Case Study of the Month

Cross-over Kidney Transplantation with Simultaneous Laparoscopic Living Donor Nephrectomy: Initial Experience

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1. Introduction

Some living donor kidney transplantations (LD-KTXs) cannot be performed because immunologic barriers, such as ABO-incompatible LD-KTX or transplantation across a positive T-cell cross-match barrier, create an increased risk of complications \[1,2\]. For these cases the 2004 Amsterdam Forum on Living Kidney Donation advocated a cross-over LD-KTX \[3\] where kidneys are exchanged between two pairs. The donor of pair 1 gives the kidney to the recipient of pair 2 and vice versa. So far, only three cross-over KTXs have been performed in Germany. Laparoscopic kidney retrieval for LD-KTX bears many advantages for the donor (less pain, shorter hospital stay, better cosmesis) without disadvantages for the donated kidney or the recipient \[4\]. To the best of our knowledge, we report the first case of a simultaneous laparoscopic living donor nephrectomy for cross-over LD-KTX.

2. Case report: cross-over pairs

The two pairs were chosen for cross-over KTX because they were medically equal (age, gender, kidney function, donor side; Fig. 1). Immunologic obstacles in the respective pairs were blood group incompatibility and preformed HLA antibodies. After the ethics committee of the organ commission...
accepted the pairs for cross-over LD-KTX, thorough medical and psychological evaluations of the two couples revealed no contraindications. Table 1 presents their demographic characteristics.

Recipient 1 had end-stage renal disease (ESRD) with full residual diuresis due to IgA nephropathy and had performed peritoneal dialysis for 55 mo. Donor 1, his wife, had no history of disease or prior operations. Magnetic resonance angiography (MRA) showed a single vein and artery for both her kidneys, and functional scintigraphy (FSG) revealed a distribution of 52% for the left and 48% for the right kidney. Intravenous pyelography (IVP), which is performed at our institution as magnetic resonance imaging (MRI) urography has not yet become standard, was normal.

Recipient 2 had ESRD with full residual diuresis due to bilateral cystic kidney disease and had performed haemodialysis for 5 mo. Donor 2, his wife, had no history of disease or prior operations. MRI showed a single vein for each kidney, a single artery of the left kidney, and two arteries of the right kidney, and FSG revealed a distribution of 47% (left) and 53% (right). IVP was normal.

2.1. Surgery

For both donors the left kidneys were chosen for explantation and simultaneous donor nephrectomies (Figs. 2–6) were performed by pure laparoscopy using a transperitoneal access (S.D., J.R.). Warm and cold ischaemic times were, respectively, 115 s and 145 s and 187 min and 200 min (explantation and implantation were performed consecutively in the same theatre). Anastomosis time was 45 min and 53 min, respectively, and ureterocystoneostomy was performed according to Politano-Leadbetter.

2.2. Immunosuppression

Recipients received immunosuppression as participants of the experimental multicentre AEB071:

| Table 1 – Demographic and immunologic data of the cross-over paired kidney transplantations |
|-----------------------------------------------|---|---|---|---|---|---|---|---|
| Age   | Gender | BMI | Blood group | Rhesus | HLA-A | HLA-B | HLA-DR | HLA antibody | HLA mismatches (broad) | CMV IgG antibodies |
| Recipient 1 | 59 | M | 25.8 | O | Positive | 24 (9), 28 | 44 (12) | 11 (5) | A 24 (9) | Positive |
| Donor 2 | 54 | F | 27.5 | O | Positive | 1, 24 (9) | 8 | 17 (3), 7 | 1-1-2 | Positive |
| Recipient 2 | 50 | M | 29.9 | AB | Positive | 3, 29 (19) | 41, 44 (12) | 7, 13 (6) | A 24 (9) | Positive |
| Donor 1 | 55 | F | 20.5 | AB | Positive | 3, 28 | 35, 44 (12) | 1, 11 (5) | 1-1-2 | Positive |

BMI = body mass index; HLA = human leukocyte antigen; CMV = cytomegalovirus.
The number for HLA in parentheses is the number of the broad antigen for the respective split. Yellow indicates immunologic obstacles against living donor kidney transplantation in the respective couples.
Recipient 1 received tacrolimus, mycophenolate sodium, steroids, and Simulect™; recipient 2 received AEB071, tacrolimus, steroids, and Simulect™. The dose of mycophenolate sodium was 1440 mg/d, the interleukin 2 antibody (Simulect™) was given at a dose of 20 mg before surgery and on day 4. Tacrolimus and methylprednisolone were tapered according to standard of care.

2.3. Results

The postoperative course in the donors was uneventful and they were discharged on day 3 (donor 2) and 5 (donor 1). Six months after donation, both donors had normal creatinine concentration, arterial blood pressure, and urinary status.

Both recipients had immediate graft function with creatinine levels on days 3, 10, and 180 of 1.51, 1.30, and 1.05 mg/dl in recipient 1 and 1.92, 1.52, and 1.60 mg/dl in recipient 2. Recipient 2 developed clinical signs of rejection 5 mo after KTX. A biopsy was not performed because the patient was receiving thrombocyte aggregation blocker therapy for cardiac comorbidities. After a cortisone pulse therapy and switch of AEB medication to tacrolimus, kidney function improved with a creatinim concentration of 1.60 mg/dl 6 mo after KTX.

Fig. 3 – Intraoperative situs: vein and artery are shown, the kidney is already in an organ retrieval bag (prior to clipping the vessels).

Fig. 4 – Prior to clipping of the donor artery with a multifire titan clipper.

Fig. 5 – Donor kidney during perfusion after organ retrieval.

Fig. 6 – Donor’s scar 6 wk after laparoscopic kidney donation.
3. Discussion

Although cross-over exchanges are prohibited in Australia, other countries (South Korea [5], The Netherlands [6]) have nationwide programs for cross-over LD-KTX. In the United Kingdom a law was passed for paired and pooled KTX from 2007 on (presentation by J.O. Olsburgh at the 22nd Congress of the European Association of Urology, Berlin 2007). In the United States, a regional paired exchange program was initiated in New England [7].

In Germany, anonymous paired exchange is prohibited. Couples who wish to undergo cross-over KTX must therefore socialise before the transplantation, although according to the German Medical Council the common fate of two cross-over pairs creates a solid and close enough relationship to meet the demands required by law. This clearly underlines the trend towards acceptance of cross-over KTX also in Germany. This was also found by Hamza et al. [8] in a national survey of the attitudes of German transplant centres towards cross-over KTX. Three German hospitals have started to perform cross-over LD-KTX from a regional list [9].

For equality reasons in the allocation process of cross-over pairs medical issues should be considered. In Korea a minimum HLA match number is required for allocation (>2 in HLA-A/B, >1 in HLA-DR) [5]. Kaplan [10] demonstrated a computer match program in which HLA antigens, forbidden antigens, ABO blood group types, and the age of donor and recipient can be well integrated.

To render equal treatment, both couples should be operated on in the same hospital. In addition to medical equality reasons, we believe that it is psychologically important for the donor and recipient of the “original” pair to not be separated. Nevertheless, programs in the Netherlands and the United States provide for donors to travel to the recipients’ hospital [6,7]. Donation and transplantation of the two couples should be performed simultaneously. A waiting time on the ward is eliminated and the theoretical chance that the second donor, after knowing that his partner has received the kidney transplant, resigns from donation is excluded.

As laparoscopic organ recovery is becoming the standard technique for organ donation, transplantation surgeons should be encouraged to train enough staff to perform simultaneous laparoscopic kidney procurement to meet the demands for a simultaneous cross-over LD-KTX.

Conflicts of interest

No funding was granted for this article; no conflicts of interest exists.

EU-ACME question

Please visit www.eu-acme.org/europeanurology to answer the below EU-ACME question on-line (the EU-ACME credits will be attributed automatically).

Question:

Which statement is correct?

A. Blood group incompatibility excludes living donor kidney transplantation.
B. Although laparoscopic kidney retrieval for living donor kidney transplantation has become the standard approach in the United States, less than half the European centres use a minimal invasive approach.
C. So far no national exchange program for living donor kidneys could be installed in any European country.
D. Living donor kidney transplantation renders the same results as kidney transplantation from deceased donors.

References


