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Synchronous nephrectomy with unilateral dual kidney transplantation: feasibility in patients with adult polycystic kidney disease

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ABSTRACT Adult polycystic kidney disease (APKD) accounts for 2% of end-stage renal disease in Singapore and is a major indication for kidney transplantation. We report synchronous nephrectomy with unilateral cadaveric dual kidney transplantation (DKT) in a patient with APKD. Simple nephrectomy of the right native 27-cm polycystic kidney was performed to provide adequate space for unilateral DKT. Right donor kidney transplantation was performed at the site of native nephrectomy. End-to-side anastomosis of the right donor renal vein to the distal inferior vena cava and the right donor artery to the common iliac artery were performed. Left donor kidney was transplanted below the right kidney, with its vessels anastomosed to the right external iliac vessels. Ureter anastomosis was performed after perfusion of both kidneys. Lich-Gregoir anastomosis of the left donor ureter to the bladder and direct right donor ureter to native ureter anastomosis was established. This case illustrates that synchronous nephrectomy with DKT is feasible to facilitate implantation on the same side.

Keywords: adult polycystic kidney disease, end-stage renal disease, expanded criteria donor kidneys, kidney transplantation, nephrectomy
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INTRODUCTION

Adult polycystic kidney disease (APKD) is an autosomal dominant disorder characterised by multiple bilateral cysts of the renal parenchyma. Clinically, patients present after the age of 30 years with end stage renal failure (ESRF), hypertension, haematuria or recurrent urinary tract infections (UTIs). Locally, APKD accounts for 2% of ESRF.[1] There is no specific treatment for APKD. Despite good conservative management, about 50% of patients will eventually require dialysis or renal transplantation. Kidney transplantation is the best treatment for ESRF.[2] In view of the shortage of organs, several initiatives have been undertaken, including dual kidney transplantation (DKT). DKT employs the use of sub-optimally functioning donor kidneys. It has been established as a solution for the lack of optimally functioning donor kidneys for single kidney transplantation (SKT). However, it is technically more challenging and becomes more complicated for a patient with APKD.

We report an initial case of synchronous nephrectomy with unilateral DKT in a patient who presented with ESRF secondary to APKD. We also review the current literature on the timing of polycystic nephrectomy and renal transplantation, and discuss the pros and cons of our approach.

CASE REPORT

Our patient was a 48-year-old Chinese man on the national transplant waiting list. He was admitted following the availability of a deceased donor. The deceased donor was a 60-year-old with hypertension and the cause of death was cerebrovascular accident. Following procurement, an explant Biopsy Modified Banff-Remuzzi Score of 7 was ascertained and dual kidneys were to be implanted as per protocol. The recipient was diagnosed with APKD for 21 years and was on haemodialysis for seven years. The only complication was a cystic haemorrhage in March 2009, from which he had recovered uneventfully. He had a 17-year history of well-controlled hypertension with no other comorbidities.

Fig. 1 Pre-operative CT image shows polycystic kidneys. The right kidney extends to the iliac crest.

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Fig. 2 CT image shows a well-perfused right upper transplant kidney with its hilum.

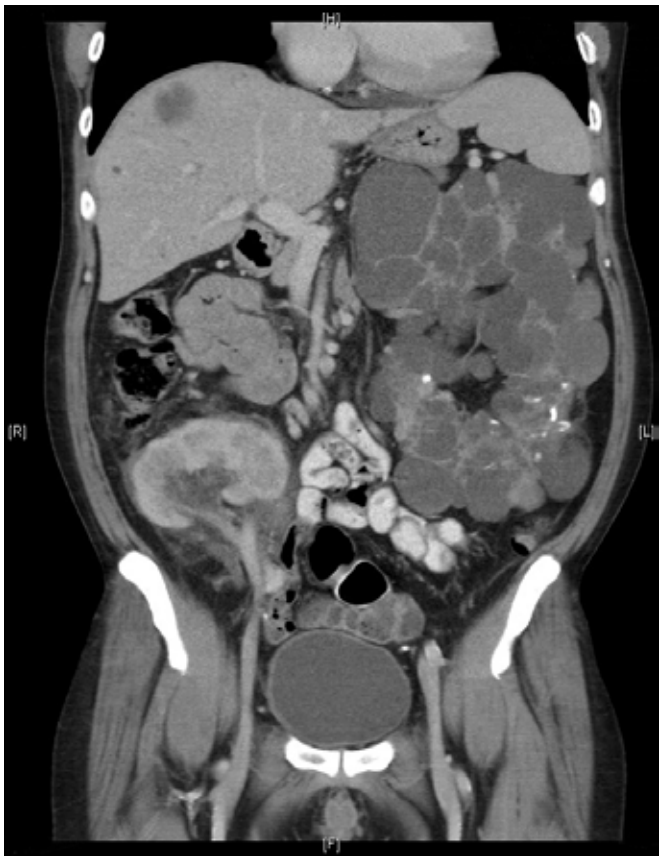

Fig. 3 CT image shows a well-perfused left lower transplant kidney with its hilum.

Pre-operative computed tomography (CT) showed large bilateral kidneys that extended to the iliac crest (Fig. 1). Right simple nephrectomy was performed to provide adequate space for DKT. Under general anaesthesia, the patient was placed in the supine position. A modified right lower quadrant Gibson incision with cranial extension up to the right costal margin was made. The retroperitoneal space was entered and the peritoneum was mobilised medially, exposing the iliac vessels. The right polycystic kidney was identified, Gerota's fascia was entered and the kidney was mobilised. Intra-operatively, there was evidence of both haemorrhagic and calcified cysts. The duodenum was identified and kocherised to identify the renal hilum, which was then isolated and dissected. A single renal artery, vein and ureter were identified. There was no evidence of any mass lesion. The right renal artery and vein were controlled with silk ties. The native ureter was divided as high as possible (to conserve as much distal length) for subsequent donor to native transureteroureterostomy anastomosis as the donor ureter was too short for a Lich-Gregoir ureteroneocystostomy. The intention was to place the right donor kidney higher than the left donor kidney. Native right nephrectomy was then performed after mobilisation. Haemostasis was carefully checked and thorough washout was performed.

Right donor kidney transplantation proceeded at the site of native nephrectomy. Right external iliac vessels, right common iliac artery and distal inferior vena cava (IVC) were identified and isolated. A Satinsky clamp was applied partially across the distal IVC, the right donor kidney transplanted with the donor renal vein and donor IVC cuff anastomosed end-to-side to the distal IVC. Straight arterial clamps were applied proximal and distal to the right common iliac artery, right internal iliac artery and external iliac artery. End-to-side anastomosis of the donor renal artery to the right common iliac artery was then performed. All clamps were released and donor kidney perfusion was confirmed. Total cold ischaemic time for the right kidney was 21 hours and anastomotic time was 33 minutes. The left donor kidney was placed in the right iliac fossa inferior to the right donor kidney. The external iliac vessels were controlled distal to the right donor kidney anastomosis. End-to-side anastomosis of the left donor renal vein and right native external iliac vein was performed. Next, we established end-to-side anastomosis of the left donor renal artery and right external iliac artery. Total cold ischaemic time for the left kidney was 24 hours and anastomotic time was 40 minutes. End-to-end anastomosis of the right donor kidney ureter to the right native ureter was performed over a size 6F double-J stent. The Lich-Gregoir technique of ureteroneocystostomy across a double-J stent was performed for the left ureter. No kinking or torsion of renal vessels was ensured at the end of the surgery.

The total operative time was 450 minutes and subsequent postoperative recovery was uneventful except for delayed graft function (DGF). The patient required one dialysis episode on postoperative day (POD) 1. Postoperative CT confirmed the positioning of unilateral implanted dual kidneys in the right abdomen with good perfusion (Figs. 2 & 3). Doppler

ultrasonography revealed no perfusion compromise with resistive index (9.68–0.78 and 0.66–0.81). The patient was discharged on POD 9 with triple immunosuppression of prednisolone, mycophenolate mofetil and Prograf. Histology was consistent with APKD, with no malignancy. The specimen was 27 cm in length. Creatinine level was 171 μmol/L on discharge and 152 μmol/L on follow-up eight months after surgery.

DISCUSSION

Many centres in the United States now perform DKT using various organ selection criteria and surgical techniques. Intra-operative and postoperative complications (urological, vascular, graft rejection, length of hospital stay), and outcomes for renal transplant recipients (graft and patient survival rates at three and five years post-transplantation) are reported to be comparable between dual and SKT. In a study in 2010, Esker et al reported no significant differences in surgical outcomes for renal transplant recipients between 100 unilateral DKT and 73 SKT procedures.[3]

DKT can be performed either unilaterally (both donor kidneys placed in the same iliac fossa) or bilaterally. The unilateral procedure provides the advantage of a shorter operating time and allows the contralateral iliac fossa to be available for future re-transplantation procedures. A study[4] concluded that both techniques proved to be safe, with no differences in surgical complication rates. DKT, however, presents a unique problem for patients with APKD because of the lack of space due to the enlarged polycystic kidneys. In patients with APKD, it may be possible to avoid native nephrectomy for SKT but it is unavoidable for DKT. A simultaneous nephrectomy increases operative time and surgical complexity, but it can still be safely performed. Hence, a patient with large polycystic kidneys should not be bypassed for unilateral DKT.

To date, there are no reports on synchronous nephrectomy with DKT. Our operation took 450 minutes. This was in comparison to 231 ± 14, 370 ± 24 and 208 ± 14 minutes for pre-transplant, synchronous and post-transplant nephrectomy with SKT.[5] As compared to synchronous nephrectomy with SKT, a subsequent DKT significantly increases the operation time by approximately 80 minutes. This may translate into an increase in operation (bleeding, infection) and general anaesthesia (ischaemic heart disease, cerebrovascular accident) risks. However, with optimal surgical technique, these risks can be minimised. Our patient did not suffer from any intra- or postoperative complications except for DGF, which was followed up closely till resolution. In a recent case series by Lucas et al,[6] synchronous renal transplantation and ipsilateral native nephrectomy does not increase morbidity as compared to transplantation alone. Operative time, estimated blood loss, complication rate and discharge creatinine levels were all comparable between the two groups.

The timing of native nephrectomy in relation to kidney transplantation has also been controversial.[4] Improved allograft survival with lower risk of infection and haematuria were believed to be the benefits of pre-transplant nephrectomy.[7] Sanfilippo et al, however, showed that bilateral native nephrectomy would lead to severe anaemia and mortality secondary to chronic graft failure.[8] An anephric patient on dialysis may have serious complications such as anaemia, congestive cardiac failure, hyperkalaemia and osteodystrophy, as any residual renal function would be removed after bilateral native nephrectomy.[9] The current consensus is that pre-transplant native nephrectomy, especially bilateral, for APKD confers no additional benefits and should not be performed.[4] Cystic haemorrhage, recurrent UTIs/pyelonephritis, nephrolithiasis, refractory pain and enlarged kidneys that require removal for unilateral kidney transplantation are indications for simple nephrectomy in APKD patients. Synchronous nephrectomy decreases operation time and the need for two separate operations. It has been reported that synchronous unilateral/bilateral nephrectomy for SKT in APKD is safe in terms of postoperative patient morbidity and graft function.[5]

Synchronous nephrectomy with unilateral DKT is feasible. We demonstrated this successfully in our patient with ESRF secondary to APKD and with no operative/postoperative complications except for benign DGF, which resolved uneventfully. However, at least a five-year follow-up is required to document the three- and five-year graft/host survival rates and more operations to demonstrate our method as an alternative to synchronous nephrectomy with SKT. Our operative procedure and technique for DKT can potentially be a solution to renal vascular thrombosis secondary to kinking of donor renal vasculature, allowing APKD patients to reap the benefits of unilateral DKT, while reducing their risk of graft failure.

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