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Introduction

This is a case report that describes surgical technique, pitfalls and outcomes of the youngest documented cross fused ectopic kidney (PCFEK) from a 20 month old child, transplanted.

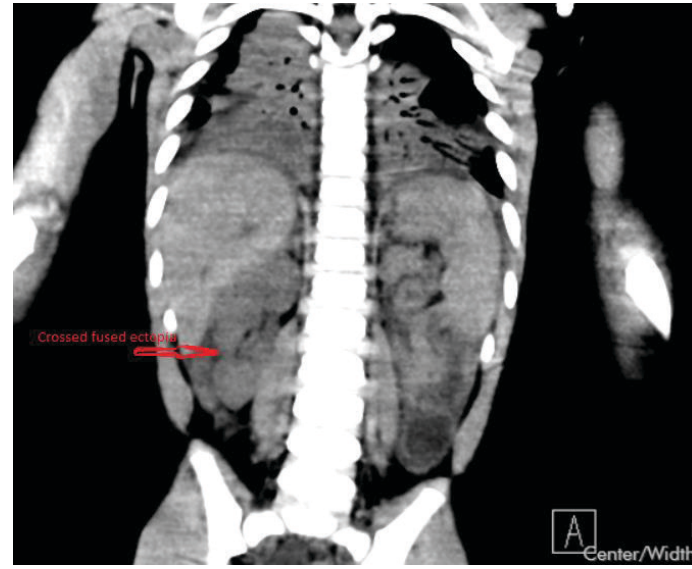


Figure 1: Donor abdominal CT showing a crossed fused ectopic kidney with the left kidney rotated to the right.

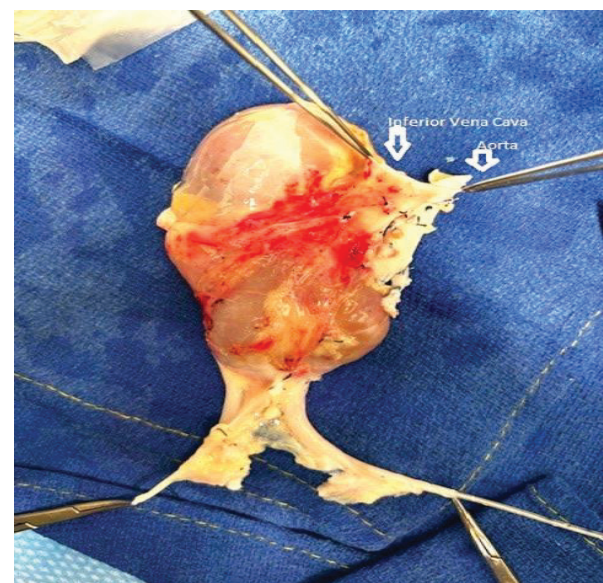


Figure 2: Back table appearance of PCFEK

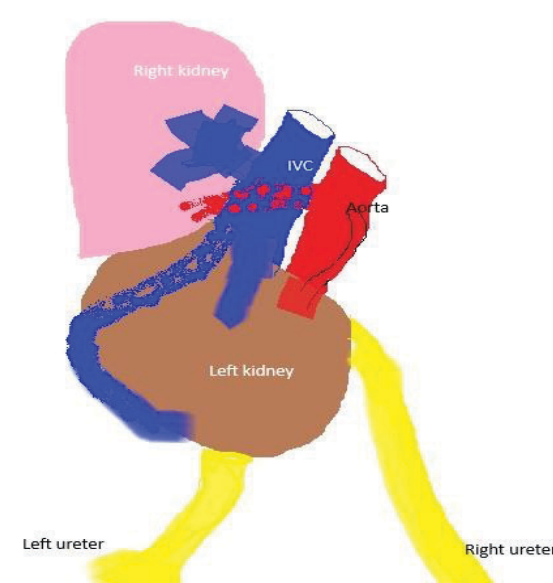


Figure 3: Diagrammatic representation of PCFEK anatomy

Methods and Materials

The donor was a 20-month-old, 10-kg child with a history of anoxic brain injury. The kidney donor profile index (KDPI) was 47%. Donor organs were recovered after brain death. The admission creatinine was 0.37 mg/dL, peak 0.6 mg/dL, and terminal 0.6 mg/dL. Urine output ranged from 0–230 mL/hour, with a terminal output of 120 mL/hour. Serologies were negative except for Epstein–Barr virus positivity (EBV +) and Cytomegalovirus negative (CMV-) (cytomegalovirus negative). Preoperative abdominal imaging documented a solitary kidney. (Fig 1). Intraoperatively, the kidney was deemed to be a horseshoe kidney. The PCFEK was diagnosed during bench preparation of the kidney (Fig 2). The kidney was allocated as such and was finally accepted low down in the match run after exhausting most of the local list for a low BMI recipient. The recipient was 62 years old on hemodialysis for two years . His end stage renal disease was secondary to diabetes mellitus and hypertension. He was CMV-and EBV+.

The allograft examined on the backtable consisted of a fused en bloc kidney measuring approximately 9 cm, with two renal arteries draining into the aorta, a common caval venous outflow into the IVC, and two ureters. The PCFEK was diagnosed during bench preparation of the kidney (Fig 2). The left renal vein was divided inadvertently during recovery as it crossed to the left of the IVC . However there remained a venous branch from the left kidney terminating in the IVC stump that accompanying the kidney. Meticulous preparation preserved renal vasculature and hemostasis. The proximal IVC and aorta were used for anastomosis in the recipient. The distal ends were ligated. The IVC and aorta were anastomosed to the external iliac vein and external iliac artery respectively . The short ureters were anastomosed to the bladder with indwelling double-J stents after spatulating them.

Results

The PCFEK had delayed graft function requiring hemodialysis once postoperatively. The patient received induction immunosuppression with intravenous methylprednisolone, anti-thymocyte globulin (Thymoglobulin™) and mycophenolate mofetil, followed by maintenance quadruple-drug immunosuppression with Belatacept™, low-dose tacrolimus reduced mycophenolate mofetil, and prednisone. Renal doppler of the transplanted kidneys on postoperative day (POD) 0 showed borderline elevated resistive indices in both renal transplants but otherwise normal flow in the dual right lower quadrant renal transplants. Thymoglobulin was administered on POD 0, 2, and 3, all of which were well tolerated.

In the immediate postoperative period, the patient exhibited low urine output (Table 1). A nuclear medicine renal scan performed on POD 1 demonstrated normal perfusion and uptake of the radiotracer by the transplanted kidney (Fig 4); however, there was no evidence of excretion, consistent with delayed graft function (DGF). Consequently, a single hemodialysis session was performed on POD 1.

Prophylactic antimicrobial therapy with valganciclovir, fluconazole, and trimethoprim-sulfamethoxazole was initiated on POD 3. Belatacept was administered on POD 4. Although urine output began to improve on POD 4, serum creatinine continued to rise, necessitating a second hemodialysis session on the same day. No further dialysis was required thereafter. The patient’s drain was removed prior to discharge due to minimal output, and he was discharged home on POD 6 in stable condition.

During the post-discharge period, the patient presented several times with orthostatic hypotension related to longstanding diabetes mellitus and autonomic dysfunction. His antihypertensive medications were discontinued, and fludrocortisone therapy was initiated, resulting in symptomatic improvement. On POD 19, the patient required Foley catheter reinsertion due to high post-void residual volumes and a rising serum creatinine level (peak 1.49 mg/dL). The catheter was removed several days later in the urology clinic, after which he maintained satisfactory urine output and stable renal function. His ureteral stents were removed without complications at the same time. . He was discharged home with a creatinine of 1.8mg/dl, and at 2 months post transplantation had a creatinine of 1.2 mg/dl and a CrCl of 48 mls/min . He has had 1 postoperative urinary tract infection and is currently doing well after both his urinary stents have been removed. His CrCl is currently 52mls/min at around 1 year after transplantation. His follow up ultrasound is without hydronephrosis.

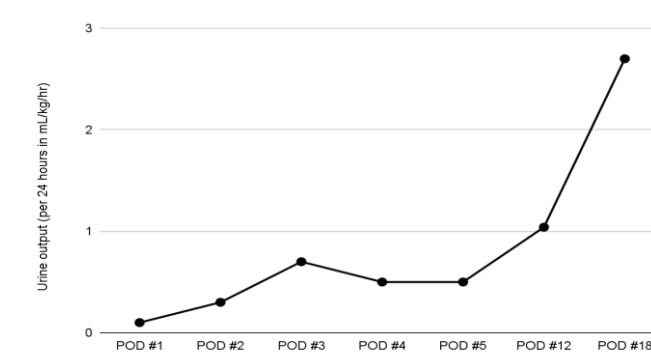


Table 1: Urine output in cc/24 hrs. post transplant

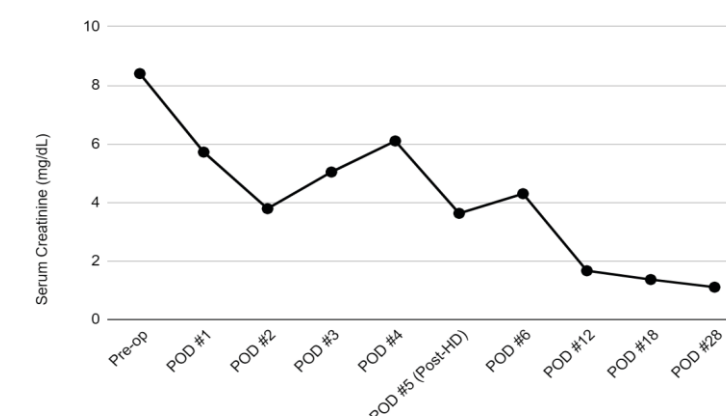


Table 2: S. Creatinine in mg/dl post transplant

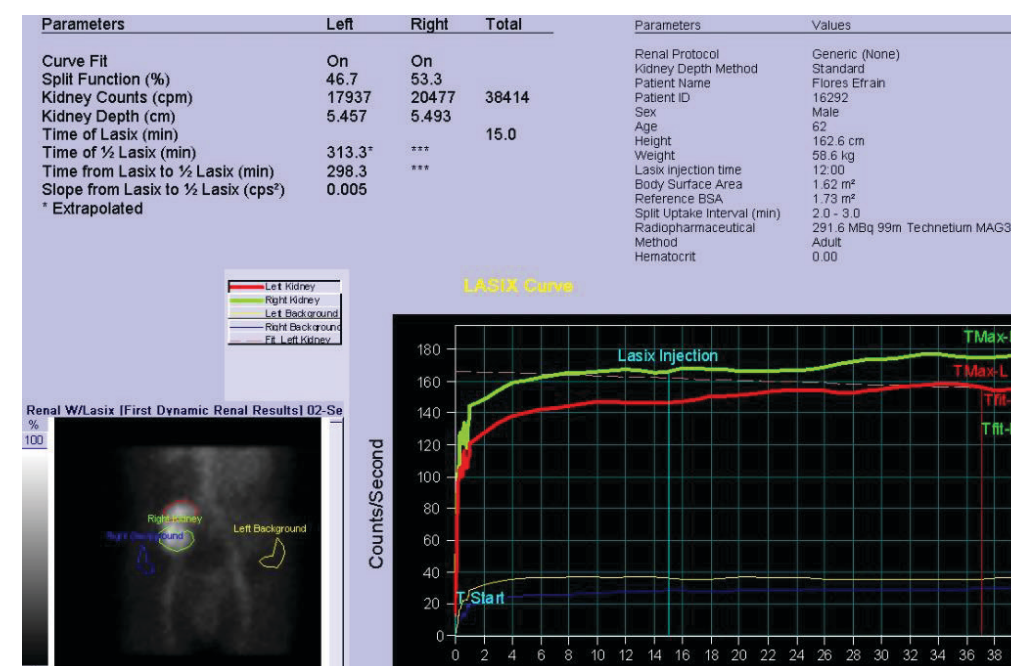


Figure 4: Post reperfusion nuclear medicine scan demonstrating normal perfusion of both kidneys with delayed graft function

Discussion

A crossed fused renal ectopia is an entity where one kidney crosses over to the other side and the parenchyma of the two kidneys fuse (Fig 5). It is the 2nd most common fusion anomaly of kidneys, the 1st being a horseshoe kidney. In most cases it involves the left kidney, as in our patient. Renal function is usually normal. Other anomalies associated with this condition are the VACTER syndrome, hydronephrosis, annular pancreas, and multicystic dysplasia. Most cases are sporadic but dominant inheritance has been reported(1).

The successful transplantation of an en bloc crossed fused ectopic pediatric kidney into an adult recipient demonstrates the feasibility of using anatomically complex renal grafts to expand the donor pool without compromising surgical or functional outcomes (2). While the use of pediatric en bloc kidneys has become an accepted practice in many centers, the presence of both fusion and ectopia adds a level of technical complexity that has traditionally deterred utilization. This case contributes to the limited but growing body of literature affirming that careful preoperative assessment and precise surgical technique can overcome the challenges associated with congenital renal anomalies.

The most significant intraoperative challenges in this case stemmed from the complex vascular and ureteral anatomy. Crossed fused ectopic kidneys often share a common arterial supply derived from the aorta or iliac vessels, with highly variable venous drainage patterns. In our case, both kidneys drained into a common caval venous channel, which facilitated the creation of a single end-to-side anastomosis to the external iliac vein. Preservation of the donor aorta and inferior vena cava for arterial and venous reconstruction, respectively, allowed for reliable and streamlined vascular inflow and outflow, minimizing the risk of segmental ischemia. This technique, frequently employed in en bloc pediatric kidney transplantation (Fig 6), also reduces the risk of vessel thrombosis which is a known complication in small pediatric grafts.

Ureteral reconstruction presented another technical consideration. The presence of two short ureters required careful placement to avoid tension or kinking. Separate extravesical ureteroneocystostomies were performed, a technique supported by prior literature demonstrating comparable leak and stricture rates to single common anastomoses (2). Postoperatively, the patient did not experience any ureteral complications, and both stents were removed uneventfully.

There have been to other reported cases of transplantation of cross fused ectopic kidneys. In both these cases, the donors were adults. While in 1 case the organs were transplanted enbloc (3), in the 2nd case the kidneys were split in transplanted into 2 separate recipients (4). Our transplant was the 1st reported case where the donor was pediatric. These kidneys may be associated with hydronephrosis and kidney stones, and hence require surveillance in the future especially if allograft function declines.

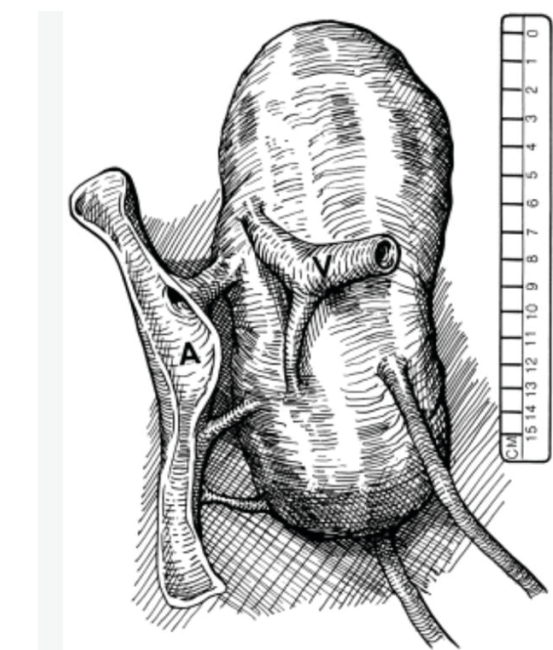


Figure 5: An artist rendering of a PCFEK showing aberrant arterial and venous anatomy.

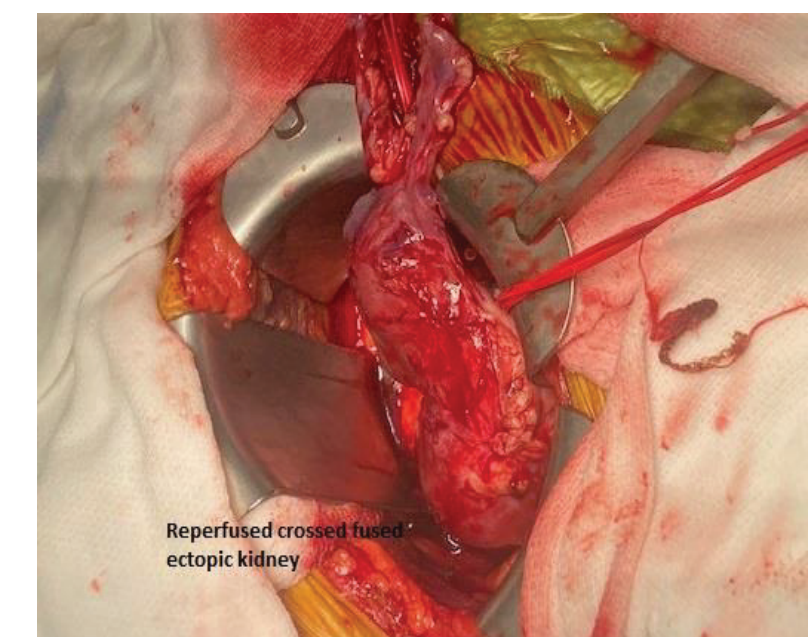


Figure 6: Post reperfusion appearance of PCFEK

Conclusions

Careful attention must be paid during the recovery of a solitary kidney so as to not miss a pediatric cross fused ectopic kidney with inadvertent vascular damage. If recovered intact these kidneys can be successfully transplanted.

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NO CONFLICTS OF INTEREST TO DECLARE

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