

Transplantation of a Pelvic Kidney with Multiple (Damaged) Vessels and a Short Ureter from a Controlled Non Heart Beating Donor

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Abstract

Background and Aims: The severity of organ shortage places transplant surgeons in the difficult position of deciding whether to use or discard marginal donor kidneys. This case details the successful use of a pelvic kidney with a short ureter and multiple vessels from a controlled non heart beating donor and reviews relevant literature.

Case Report: A 69 year old lady received the right kidney from a 48 year old female controlled non heart beating donor. The donor kidney had three arteries (one of which was damaged) on one aortic patch, and an extremely short (7cm), thin-walled and narrow lumen (2-3 mm) ureter, all of which combined to make the transplantation technically challenging and the postoperative course complicated. In the post transplantation period, there were difficulties in establishing adequate transplant drainage due to frequent nephrostomy tube and ureteric stent dislodgement, and sepsis. The patient was discharged home on day 62 with a glomerular filtration rate of 31 ml/min and a creatinine of 148 µmol/L, and these were 51 ml/min and 97 µmol/L nine months postoperatively.

Conclusions: This case demonstrates that it is possible to extend the boundaries for accepting marginal kidneys for transplantation, after discussing the risks of the procedure with the patient. Ureteric stenting, intense postoperative monitoring of the transplant and early intervention in the event of ureteric complications must be applied to ensure success. Implantation of marginal donor kidneys with damaged or short ureters should be considered if a good renal function is likely.

Keywords: Pelvic Kidney, Marginal Donor, Renal Transplantation, Ureteric Stricture, Ureteric Stent

Introduction

With the escalating demand for renal transplantation and an ever growing waiting list there is a need to explore the use of marginal donor kidneys. Currently the median waiting time for a deceased donor renal transplant is 841 days in the United Kingdom (1). As the use of controlled non heart beating donors grows there will often be instances where kidneys with aberrant anatomy will be retrieved. The question then is whether to transplant or discard them. If it can be demonstrated that these can be transplanted safely

and effectively, they might be used more widely helping ease the donor organ shortage.

This case involves the successful transplantation of a pelvic kidney retrieved from a controlled non heartbeating donor. Other risk factors included mul-

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triple arteries and a thin and short ureter. However, as the donor renal function was good and the kidney itself had no other abnormalities it was offered to an older recipient who had been waiting for a transplant for 606 days. A decision was made to place a stent in the ureter and monitor the post transplant course closely for complications, with early intervention if necessary. Though transplantation of pelvic kidneys from living donors has been reported (2), there is no report of transplantation of a pelvic kidney from a controlled non heart beating donor in the available literature. Below, we outline an overview of the case followed by a review of the literature (using PubMed and Medline key words: pelvic kidney, renal transplantation, marginal donor, ureteric stricture, ureteric stent) and the resulting conclusions.

Case Report

A 69 year old lady in established renal failure due to focal segmental glomerulonephritis with a history of smoking-related emphysema and hypertension, had been on the transplant waiting list for 606 days when she was offered a right kidney from a 48 year old female controlled non heart beating donor (CN-HBD) in January 2009. The donor had a history of severe scoliosis and spina bifida. The kidney, which was pelvic in position, was of normal size with three arteries on a single patch – the smallest calibre uppermost artery was partially cut during retrieval. In addition, the ureter was extremely short (7 cm including pelvis), thin-walled and of small calibre (2-3 mm). Prior to implantation the superior polar artery was repaired with Prolene 7/0. The donor renal vein was anastomosed to the right external iliac vein, and the Carrel's patch with three donor renal arteries was anastomosed to the right external iliac artery. The kidney perfused well apart from patchy areas at both poles. Ureteroneocystostomy by the Lich-Gregoire technique was performed over a 12 cm 6 French double-J ureteric stent (Cook Medical), which was

inserted with difficulty due to the narrow lumen of the ureter. The markings on the stent were visible through the thin ureter wall.

Routine postoperative renal transplant ultrasound (US) on day one showed good blood flow and a normal renal pelvis. A repeat US on day five demonstrated moderate pelvi-calyceal and proximal ureteric dilatation. Another US scan was performed on day seven followed by insertion of a nephrostomy tube due to progressive hydronephrosis. Nephrostomography demonstrated obstruction to flow in the middle ureter (Figure 1). Urine output through the nephrostomy slowly increased from four to around 20 ml per hour, glomerular filtration rate (GFR) increased from five to 12 ml/min and creatinine fell from 727 to 376 $\mu\text{mol/L}$. The nephrostomy tube was accidentally dislodged on the 16th postoperative day while the patient was asleep. The ureteric stent, which was entangled with the nephrostomy tube (Figure 2) was also dislodged proximally and found to be lying subcutaneously. An attempt was made to replace the stent radiologically via a new nephrostomy tube but

Figure 1. Early hydronephrosis due to obstruction at mid ureter level



it was not possible to negotiate the stricture at the lower end of the ureter.

A renal biopsy confirmed persisting acute tubular necrosis (ATN). On postoperative day 21 enterococci were isolated from the nephrostomy and she was commenced on Vancomycin. The nephrostomy was accidentally dislodged again on the 25th postoperative day and the creatinine level that had decreased to 264 $\mu\text{mol/L}$ on the previous day began to rise. The nephrostomy tube was reinserted on the 27th postoperative day with the drainage of a large amount of pus, which yielded multiply resistant enterococci on culture. She was also commenced on Linezolid and Meropenem. With these measures, her creatinine level decreased to 192 $\mu\text{mol/L}$ and her GFR rose from 12 to 22 ml/min. After three weeks of improving GFR and creatinine levels, an antegrade ureteric stent was placed radiologically and the nephrostomy tube removed. She was discharged home on day 62

Figure 2. Entanglement of the nephrostomy tube with the ureteric stent



Discussion

The increasing number of patients on the waiting list for renal transplantation without a concomitant increase in donor numbers has led to a severe shortage in transplant organs worldwide. The increasing severity of organ shortage places transplant surgeons in the difficult position of deciding whether to discard a marginal donor kidney or to use such an organ whilst accepting the risks of complications and prolonged hospitalisation.

With increasing experience with the use of kidneys from CNHBD, most surgeons would no longer consider kidneys from a 48 year old CNHBD to be marginal organs. However, the fact that the kidney in this case was pelvic in position, had three arteries of varying sizes, one of which was damaged, and an extremely short, narrow calibre thin-walled ureter, all combined to make the transplant procedure technically challenging and the postoperative course a complicated one. The decision to use this kidney was heavily influenced by the age of the donor, the donor physiology upon withdrawal of futile life sustaining therapy, and the fact that the donor died within one hour of withdrawal. Kidney function was expected to be good provided urological complications were adequately managed. Furthermore, the recipient who had been waiting for 606 days was willing to receive the kidney.

Pelvic kidneys tend to have anomalous arterial supply and often have ureteric anomalies (3, 4) which has precluded transplantation in the past, particularly from deceased donors. However, there are a number of case reports of the successful transplantation of such pelvic kidneys from living donors with good results (2, 4-7). Arterial anastomosis is often difficult due to multiple arteries and sometimes measures like anastomosis to the internal iliac artery or inferior epigastric artery are employed to achieve a good result (3).

Many authors quote ureteric complication rates

of five to 20 per cent following renal transplantation (8-10). The routine use of ureteric stents for ureteroneocystostomies is controversial [9]. While many authors advocate their use selectively for ureters at risk of complications (11-13) others have recommended universal insertion of stents (9, 14). Both routine and selective users of ureteric stents would agree that stenting was indicated in this case. Ureteric stenting is associated with a higher incidence of urinary tract infections (13, 15, 16), however, some authors have shown that post-transplant co-trimoxazole reduces this risk (14). This is also the practice at our centre.

The early development of hydronephrosis in this case is not surprising. Urine flows around the ureteric stent rather than through it into the bladder. Given the small ureteric calibre and the tightness of fit of the stent (markings of stent visible through the ureter wall), it is understandable why flow around the stent became impaired. The circumstances surrounding the accidental dislodgement of the stent along with the nephrostomy tube remain unclear but this led to a longer stay in hospital. Antegrade stenting successfully performed radiologically avoided the need for surgical exploration of the transplant kidney. Retrograde stenting of the ureter through cystoscopy has been used successfully as a first line treatment for stenosis of transplant ureters (17) with success rates as high as 70% (18). However as approximately 80% of transplant ureter stenoses are at the ureterovesical junction, retrograde stenting may not be possible in all cases. An antegrade approach was used in this case as access to the renal pelvis was already available through a nephrostomy tube. Nitinol stents and extraanatomical ureteral bypass stents have been utilised to treat transplant ureter stenosis successfully (19), as have polyester grafts (20).

Complex surgical options are available for the reconstruction for transplant ureteric complications, for example Boari flap (21) while the native ureter (22, 23), appendix (24) and ileal segments (25) have been used for other ureteric injuries or stenosis.

However, these techniques are not recommended for the surgical anastomosis at the time of the initial renal transplantation, though the use of the native ureter has shown good results in some series (26).

Conclusions

This case demonstrates that it is sometimes possible to extend the boundaries for accepting marginal kidneys for transplantation. While the short term course may be stormy the long term outcome could potentially be satisfactory. Implantation of such kidneys with a ureteric stent, coupled with more intense postoperative monitoring of the transplant and early intervention if ureteric complications develop should be considered in kidneys likely to provide good renal function, but with damaged or short ureters.

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