Case Report

Living Donor Kidney Transplantation for a Recipient after 41 Years of Hemodialysis

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Abstract: Due to atrophic bladder, patients undergoing long-term dialysis experience vesicoureteral reflux and complicated urinary tract infections after kidney transplantation. A 58-year-old woman underwent living donor kidney transplantation after 41 years of dialysis. She had no contraindications, with good cardiac function and minimal artery calcification despite the long history of hemodialysis. Immunosuppression was initiated with tacrolimus, mycophenolate mofetil, prednisolone, and basiliximab. Ureteroneocystostomy with an antireflux technique was carefully conducted as her bladder volume was 15 mL. The postoperative clinical course was uneventful with immediate graft function. The bladder volume gradually increased to 81 mL at discharge, 3 weeks postoperatively. The patient was initially depressed due to frequent urination early post-transplant but recovered soon after as the bladder volume gradually increased to 400 mL. The patient has not yet reported a urinary tract infection episode. This case highlights living donor kidney transplantation-induced recovery of bladder function with careful ureteroneocystostomy, despite the long dialysis history.

Keywords: kidney transplantation; long-term dialysis; atrophic bladder

Citation: Tanaka, K.; Hidaka, Y.; Yamanaga, S.; Kinoshita, K.; Kaba, A.; Toyoda, M.; Yokomizo, H. Living Donor Kidney Transplantation for a Recipient after 41 Years of Hemodialysis. *Transplantology* **2022**, *3*, 1–5. <https://doi.org/10.3390/transplantology3010001>

Academic Editor: Pasquale Esposito

Received: 8 December 2021

Accepted: 24 December 2021

Published: 27 December 2021

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1. Introduction

Kidney transplantation is the preferred treatment for patients with end-stage renal diseases [1]. In Japan, the number of kidney donations after brain death has increased only slightly, forcing many patients into long-term dialysis [2]. Kidney transplantation for long-term dialysis patients is safe [3–7]. However, patients are susceptible to urinary complications due to atrophic bladder [8–10], and dialysis for more than 10 years was found to negatively impact short-term graft survival [11]. Herein, we report a living donor kidney transplantation case after 41 years of hemodialysis. This dialysis period before transplantation may be the longest in the world.

2. Case Report

A 58-year-old woman (blood type AB) on hemodialysis for 41 years and 11 months was referred to our hospital for a living donor kidney transplantation from her husband's sister (blood type B). Her dialysis treatment had begun at the age of 16 years due to chronic glomerulonephritis. Although she had considered living kidney transplantation once before, she had given up since her parents have medical illnesses and she has no siblings. She also hesitated to register to the kidney transplantation waiting list because of the long waiting period (approximately 15 years). The patient's medical history also included dialysis amyloidosis, carpal tunnel syndrome, and hepatitis C viral infection, which was treated with direct-acting antiviral drugs; viral copies were undetectable at the time of

transplantation. The patient had a surgical history of parathyroidectomy and parathyroid auto-transplantation for secondary hyperparathyroidism.

Her weight was 59.5 kg and her height 164 cm (Body mass index = 22.1 kg/cm²). Her blood tests revealed high blood urea nitrogen (36.7 mg/dL) and creatinine (6.54 mg/dL) levels, hyperphosphatemia (5.6 mg/dL), a low intact parathyroid hormone level (8 pg/mL), and normal fasting glucose (111 mg/dL) and hemoglobin (13.0 g/dL) levels. Echocardiogram showed normal sinus rhythm, and echocardiography demonstrated normal ejection fraction (biplane modified Simpson's method, 66%) and mild tricuspid regurgitation. Chest X-ray did not show an enlarged cardiac outline. Preoperative computed tomography without contrast showed atrophic kidneys and minimal calcification of the iliac arteries, despite long-term hemodialysis (Figure 1). There were five human leucocyte antigen (HLA) mismatches and negative results for complement-dependent cytotoxicity crossmatch, flow cytometry crossmatch, and panel reactive antibody test (HLA classes I and II).

Figure 1. Preoperative computed tomography images of the (a) common iliac artery and the (b) external iliac artery, showing minimal calcification of the arteries (yellow arrows).

Immunosuppression was induced by administering extended-release tacrolimus (estimated area under the curve (0–24 h): 250 ng·h/mL, target trough level: 5–8 ng/mL) starting from preoperative day 4 and mycophenolate mofetil, prednisolone, and basiliximab from the operative day. The allograft was placed in the right iliac fossa. The renal artery was anastomosed to the right internal iliac artery in an end-to-end fashion, and the vein was anastomosed to the right external iliac vein by end-to-side fashion. The ureteroneocystostomy was conducted by the Lich–Gregoir method using 5-0 polydioxanone monofilament sutures. A 2 cm long submucosal tunnel was created as an antireflux procedure, and a 5-French gauge double-J ureteral stent was placed. Normal saline was injected into the bladder, and the volume was approximately 15 mL. The allograft started to produce urine 8 min after reperfusion, and the operation was completed uneventfully. Total operation time was 324 min, and total blood loss was 180 mL.

The perioperative graft function was good, and the clinical course was uneventful (Figure 2). Postoperative hemodialysis was unnecessary as the serum creatinine level decreased to 1.33 mg/dL on postoperative day (POD) 1. The serum ionized calcium level also decreased (to 5.7 mg/dL), and calcium lactate hydrate and calcitriol were prescribed. The double-J stent and Foley catheter were removed on POD 6. Flexible cystoscopy showed edematous anastomosis mucosa but no obvious stricture. The patient's voided volume increased to a maximum of 81 mL per urination at discharge, but frequent urination (every 30 min) was still necessary. Urine tests never indicated a bacterial infection. Ultrasonography, which was performed daily at the bedside, never showed hydronephroses or urinary leakage at the anastomosis site until discharge on POD 21.

Figure 2. The postoperative clinical course, which was uneventful. Blue bar, black solid line and dotted line represents urinary volume, voided volume and serum creatinine level, respectively.

Approximately 3 months after surgery, the patient was temporarily depressed owing to uncontrolled urinary habits. The patient complained of daily abdominal bloating (around noon), lower urination volume during the day and more at night, and hesitation in leaving her residence. However, the patient never experienced incontinence, incomplete emptying of the bladder, and nocturnal enuresis. A physical examination and ultrasonography found no abnormalities.

The patient sought advice and counseling from a patients' advocacy group and attended several yoga classes for kidney recipients. These supportive care measures eased the patient's frustrations. Her abdominal bloating gradually improved and disappeared. The patient stated that her maximum voided volume improved from 100 mL 1 month after surgery to 320 mL 1 year after surgery, eventually reaching 400 mL 2 years after surgery. The patient felt urinary urgency during the day at approximately 150–200 mL (occasionally around 100 mL) and urinated approximately 13 times during the day and 5 times when sleeping at night. The patient was overjoyed that the kidney transplantation allowed her to take a trip and enjoy a fine meal.

Two years after surgery, there were no signs of allograft rejection, vesicoureteral reflux, proteinuria or other serious infections, including a urinary tract infection. Her allograft function remained good 1 and 2 years after surgery (at 1 year, creatinine was 1.05 mg/dL and creatinine clearance 51.3 mL/min; at 2 years, 1.01 mg/dL and 52.6 mL/min, respectively). The arteriovenous fistula was closed 21 months after surgery.

3. Discussion

Kidney transplants for long-term dialysis patients are common worldwide, but the impact of dialysis duration on the surgical outcomes remains unclear. The United Network for Organ Sharing showed that a longer dialysis period negatively correlated with 10-year grafts and patient survival compared with preemptive transplants, and recipients with a

dialysis period greater than 10 years had higher complication rates within 30 days after surgery [11]. However, Japanese studies reported that the 1-year renal function and graft survival of recipients with 15- to 20-year dialysis periods were comparable to shorter dialysis periods [4,6]. Wu et al. also showed that the long-term surgical complication risks do not differ between recipients with dialysis periods greater than 10 years and those with less than 10 years [10]. Regional differences may occur because of the variable management process for dialysis patients.

While kidney recipients with longer dialysis periods tend to have a smaller bladder capacity [9], most recipients have sufficient bladder volume to resume normal daily life. Previous studies showed that bladder capacities <100 mL often increased to >300 mL, and capacities <50 mL increased to >150 mL 1 year after surgery [3,9]. Furthermore, small bladder capacity was not associated with postoperative urinary tract infections, creatinine level, or graft survival [3,12]. However, some studies suggested that small bladder capacity negatively affected postoperative vesicoureteral reflux (VUR). Hotta et al. showed that a bladder capacity of <50 mL was associated with a higher risk of postoperative VUR [8]. Inoue et al. also demonstrated that a dialysis period >5 years and a bladder capacity <130 mL correlated with postoperative VUR [9]. These results suggest that small bladder capacity may be associated with postoperative VUR but not a decline in graft function.

Lich–Gregoir ureteroneocystostomy is now the standard technique for renal transplantation. This technique was originally developed as an extravesicle procedure to treat vesicoureteral reflux [13]. A variety of ureteroneocystostomy procedures have been described to avoid complications: Politano–Leadbetter [14], Taguchi [15] and Lich–Gregoir [16]. Some studies had compared these techniques in the setting of renal transplantation and revealed that the Lich–Gregoir procedure had the lowest complication rate [17–19]. Furthermore, Moreno-Alarcón et al. demonstrated the effectiveness of a double J catheter [20]. The Lich–Gregoir technique with a double J catheter showed a significantly lower rate of fistula and stenosis. Our institution routinely uses this procedure with a double J catheter and had encountered only 2 cases of urinary stenosis out of 250 cases. As mentioned in this case report, this antireflux technique may be useful even for atrophic bladders.

Okamoto et al. reported a case of kidney transplantation in a Japanese patient after 38 years of hemodialysis [21]. The patient had minimal iliac vessel calcification, no cardiac problems, and a preoperative bladder capacity of 50 mL but developed postoperative VUR-induced pyelonephritis. The authors rehabilitated the bladder by transient occlusion of a Foley catheter, and the patient was discharged without urinary problems.

Our patient also had minimal iliac vessel calcification and normal left ventricular function. In the first 3 weeks after surgery, the bladder capacity increased from 15 mL to 81 mL, and 2 years after surgery, there were no signs of VUR or urinary tract infections. While the patient's long-term renal function and bladder capacity were good, abdominal discomfort caused by urinary frequency was bothersome. Supportive care was important for the physical and mental recovery of the patient.

Kidney transplantation for extreme long-term dialysis recipients may have serious urinary complications and habit issues. However, kidney transplantations with careful ureteroneocystostomy can be performed safely even for patients with extremely long hemodialysis history and these patients should not be overlooked.

4. Conclusions

A living donor kidney transplantation was performed in a patient with an extremely long dialysis period (41 years). The transplant was successful, with no major urinary complications, but required postoperative supportive care for depression. Successful kidney transplantation for long-term dialysis patients is possible if patients have no cardiac and vascular comorbidities, but inevitably requires long and severe bladder rehabilitation for several months. Surgeons should inform patients of the clinical course of bladder expanding.

Author Contributions: K.T.: Writing—Original Draft Preparation. Y.H.: Conceptualization. S.Y.: Writing—Review and Editing. K.K.: Writing—Editing. A.K.: Writing—Editing. M.T.: Writing—Review and Editing. H.Y.: Supervision. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Ethical review and approval were waived for this study.

Informed Consent Statement: Written informed consent has been obtained from the patient to publish this paper.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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