

En bloc dual kidney transplantation from paediatric donors in Sri Lanka

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Abstract

Introduction: Kidney transplantation is the optimal treatment for patients with end-stage kidney disease (ESKD). However, the shortage of donor organs remains a major limitation. The use of kidneys from paediatric deceased donors is one strategy to expand the donor pool. En bloc dual kidney transplantation (EBKT), in which both kidneys are transplanted together with the donor aorta and inferior vena cava, has been developed to overcome concerns related to small renal mass and vascular complications.

Case series: We report three cases of en bloc dual kidney transplantation from paediatric deceased donors performed in Sri Lanka. Donor ages ranged from three to seven years (mean age 5.25 years), with body weights between 12 kg and 14.5 kg (mean weight 13.25 kg). The grafts were transplanted into adult recipients with end-stage renal disease. In all cases, the donor aorta and inferior vena cava were anastomosed to the recipient's external iliac vessels. Two recipients demonstrated immediate graft function, while one developed transient acute tubular necrosis with subsequent recovery. All recipients were discharged with satisfactory graft function.

Conclusion: This case series demonstrates that en bloc dual kidney transplantation from paediatric donors is a feasible and safe option with favourable early graft outcomes. It may represent a valuable strategy to expand the donor pool in resource-limited settings such as Sri Lanka.

Introduction

Kidney transplantation (KT) is the optimal renal replacement therapy for patients with end-stage kidney disease (ESKD), providing better survival and quality of life compared with long-term dialysis. However, the global shortage of donor kidneys continues to limit the access to transplantation. To expand the donor pool, kidneys from paediatric deceased donors are increasingly being considered. However, transplantation of single kidneys

from very young or low-weight donors is associated with concerns regarding inadequate nephron mass, vascular thrombosis, and hyperfiltration injury, particularly in adult recipients.

En bloc dual kidney transplantation (EBKT), in which both kidneys are transplanted together with the donor aorta and inferior vena cava (IVC), is an established technique to address these challenges. The first report of EBKT from a paediatric donor to an adult recipient was described in 1972 [1]. Long-term graft function and survival are comparable with those of live donor single kidney transplantation [2,3].

Although favourable results have been reported, EBKT remains underutilized, and data from many centres are limited.

This case series reports the local experience from Sri Lanka with en bloc dual kidney transplantation from paediatric deceased donors, describing donor and recipient characteristics and early graft outcomes.

Case Series

Case 1

A 3½-year-old girl was admitted to the Teaching Hospital Anuradhapura with respiratory arrest following a snake bite. Despite intensive care unit management for 10 days, brain death was confirmed. Informed consent for organ donation was obtained from her parents. Her body weight was 12 kg.

The graft was transplanted into a 44-year-old male weighing 50 kg with end-stage renal failure secondary to hypertensive nephropathy. Immediate graft function was observed, with serum creatinine decreasing from 4.49 mg/dL (normal range 0.6–1.2 mg/dL) on postoperative day 0 to 2.24 mg/dL on postoperative day 2. At 5-year follow-up, the patient remained clinically stable with normal serum creatinine levels and no reported complications.

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Case 2

A 7-year-old girl was admitted following an unsalvageable head injury due to a road traffic accident. After confirmation of brain death, consent for organ donation was obtained.

The graft was transplanted into a 41-year-old recipient with end-stage renal disease secondary to diabetic nephropathy. The patient initially developed acute tubular necrosis, but renal function gradually improved. The patient was discharged on postoperative day 8 with a serum creatinine level of 1.0 mg/dL (normal range 0.6-1.2 mg/dL). At 2-year follow-up, the patient remained clinically stable with normal serum creatinine levels and no reported complications.

Case 3

A 5-year and 3-month-old girl, a known patient with Down syndrome, ostium secundum atrial septal defect, and bilateral astigmatism, underwent burr-hole drainage for a cerebral abscess. Despite the procedure, her neurological condition did not improve. Following confirmation of brain death, informed consent for organ donation was obtained from her parents. Her body weight was 14.5 kg.

The graft was transplanted into a 42-year-old male with end-stage renal failure secondary to hypertensive nephropathy. The postoperative period was uneventful, and the patient was discharged on postoperative day 6 with a serum creatinine level of 1.4 mg/dL (normal range 0.6-1.2 mg/dL) and a 24-hour urine output of 2.5 litres.

At 4-month follow-up, the patient remained clinically stable with normal serum creatinine levels. The postoperative course was complicated by a ureteric leak, which was managed with open surgical repair, with no further complications.

Surgical technique

In all cases, both kidneys with ureters, the donor aorta, and the inferior vena cava were retrieved en bloc. The upper ends of the aorta and inferior vena cava were closed (Figure 1). The lower ends of the graft aorta and inferior vena cava were anastomosed to the recipient's external iliac artery and external iliac vein, respectively, in an end-to-side fashion (Figure 2).

The ureters were either joined distally and anastomosed to the bladder (in 2 cases) or implanted separately into the bladder (in one case) over double-J stents, depending on intraoperative anatomical considerations.

The procedure was technically challenging due to the small calibre of the donor vessels, requiring meticulous back-table dissection and careful vascular anastomosis to minimise thrombosis risk. Use of the donor aorta and inferior vena cava for en bloc implantation facilitated

reconstruction. Special attention was required during ureteric anastomosis due to the small calibre of the ureters. Proper placement of both kidneys with the vascular pedicle in the right iliac fossa without kinking was ensured prior to closure. Postoperatively, graft perfusion was closely monitored, and anticoagulation was considered.



Figure 1. Retrieved en bloc kidneys from a paediatric donor with attached donor aorta and inferior vena cava (IVC) following back-table reconstruction, prepared for implantation.



Figure 2. En bloc paediatric donor kidneys after implantation, showing good graft perfusion following arterial and venous anastomoses to the recipient's external iliac vessels.

Discussion

Kidney donation from paediatric donors occurs infrequently. However, these kidneys are often considered unsuitable for transplantation because of several concerns. These include technical challenges during surgery, a

higher risk of graft thrombosis due to the small size of the renal vessels, possible poor graft function and survival related to limited renal mass, and the potential for hyperfiltration injury [4].

An alternative method is en bloc transplantation using the donor aorta and inferior vena cava for vascular anastomosis. En bloc dual kidney transplantation provides favourable outcomes by reducing the above-described complications.

En bloc dual kidney transplantation has been associated with a higher rate of surgical complications, reported to be up to 16% [5]. Among these, arterial or venous thrombosis accounts for approximately 69% of the complications [5]. In addition, some studies have shown a higher rate of early graft loss during the first postoperative year in paediatric en bloc kidney transplantation [6,7].

However, Thomusch et al. reported that the long-term graft function and survival of en bloc kidney transplants were superior to those obtained from adult cadaveric donor grafts [6]. It has also been shown that transplanted kidneys undergo compensatory hypertrophy, resulting in improved renal function and glomerular filtration rate over time [8,9].

When evaluating the advantages of en bloc dual kidney transplantation, a study based on data from the Scientific Registry of Transplant Recipients demonstrated that, for donors weighing between 10 kg and 34 kg, en bloc transplantation provided better outcomes compared with single kidney transplantation [10].

In the Sri Lankan setting, patients with end-stage kidney disease are often underdialysed due to limited healthcare resources. Human leukocyte antigen (HLA) testing is not routinely performed prior to deceased donor kidney transplantation. Instead, transplantation is carried out based on blood group compatibility and direct lymphocyte cross-matching.

Another limitation of deceased donor kidney transplantation is that recipients are often not optimally prepared compared with those undergoing living donor transplantation due to the limited time available for adequate pre-transplant preparation.

In our series, all three cases demonstrated favourable graft outcomes, consistent with the literature on paediatric en bloc kidney transplantation. Although these grafts are associated with higher risks of thrombosis and delayed graft function, only transient acute tubular necrosis was observed, with subsequent recovery. The stable graft function at follow-up in our patients further supports the feasibility and effectiveness of this approach in appropriately selected recipients, even within the constraints of the local setting.

Conclusion

This case series from Sri Lanka suggests that en bloc dual kidney transplantation from paediatric donors is a feasible option, with favourable early graft outcomes observed in this small series. It may be considered in appropriately selected recipients, particularly in settings with limited donor availability and long kidney transplant waiting lists.

Conflicts of interest

There is no conflicts of interest.

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