

Successful Reuse of a Kidney Allograft from a Brain-Dead Donor into a Second Recipient: A Case Report

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The limited donor organ supply is a main problem for transplant surgeons in Korea, and forces them to use organs from extended sources. In one such case, we reused a transplanted kidney allograft in August 2012. This was the first successful case involving the reuse of a transplanted kidney allograft in Korea. The kidney donor was a 44-year-old man brain-dead due to spontaneous subdural hemorrhage. He received a kidney transplant from his sister in 2006. The second recipient was a 59-year-old man who had been receiving hemodialysis for 11 years. There were full human leukocyte antigen (HLA) matches between the first donor and the first recipient, and two HLA mismatches between the first donor and the second recipient. Fortunately, we were able to perform a crossmatch test between the first donor and the second recipient as well as the first recipient and the second recipient (with the first donor's agreement). We used the left iliac artery for perfusion instead of the aorta during organ procurement. The cold ischemic time was 4 hours and the initial kidney function was excellent. The patient has been doing well, without any significant complications or rejections, for 3 weeks. His last serum creatinine level was 0.91 mg/dL. Our case shows that the reuse of kidney allografts could be a possible solution for the shortage of donor kidneys. However, this method requires careful consideration and an agreement among participants before its performance.

Key Words: Kidney transplantation, Reuse, Brain death

중심 단어: 신이식, 재사용, 뇌사

Introduction

There is still a great shortage of organ donation while organ transplant waiting lists are rapidly growing(1). According to 2011 organ transplantation statistics in Korea, there were 10,964 patients who were on the kidney transplantation waiting list. But only 1,639 patients (14.9%) of them were counted as possible candidates and 668 patents (40.8%) had kidney transplant from deceased donors. As a result, post-mortem organ donation or organ donation after brain death has been promoted and its attempts have led to

transplant suboptimal organs(2). The patients with organ transplantation are occasionally declared brain death with the increase of organ transplantation. Since the transplanted organs are still functioning well, there is of special interest in reusing the organs once transplanted(3). However, there are a few concerns that need to be discussed in advance regarding the reuse of the transplanted organs. First, there are technical difficulties rising from the procurement of organs which have already transplanted once. Secondly, there might be an increased risk of cancer transfer or infection sources due to multiple hosts(4). The third concern is that a preoperative crossmatch test could not be possible in absence of the first donor. This issue has been actively discussed in liver transplantation more than in kidney(3).

This paper reports a successful case of reusing a transplanted kidney after a kidney transplant patient was declared brain dead.

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Received : April 22, 2013, Revised : May 5, 2013,
Accepted : May 26, 2013

Case Report

The donor was a 44-year-old male who was admitted to the hospital through the emergency department due to spontaneous intracranial hemorrhage. Brain death was suspected from the time of the admission but a number of treatments to lower intracranial pressure were nonetheless attempted. His brain function was not recovered with all the possible efforts we made. And his brain stem reflexes were absent. He had a kidney transplant from his sister after being diagnosed with end-stage renal disease (ESRD) 6 years ago. He was treated with triple immunosuppressive regimen (cyclosporine, steroid, and mycophenolate mofetil [MMF]) and was in a fairly stable condition without any specific problems. A blood test performed immediately before the organ procurement revealed blood urea nitrogen (BUN) 13.2 mg/dL and creatinine (Cr) 1.10 mg/dL. The transplanted kidney, the first donor's left kidney, had been transplanted to his right iliac fossa and the cold ischemic time at that time was not identifiable. The renal artery had been anastomosed end to end to the right internal iliac artery and the renal vein had been anastomosed end to side to the right iliac vein. Ureteroneocystostomy had been performed to reconstruct the ureter. His family agreed to donate his organs and brain death decision committee was held in the hospital. Liver and corneal transplantation was decided by Korean Network for Organ Sharing (KONOS) but the decision regarding the reuse of the transplanted kidney was left to us because there were no documented cases where the reuse of transplanted organs was done in Korea. We selected

the recipient candidates among the existing old patients who had same blood type with the donor. The selected recipient was a 59-year-old male who had been on hemodialysis for 13 years due to ESRD with unknown etiology. He had a surgical history of thoracic aorta replacement surgery (due to aortic dissection, 10 years ago) and temporary cardiac pace making procedure (due to sick sinus syndrome, twice, 3 years ago). And his recent echocardiography result revealed mild aortic regurgitation. A surgical risk of this patient was judged to be high. The panel reactive antibody (PRA) test performed during the registration to the transplant waiting list was negative. Informed consent for an operation was obtained after donor information was given. The crossmatch test between the deceased donor and the second recipient was negative. The crossmatch test between the first donor, a sister of the deceased donor, and the second recipient was also performed with her permission and the result was negative. The HLA typing between the first donor and the deceased donor showed a matching result with A (2, -), B (62, 54), and DR (4, 10). The HLA typing between the first donor and the second recipient showed A (2, -), B (35, 54), and DR (4, 15) (Table 1). Organ procurement from the deceased donor was discussed with the liver transplant team. Infusion of perfusion solution into the left iliac artery instead of the aorta and the procurement of kidney allograft with the right iliac vessel and a part of the bladder from the right iliac fossa were agreed (Fig. 1). The renal allograft was prepared to be anastomosed to the right iliac artery and the right iliac vein during the back table procedure (Fig. 2). During transplant, the renal artery

Table 1. Brief clinical characteristics of first donor, first recipient, and second recipient

Characteristic	First donor	First recipient	Second recipient
Age (yr)/Sex	46 ^a /F	44/F	59/M
Blood group (ABO&RH)	AB+	AB+	AB+
HLA antigens	A (2, -) B (62, 54) DR (4, 10)	A (2, -) B (62, 54) DR (4, 10)	A (2, -) B (35, 54) DR (4, 15)
Immunosuppressives	(-)	Cyclosporin+steroid+MMF	Tacrolimus+steroid+MMF
Cold ischemic time	(-)	Unknown	8 hr

Abbreviations: F, female; M, male; HLA, human leukocyte antigen; MMF, mycophenolate mofetil.

^aAge of 6 years ago when she donated the left kidney.

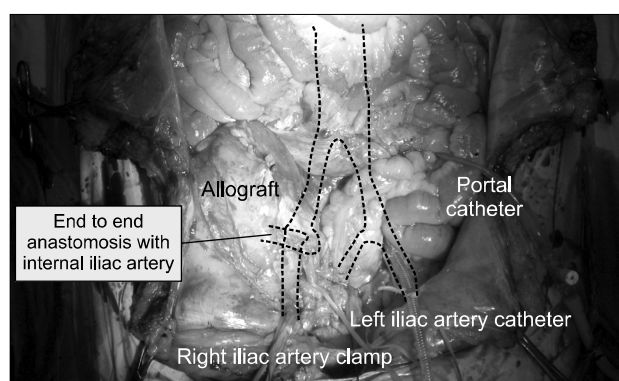


Fig. 1. Catheter insertion for perfusate infusion. We inserted the catheter via left iliac artery and clamped the supraceliac aorta and right iliac artery at distal to kidney transplantation. Portal catheter was inserted via inferior mesenteric vein. Dot-line is the arterial shapes.

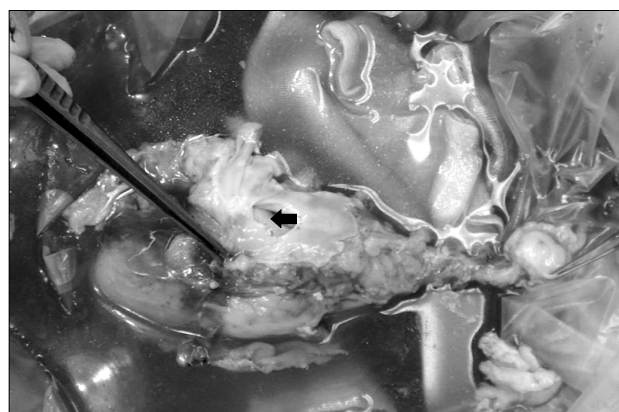


Fig. 2. Harvested kidney allograft. Kidney was harvested with donor's right iliac artery and vein. A black arrow indicates the renal vein surrounding by donor's iliac vein.

was anastomosed to the right internal iliac artery of the recipient including the iliac artery of the donor. The renal vein was also anastomosed end to side to the recipient's right iliac vein including the donor's iliac vein patch at the lateral side of renal artery (Fig. 3). The cold ischemic time was 8 hours and urination after reperfusion was excellent. Ureteroneocystostomy was performed to reconstruct the ureter to the bladder dome of the recipient. The immunosuppressive protocol included basiliximab, tacrolimus, steroid, and MMF. The patient was discharged from the hospital after 21 days without any specific problems and serum BUN, Cr, and estimated glomerular filtration rate were 19.3, 1.07 mg/dL and 74.68 mL/min on discharge. To

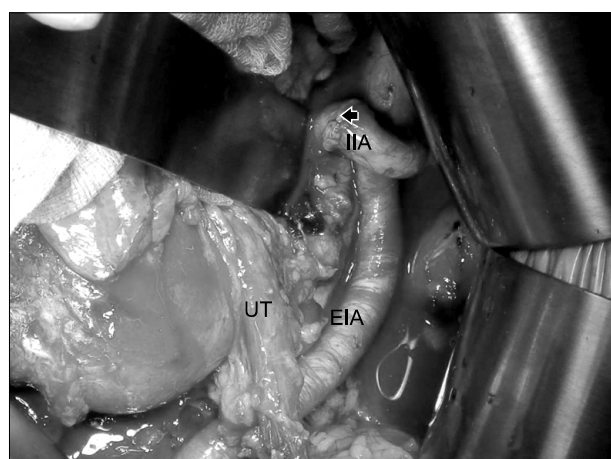


Fig. 3. Operative findings of transplantation. Renal artery was reconstructed by end to end anastomosis between donor's iliac artery and recipient's right internal iliac artery. Renal vein was reconstructed by end to side anastomosis between donor's iliac vein patch and recipient's right iliac vein. Ureteroneocystostomy was done with double J stent. A black arrow indicates the anastomosis of donor's renal artery and recipient's internal iliac artery. Abbreviations: IIA, internal iliac artery of recipient; EIA, external iliac artery of recipient; UT, ureter.

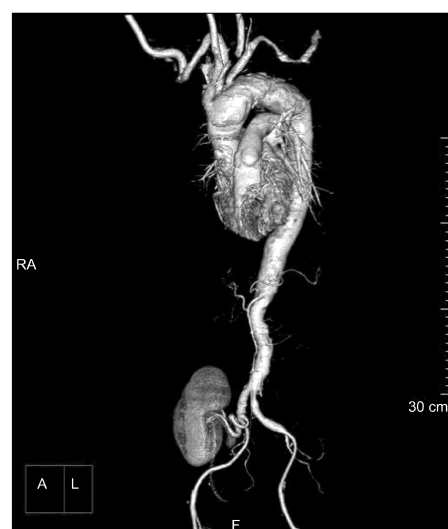


Fig. 4. Computed tomographic angiography of transplanted kidney.

assess his aortic replacement, computed tomographic angiography was performed after the operation and the result revealed that renal artery was in normal condition (Fig. 4). Renal biopsy was performed a month after the operation and the result revealed hypertrophied glomerulus but no other specific findings. It has been 3 months since the operation and the pa-

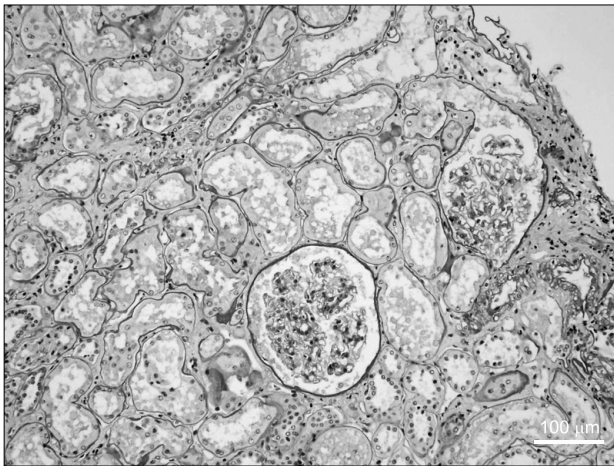


Fig. 5. Microscopic findings of kidney biopsy. There is no abnormality except the hypertrophied glomerulus (PAS, $\times 200$).

tient's condition has been stable without any specific problems (Fig. 5).

Discussion

The reuse of a transplanted kidney is a rare attempt and, according to our present understanding, only four cases have been reported(5). This case is the first successful reuse of a transplanted kidney in Korea. There are a few concerns which need to be addressed when it comes to reuse a transplanted kidney. First, there is a high risk of cancer transfer or infection sources(4). It was thought that this case was not much different from other deceased donors' cases because the first donor was a living donor who was a sister of the first recipient and her condition was identifiable. The second concern is technical difficulties rising from the procurement of a transplanted organ. The renal allograft was severely adhered to the surrounding tissues and the renal hilum was almost unrecognizable in this case (Fig. 1). Perfusion solution was therefore infused into the left iliac artery instead of the aorta. Moreover, to infuse the perfusion solution to the liver, the proximal aorta was clamped above the celiac artery and the right iliac artery was clamped at distal part from the place where the kidney was transplanted so that the perfusion solution could be infused to the kidney allograft (Fig. 1). To minimize organ injuries, adhesive surrounding tissues were removed all together during

re-recovery of the kidney allograft. Also the donor's iliac artery and iliac vein were used for the anastomosis instead aggressively in search of kidney hilum during back table procedure (Fig. 2). Ureter was carefully dissected and harvested with the bladder wall of the donor. Its length was sufficient enough to perform ureteroneocystostomy for the second recipient. The third problem is that a preoperative crossmatch test is not feasible. Serum or lymphocytes of the first donor is needed for a complete crossmatch but it is not easy to obtain samples after a certain period of time like this case. According to literature review, cases at the beginning of reusing organs included patients who were declared brain dead after a short period of time post to organ transplantation and cases in which donated kidneys couldn't be used(6,7). Some maintained that virtual crossmatch should be used to solve this problem(8). A recent case report did not even mention anything about crossmatch(4). Organ transplantation is not impossible as long as crossmatch result is acceptable because ABO incompatible transplantation has been performed in recent years. However, it is only possible in case of that there is enough time to remove donor-specific antibodies from a donor. Virtual crossmatch is judged to be one of possible alternatives in reuse of a transplanted organ obtained from a deceased donor like this case. It was fortunate for us to obtain a serum sample from the first donor and to be able to check crossmatch result with the first donor as well as the second donor prior to the surgery. KONOS allowed us to select an appropriate recipient because it was the first case in Korea. The authors primarily contacted patients who were older and with negative PRA and finally selected a patient who gave a written consent after sufficient information about this study was given. There was a total lack of long term follow-up report on reusing of a kidney allograft so that it was reasonable to select a person with shorter life expectancy.

Reuse of a transplanted kidney could be a most likely solution to solve death problem with functioning graft and also seems to be considered one of effective alternatives to increase organ supply for transplantation.

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