

## Ipsilateral dual kidney transplantation in an elderly patient with severe atherosclerosis: a case report

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Dual Kidney Transplantation (DKT) has been developed to improve outcomes from transplantation based on extended criteria of donors (ECD) and demonstrated excellent short-term outcomes. We performed DKT at Samsung Medical Center in March 2021. The donor was a 74-year-old male with no history of known underlying diseases but died from traumatic subarachnoid hemorrhage. The recipient was a 72-year-old male who had been undergoing nephrological observation for 4 years prior to the kidney transplant. The patient had been on hemodialysis since July 2017 and had been suffering from type 2 diabetes since 2003. On non-contrast computed tomography, diffuse calcific atherosclerosis was observed in the abdominal aorta and left iliac artery. As a result, ipsilateral DKT was performed. Because of this diffuse calcific atherosclerosis, we planned ipsilateral DKT on the right side. Postoperative healing was uneventful without complications. In conclusion, DKT is an option for improving survival in the ECD pool, and ipsilateral DKT can be helpful option for preventing organ discard in ECDs.

**Keywords:** Kidney transplantation; Criteria of donors; Atherosclerosis; Case reports

### INTRODUCTION

Kidney transplantation (KT) is one of the treatment considerations for chronic kidney disease. KT improves quality of life by providing improved survival compared to dialysis [1]. The number of patients on the waiting list for kidneys in July 2020 was 25,614 in Korea as per data from the Koreans Network for Organ Sharing (KONOS) [2]. In Korea, approximately 2,000 kidney transplants have been performed each year in the past decade. Unfortunately, the increase in the number of patients on the waiting list is not proportional to the number of transplantable organs. To address the challenge of organ donation shortages, extended criteria of donors (ECD) are being used worldwide [1]. Since the outcome of KT using organs from ECD

donors is not always satisfactory, it has been proposed that both kidneys of a deceased donor be used, known as dual kidney transplantation (DKT), to create a sufficient number of functional nephrons for transplantation and improve the survival of these ECD grafts [3,4]. Since 2014, the KONOS has established criteria for DKT: serum creatinine level greater than 3.0 mg/dL or estimated glomerular filtration rate less than 30 mL/min if the donor is 70 years of age or older. ECD was defined based on United Network for Organ Sharing criteria. ECDs consisted of deceased donors older than 60 years and deceased donors aged 50 to 59 years, who met two of the following criteria: history of hypertension, cerebrovascular accident causing brain death, and final pre-procurement serum creatinine level 1.5 mg/dL [5]. These criteria provide a way to extend the

## HIGHLIGHTS

- We report a case of successful ipsilateral dual kidney transplantation from extended criteria of donor.
- Ipsilateral dual kidney transplantation can cause structural problems, but this procedure reduces cold ischemia times and operation time.

use of kidney grafts from marginal donors and to reduce the organ discard rate.

DKT was developed to improve outcomes from transplantation based on ECD and has shown excellent short-term outcomes. Six-month patient graft survival has been reported to be 100% [6]. In addition, one study reported a five-year graft survival of 87.3% [7]. DKT also minimizes surgical complications associated with replacement of both kidneys. In many centers, DKT is performed by placing the two kidneys through separate incisions for easier vessel accessibility. Also, if surgical complications occur, other graft sites will not be affected [8]. On the other hand, a previously published study revealed that ipsilateral placement of DKT reduced surgical injury and postoperative complications [9].

In Korea, although ECDs are accepted more frequently, DKT remains infrequent compared to its performance in Europe or the United States [10]. We experienced several such cases at our center, and all underwent bilateral DKT. However, one patient showed severe diffuse calcific atherosclerosis in the abdominal aorta and left iliac artery. Based on that finding, we performed ipsilateral DKT and report our results.

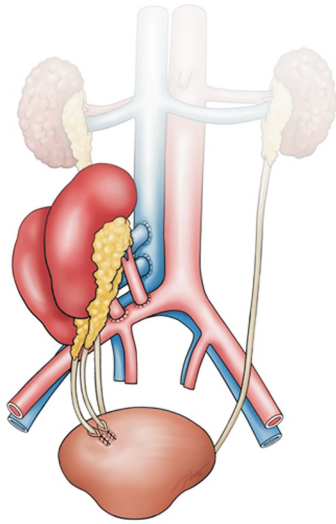
## CASE REPORT

The present study protocol was reviewed and approved by the Institutional Review Board of Samsung Medical Center (IRB No. 2021-10-047). Informed consent was waived because of the retrospective nature of the study.

The donor was a 74-year-old male with no history of known underlying diseases but who died from traumatic subarachnoid hemorrhage. His final serum creatinine was 2.88 mg/dL. The recipient was a 72-year-old male who had been under nephrological observation for 4 years prior to the kidney transplant. The patient had been on hemodialysis since July 2017 and had been suffering from type 2 diabetes since 2003. On non-contrast computed tomogra-



**Fig. 1.** Pretransplant non-contrast computed tomography scan. The left iliac artery shows severe calcification. (A) Axial view. (B) Sagittal view. (C) Coronal view.



**Fig. 2.** Schematic of the ipsilateral dual kidney transplantation.

phy, diffuse calcific atherosclerosis was observed in the abdominal aorta and left iliac artery. Therefore, our center, which typically performs bilateral DKT, planned ipsilateral DKT on the right side due to its smaller amount of atherosclerosis (Fig. 1).

The surgical procedure began with a long midline incision. The right iliac artery and vein, distal aspects of the common iliac arteries, and inferior vena cava (IVC) were exposed and prepared due to the severe calcific atherosclerosis. The right donor kidney was positioned inferior-laterally in the lower right flank, while the left donor kidney was positioned superior-medially. Each renal vein was anastomosed end-to-side to the recipient IVC, while the renal arteries were anastomosed end-to-side to the recipient common iliac artery with prolene (6-0) sutures. Following completion of vascular anastomoses, separate ureteroneocystostomies were performed 2 cm apart according to the Lich-Gregoir technique using a double J stent for each ureter (Fig. 2).

In the immunosuppressive protocol, intravenous prednisolone was given at 500 mg/day and slowly tapered to orally methylprednisolone 8 mg by end of 1 month. Mycophenolate mofetil 750 mg also was given. Tacrolimus was initiated at 3 mg and adjusted to maintain a level between 6 and 9 ng/mL. Ultrasonography of the transplanted kidneys on postoperative day 5 following transplantation showed the proximal kidney to be 100 mm in size and kidney parenchyma 56 mm in width; the distal kidney was 110 mm in size with parenchyma 70 mm in width. No oc-

clusion signs or dilation of the kidney canal system were observed. Color Doppler ultrasound examination detected flow through the renal artery and vein. In the proximal and distal kidney, renal arterial flow was 27.4 cm/sec and 41 cm/sec, respectively. The average resistance index was 0.94 in both the proximal and distal kidneys. The technetium (Tc) 99m-labeled diethylene triamine penta-acetic acid (DTPA) on postoperative day 18 exhibited normal function in both transplanted kidneys. The hospital stay after transplantation was 22 days and involved no surgical complications. At 6 months after transplantation, serum creatinine was 1.1 mg/dL and both transplanted kidneys maintained good function.

## DISCUSSION

DKT is a safe way to address organ shortages using marginal donors who are not acceptable for single transplantation. DKT also exhibits satisfactory renal function [4,11,12]. On the other hand, DKT causes complications such as lymphoceles and bleeding and has higher incidence of deep venous thrombosis and uretero-bladder anastomosis stenosis compared with single kidney transplantation (SKT) [13]. This indicates that DKTs require greater dissection and surgical and anesthetic durations. In addition, intraoperative medical and surgical complications are expected to be more frequent compared to those in SKT. However, in one cohort study, the incidence of renal vein thrombosis was 1% with DKT compared to 5% in SKT [14]. Ekser et al. [14] compared bilateral DKT with ipsilateral DKT and demonstrated that the ipsilateral procedure reduces cold ischemia times for the second kidney and shortens the operative time [9,14]. Cocco et al. [15] noted that ipsilateral placement was approximately 1 hour shorter than bilateral placement. In our experience, the average operative time from initiation of anastomosis to reperfusion in bilateral DKT was 119 minutes. The present case of ipsilateral DKT took 52 minutes, which was approximately one hour shorter than previous bilateral placements in our center.

In DKT, each allograft can be transplanted into separate iliac fossae (bilateral), two allografts can be transplanted separately into one iliac fossa (ipsilateral), or they can be transplanted en bloc. Several studies have shown that en bloc anastomosis can reduce cold ischemia and operation times [16,17]. Since our patient had diffuse calcific atherosclerosis in the abdominal aorta and left iliac artery, we

determined that ipsilateral DKT should be performed on the right side due to a smaller amount of atherosclerosis. In this case, we first planned to implant the donor's IVC to the recipient's external iliac vein and anastomose the "Y" arterial interposition graft to the recipient iliac artery. Since a heavily calcified aorta could hinder arterial anastomosis and increase the risk of graft thrombosis [15], we decided to transplant the two kidneys separately into one iliac fossa.

Ipsilateral DKT can cause structural problems as two allografts must be placed into one space. To prevent spontaneous rotation and torsion of the graft, we first retroperitonealized the two allografts. A space was created by mobilizing the ascending colon by cutting the edge of the peritoneum at the lower border of the cecum. After ureteral anastomosis, the cut edges of the raised peritoneal flap were sutured to cover both allografts.

In 2014, approximately 1,885 kidneys were discarded in the United States [18]. There should be refining criteria to match marginal donors to recipients instead of discarding ECD kidneys. DKT is a helpful option for preventing organ discard based on ECD. Ipsilateral DKT is not easy due to the large size of the transplanted kidney and the small amount of space. In addition, if the recipient has severe atherosclerosis on one side of their iliac artery, ipsilateral DKT instead of bilateral DKT might be a proper alternative to allow successful transplantation. Since there are not many studies on ipsilateral DKT in Asia, additional studies are needed to determine further indications. We believe that DKT will improve survival in the ECD pool, and that ipsilateral DKT can be one option in the circumstance of specific beneficiary conditions.

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### Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Conceptualization: all authors. Formal analysis: YJO. Data

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## REFERENCES

1. De Serres SA, Caumartin Y, Noël R, Lachance JG, Côté I, Naud A, et al. Dual-kidney transplants as an alternative for very marginal donors: long-term follow-up in 63 patients. *Transplantation* 2010;90:1125-30.
2. Korean Network for Organ Sharing (KONOS). KONOS waiting list in quarterly statistics data [Internet]. Seoul: KONOS; 2020 [cited 2021 Dec 20]. Available from: <https://www.konos.go.kr>.
3. Carter JT, Lee CM, Weinstein RJ, Lu AD, Dafoe DC, Alfrey EJ. Evaluation of the older cadaveric kidney donor: the impact of donor hypertension and creatinine clearance on graft performance and survival. *Transplantation* 2000;70:765-71.
4. Bunnapradist S, Gritsch HA, Peng A, Jordan SC, Cho YW. Dual kidneys from marginal adult donors as a source for cadaveric renal transplantation in the United States. *J Am Soc Nephrol* 2003;14:1031-6.
5. Metzger RA, Delmonico FL, Feng S, Port FK, Wynn JJ, Merion RM. Expanded criteria donors for kidney transplantation. *Am J Transplant* 2003;3 Suppl 4:114-25.
6. Johnson LB, Kno PC, Dafoe DC, Schweitzer EJ, Alfrey EJ, Klassen DK, et al. Double adult renal allografts: a technique for expansion of the cadaveric kidney donor pool. *Surgery* 1996;120:580-3.
7. Khalil MA, Tan J, Khan TF, Khalil MA, Azmat R. Dual kidney transplantation: a review of past and prospect for future. *Int Sch Res Notices* 2017;2017:2693681.
8. Medina-Polo J, Pamplona-Casamayor M, Miranda-Utrera N, González-Monte E, Passas-Martínez JB, Andrés Belmonte A. Dual kidney transplantation involving organs from expanded criteria donors: a review of our series and an update on current indications. *Transplant Proc* 2014;46:3412-5.
9. Veroux M, Corona D, Gagliano M, Macarone M, Sorbello M, Giuffrida G, et al. Monolateral dual kidney transplantation from marginal donors. *Transplant Proc* 2007;39:1800-2.
10. Lee KW, Park JB, Cha SR, Lee SH, Chung YJ, Yoo H, et al. Dual kidney transplantation offers a safe and effective way to use kidneys from deceased donors older

- than 70 years. *BMC Nephrol* 2020;21:3.
11. Ekser B, Baldan N, Margani G, Furian L, Frison L, Valente M, et al. Monolateral placement of both kidneys in dual kidney transplantation: low surgical complication rate and short operating time. *Transpl Int* 2006;19:485-91.
  12. Wolters HH, Palmes D, Heidenreich S, August C, Brockmann J, Senninger N, et al. Long-term follow-up of double kidney transplantation using a score for evaluation of marginal donors. *Transpl Int* 2005;18:453-7.
  13. Fishman JA, Rubin RH. Infection in organ-transplant recipients. *N Engl J Med* 1998;338:1741-51.
  14. Ekser B, Furian L, Broggiato A, Silvestre C, Pierobon ES, Baldan N, et al. Technical aspects of unilateral dual kidney transplantation from expanded criteria donors: experience of 100 patients. *Am J Transplant* 2010;10:2000-7.
  15. Cocco A, Shahrestani S, Cocco N, Hameed A, Yuen L, Ryan B, et al. Dual kidney transplant techniques: a systematic review. *Clin Transplant* 2017;31:e13016.
  16. Tran KC, Li D, Taqi A, Sener A, McAlister VC, Luke PP. Dual en bloc technique for adult renal transplantation. *Clin Transplant* 2017;31:e13017.
  17. Salehipour M, Bahador A, Nikeghbalian S, Kazemi K, Shamsaeifar AR, Ghaffaripour S, et al. En bloc transplantation: an eligible technique for unilateral dual kidney transplantation. *Int J Organ Transplant Med* 2012;3:111-4.
  18. Barach PR, Jacobs JP, Lipshultz SE, Laussen PC. *Pediatric and congenital cardiac care*. London: Springer; 2015.