rejection. Of late, MMF is being used as an initial immunosuppression.

Results

Case number 1 received an en bloc kidney transplant in 1989, and was given anti-thymocyte globulin (ATG) as induction. The patient developed two episodes of biopsy-proven rejection at 21 days and at two months, and was given OKT3 for 10 days. The kidneys never functioned and transplant nephrectomy was performed on the 68th day. The

donor was a three-year-old whose renal function at the time of harvest was satisfactory. The cause of the non-function was probably rejection.

The second patient received anti-lymphocyte globulin (ALG) for seven days, and continued on triple therapy. She had good primary function, and the DTPA nuclear scan on the first postoperative day showed good perfusion and excretion of the transplanted kidneys (Figure 2). No episode of rejection occurred, and the graft was still functioning well at 63 months. Her last creatinine level was 135 $\mu\text{mol/L}$.

Case number 3 lost her en bloc transplant due to renal vein thrombosis on the first postoperative day.

The fourth patient was a 14-year-old female who received an en bloc kidney transplant in October 1993. She received ALG for eight days, and then continued with triple therapy.

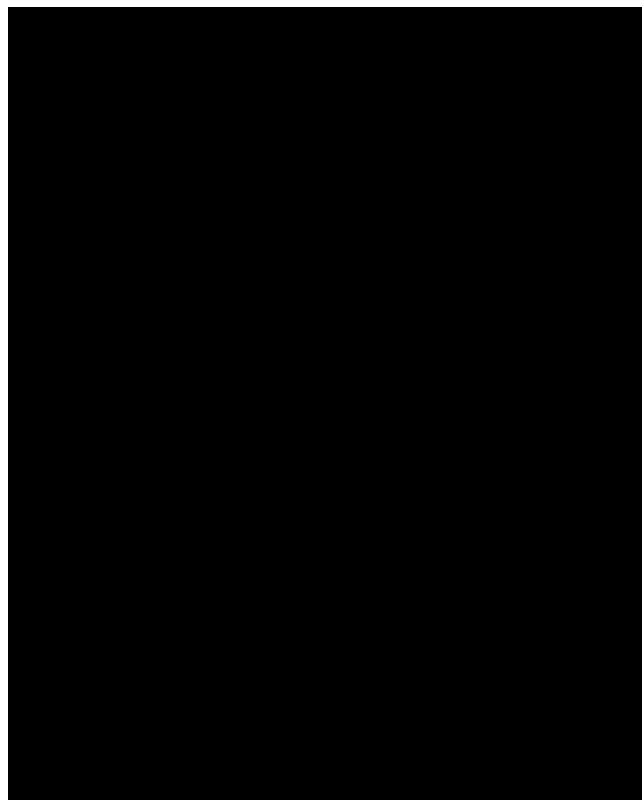


FIGURE 1. Appearance of en bloc kidneys after transplantation.

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She had four episodes of biopsy-proven rejections, and was treated successfully with pulse therapy. In November 1997, her renal function was satisfactory, but she returned 10 days later with severe rejection. This was because she had stopped her medication for three days. She was treated with pulse therapy and OKT3 for 12 days without improvement, losing her graft 50 months after transplantation because of noncompliance.

Case number 5 was a 15-year-old male with systemic lupus erythematosus (SLE) who received an en bloc kidney transplant in September 1995. He received ALG for eight days, cyclosporin, prednisone and Imuran. He developed two episodes of rejection in May and July 1997. His renal biopsy in May 1997 also showed recurrence of the original SLE in the transplanted kidneys. In July 1997, his cyclosporin was converted to FK506 and Imuran was discontinued. The en bloc kidneys were still functioning at 32 months.

The sixth patient's en bloc transplant was performed in May 1997. She received ALG for seven days and then continued on triple therapy of cyclosporin, prednisone and MMF as her initial immunosuppression. In November 1997, she had an episode of rejection which was successfully treated with high-dose steroid pulse therapy. Follow-up ultrasound showed hydronephrosis of lateral kidney. Antegrade nephro- pyelogram showed ureteric stenosis, which was treated and stented. Later, the medial kidney showed the same hydronephrotic change that was also stented because of ureteric stenosis. The creatinine returned to normal levels. Follow-up ultrasound in January 1998 showed hypoechogenic areas in both kidneys which were confirmed by contrast CT to be tumor (Figure 3). Core biopsy showed post-transplant lymphoproliferative disorder. Her serum creatinine was 151 $\mu\text{mol/L}$. A decision was made to remove the en bloc, and transplant nephrectomy was performed in February 1998 with a functioning graft. The last patient received an en bloc kidney transplant in October 1997. She received ALG for six days and then continued on FK506 and prednisone. Imuran was not given at any time. At her last follow-up, the patient was doing well with no episodes of rejection. Her latest creatinine was 106 $\mu\text{mol/L}$. Table 1 shows a summary of graft and patient survival, and the cause of graft loss.

Discussion

One- and five-year graft survival for pediatric en bloc kidneys has been reported as 82% and 70%, respectively, by Satterthwaite et al.¹ Gruessner et al.² reviewed 17 years' experience at the University of Minnesota, and demonstrated that kidneys of the same donor age but transplanted en bloc had significantly higher graft survival rates than single kidneys of the same donor age, 78% at one year and 48.6% at 10 years, compared to only 61% at one year and 34% at 10 years. Nghiem et al.³ reported that when the en bloc and the non en bloc primary cadaveric groups were compared, no significant difference in the five-year graft survival rate was observed (68.8% and 65.3%, respectively), suggesting that

infant kidneys transplanted en bloc had fairly long-term graft survival.

In our series, five out of seven (71%) showed primary function. The two which never functioned were due to rejection in one and vascular thrombosis in the other. Merkel et al.⁴ in a series of 20 en bloc kidney transplants reported 19 (95%) primary function. In their series of 40 en bloc renal transplants, Bretan et al.⁵ reported that all grafts functioned immediately. In their series of 13 en bloc transplants, Kirste et al.⁶ reported a primary function rate of 92%. There were no delayed graft functions in our series. In their series of 22 patients, Satterthwaite et al.¹ reported that 14% never functioned, and 23% had delayed graft function.

The only vascular complication we had was venous thrombosis (14%) at day one, and the graft was lost. In their series, Bretan et al.⁵ documented one graft loss (2.5%) of venous thrombosis due to hypercoagulable state. In their series of 22 en bloc kidney transplants, Satterthwaite et al.¹ reported one venous thrombosis (4.5%) and two arterial thrombosis (9%), and all three grafts were lost. In their series of 45 patients, Nghiem et al.⁷ had six cases of venous thrombosis (13%), and all were lost. Merkel et al.⁴ had 25% of renal artery stenosis as a result of acute rejection, and all were corrected by microangioplasty. Nghiem et al. showed that when en bloc kidneys were used, they grew nearly two-fold in 3-6 months, and approached three-fold at six months, and similarly, glomerular filtration rates increased almost four-fold and five-fold during the same periods.⁷ In another series by Nghiem⁸ in which 20 en blocs were performed, the donors weighed less than 15 kg. One graft (5%) was lost due to venous thrombosis.

Urological complications did not occur in our series, except for one case where the ureteric obstruction occurred as a result of post-transplant lymphoproliferative disorder (PTLD). In their series of 40, Bretan et al.⁵ had one urinary leak (2.5%), and one dehiscence (2.5%). Both were repaired

TABLE 1. Summary of graft and patient survival and cause of graft loss.

Recipient age/ sex/wt (kg)	Date of transplant	Donor's age (mo.)	Cause of graft loss	Graft survival time	Patient survival
42/M/70	Nov. 89	36	Primary non- function	2 mo.	Alive
24/F/40	Feb. 93	14	—	63 mo. functioning	Alive
23/F/35	May 93	24	Venous thrombosis day 1	—	Alive
14/F/42	Oct. 93	7	Non-compliance rejection	Functioned for 50 mo.	Alive
15/M/46	Sept. 95	36	—	32 mo. functioning	Alive
37/F/50	May 97	36	PTLD	9 mo.	Alive
36/F/41	Oct. 97	36	—	7 mo. functioning	Alive

PTLD=post-transplant lymphoproliferative disorder; mo.=months.

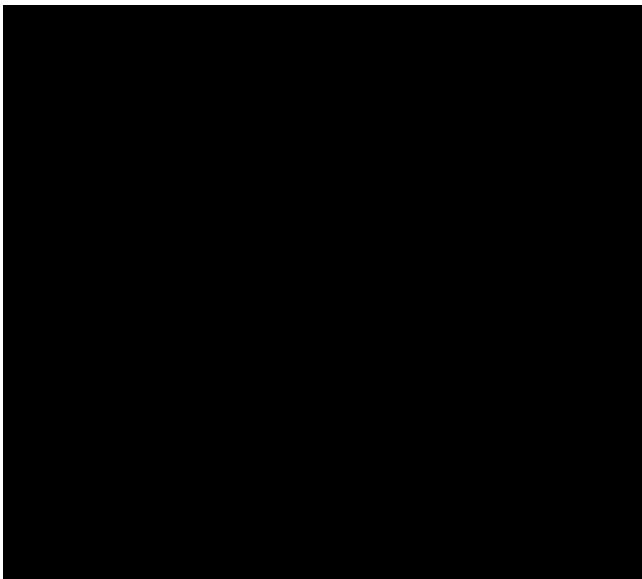


FIGURE 2. DTPA nuclear scan showing good perfusion and excretion in both en bloc kidneys.

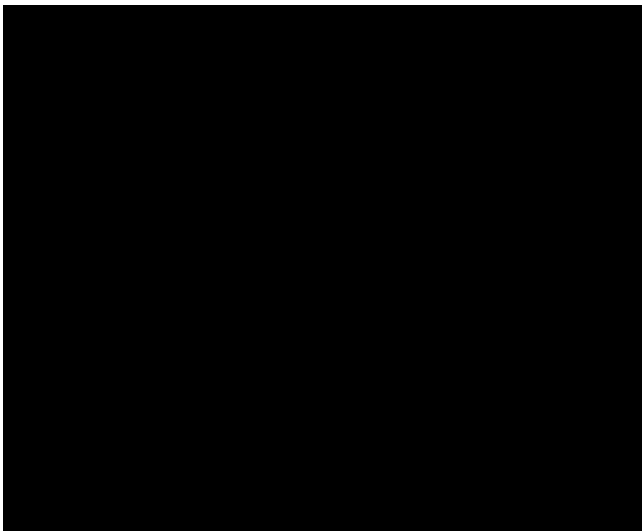


FIGURE 3. CT scan of Case #6 showing tumor of both en bloc kidneys.

surgically. Merkel et al.⁴ had 25% ureteral leaks or stenosis. All of them survived and no grafts were lost. In their series of

12, Lloyd et al.⁹ demonstrated urinary complications in three recipients (25%).

In this era of severe organ shortage and increasing numbers of patients with end-stage renal disease requiring renal transplant, pediatric donor kidneys should be used to increase the donor pool. The results from different centers using en bloc kidneys are encouraging. They show that these en blocs are superior to suboptimal organs obtained from donors above 60 years of age.

From the above study, we feel that when the cadaveric donor age is below three years of age, kidneys should be used en bloc. The technical complication rate is less than using single kidneys in this age group, and the kidneys grow in size and provide good long-term function.

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