ANNALS OF TRANSPLANTATION

CASE REPORT

e-ISSN 2329-0358
© Ann Transplant, 2026; 31: e952581
DOI: 10.12659/AOT.952581

Received: 2025.12.25
Accepted: 2026.04.01
Available online: 2026.04.15
Published: 2026.XX.XX

First Reported Asian Cases of Robot-Assisted Simultaneous Bilateral Nephrectomy With Kidney Transplantation in Autosomal Dominant Polycystic Kidney Disease: A Case Series

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Financial support: This study was supported by a grant (grant number: 2022IL0029-1) from the Asan Institute for Life Sciences, Asan Medical Center, Seoul, South Korea
Conflict of interest: None declared

Background: Autosomal dominant polycystic kidney disease (ADPKD) is frequently associated with massive kidney enlargement, which complicates kidney transplantation by limiting intra-abdominal space. Simultaneous bilateral nephrectomy with kidney transplantation can reduce surgical burden and avoid staged procedures, but it is technically demanding and rarely performed using robotic surgery. No such cases have been reported previously in Asian patients.

Case Reports: Two adult patients with end-stage kidney disease due to ADPKD presented with severe abdominal distension, pain, early satiety, and impaired quality of life caused by massively enlarged kidneys extending into the pelvis. Robot-assisted simultaneous bilateral nephrectomy was performed using a transperitoneal approach, followed by living-donor kidney transplantation during the same operation. Despite distorted anatomy, limited working space, and extensive vascular adhesions, robotic nephrectomy allowed precise dissection and safe completion of bilateral kidney removal. After repositioning, graft implantation in the iliac fossa was successfully achieved. Operative times were prolonged (approximately 10 hours and 9 hours), reflecting the complexity of simultaneous bilateral nephrectomy and transplantation, while estimated blood loss remained low and no transfusions were required. Both patients demonstrated immediate graft function, early ambulation, and uneventful recovery without intraoperative or postoperative complications.

Conclusions: Robot-assisted simultaneous bilateral nephrectomy with kidney transplantation is feasible and safe in selected patients with severely enlarged polycystic kidneys. These first reported Asian cases suggest that this approach may offer perioperative and recovery advantages while avoiding the risks of staged operations.

Keywords: **Case Reports • Postoperative Recovery • Robotic Surgical Procedures • Surgical Procedures, Operative • Transplantation**

Full-text PDF: https://www.annalsoftransplantation.com/abstract/index/idArt/952581

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Introduction

Autosomal dominant polycystic kidney disease (ADPKD) is the most common hereditary renal disorder, affecting approximately 1 in 400 to 1000 individuals worldwide [1,2]. The disease is characterized by the progressive growth of renal cysts, leading to abdominal distension, chronic pain, infection, and ultimately end-stage renal disease (ESRD) in nearly 50% of patients by the age of 60 years [3,4]. Kidney transplantation (KT) remains the treatment of choice for ESRD due to ADPKD, but the anatomical challenges posed by massively enlarged kidneys often necessitate unilateral or bilateral nephrectomy [3,5].

While native nephrectomy can be performed before or after transplantation, performing it simultaneously at the time of transplantation offers logistical advantages and reduces the need for multiple surgeries, but comes at the expense of greater technical complexity [6,7]. In patients with ADPKD, open bilateral nephrectomy has traditionally been performed but is often associated with substantial morbidity, prolonged recovery, and considerable blood loss [8,9]. In recent years, however, robot assisted approaches have emerged as a minimally invasive alternative, providing enhanced 3-dimensional visualization, greater surgical precision, and a lower incidence of postoperative complications [10-12]. Nevertheless, robot-assisted kidney transplantation (RAKT) remains rarely performed in ADPKD, largely due to the limited pelvic space created by massively enlarged native kidneys, technical challenges of safely mobilizing these kidneys, and concerns regarding prolonged operative time and increased perioperative risk in this complex patient population.

In light of these challenges, we describe the first 2 cases in Asia of simultaneous robot-assisted bilateral nephrectomy and RAKT in patients with ADPKD. This report provides a comprehensive description of the surgical approach and postoperative outcomes, contributing valuable evidence to the growing body of literature supporting robotic approaches in renal transplantation.

Case Reports

Case 1

A 24-year-old female patient with ESRD secondary to genetically confirmed ADPKD was referred for living-donor KT. Genetic testing identified a heterozygous *PKD1* mutation (c.4447C>T; p.Gln1483Ter) consistent with the familial pathogenic variant. She had experienced progressive renal decline and commenced hemodialysis via a right internal jugular catheter 3 days before transplantation. Her body mass index (BMI) was 19.5 kg/m^2, and cross-sectional imaging demonstrated markedly enlarged native kidneys measuring 20.0×10.0×7.0 cm on the right and 16.5×12.5×8.2 cm on the left, which produced significant intra-abdominal mass effect (**Figure 1**). The living donor was her 33-year-old sister, confirmed to be free of the familial mutation and demonstrating favorable left kidney anatomy, with a single artery and vein. After detailed evaluation, simultaneous robot-assisted bilateral nephrectomy and KT were performed using the da Vinci Xi platform. The operation lasted approximately 10 hours, with a cold ischemia time of 90 minutes and a rewarming time of 42 minutes. The graft weighed 178.8 g and measured 11.7×5.8×5.1 cm. Postoperatively, urine output reached 5160 mL within the first 24 hours, and the serum creatinine level decreased from 7.26 mg/dL preoperatively to 0.99 mg/dL by postoperative day (POD) 5. The patient required 1 unit of packed red blood cells on POD 4 for anemia but otherwise recovered uneventfully and was discharged on POD 5 in excellent condition.

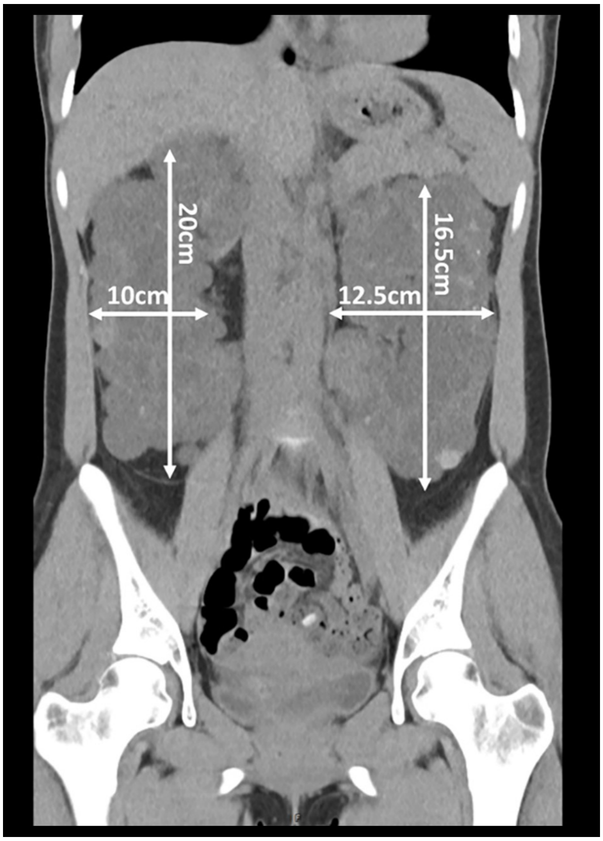

Figure 1. Preoperative abdominal CT imaging demonstrating massively enlarged polycystic kidneys in case 1 patient. Preoperative coronal CT of case 1 showing markedly enlarged polycystic kidneys with innumerable cysts replacing normal parenchyma. The right kidney measures approximately 20 cm and the left approximately 16.5 cm, occupying most of the retroperitoneal space and limiting pelvic room for graft placement.

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Table 1. Comparative clinical, surgical, and postoperative characteristics of the 2 patients with autosomal dominant polycystic kidney disease undergoing simultaneous robot-assisted bilateral nephrectomy and kidney transplantation.

Variable	Case 1	Case 2
Recipient age/sex	24/F	54/F
BMI (kg/m^2)	19.5	20.7
Genetic mutation	*PKD1* c.4447C>T (p.Gln1483Ter)	*PKD1* c.4996T>C (p.W1666R)
Native kidney size (R)	20.0×10.0×7.0 cm	16.5×8.4×6.5 cm
Native kidney size (L)	16.5×12.5×8.2 cm	19.3×8.8×6.8 cm
Dialysis status	Preemptive before KT	HD
Donor	33-year-old sister, *PKD1*-negative	57-year-old brother, *PKD1*-negative
Donor kidney selected	Left (1A/1V)	Left (1A/1V)
Graft weight	178.8 g	160 g
Graft size	11.7×5.8×5.1 cm	10.4×7.2×4.8 cm
Operative time	10 h	8 h 55 min
Cold ischemia time	90 min	80 min
Rewarming time	42 min	42 min
Vascular anastomosis time	32 min	35 min
Creatinine (discharge)	0.99 mg/dL	0.75 mg/dL
Length of stay	5 days	5 days
Complications	1 RBC transfusion	None

A – artery; BMI – body mass index; F – female; HD – hemodialysis; KT – kidney transplantation; L – left; PKD – polycystic kidney disease; R – right; RBC – red blood cell; V – vein.

Case 2

The second case involved a 54-year-old female patient with ESRD secondary to ADPKD, in whom genetic analysis identified a heterozygous *PKD1* variant (c.4996T>C; p.W1666R), classified as likely pathogenic. She had been maintained on hemodialysis, and preoperative imaging demonstrated massively enlarged polycystic kidneys, measuring 16.5×8.4×6.5 cm on the right and 19.3×8.8×6.8 cm on the left. Her BMI was 20.7 kg/m^2, and brain magnetic resonance angiography revealed only mild leukoaraiosis without vascular abnormalities. The donor was her 57-year-old brother, who was confirmed to not carry the familial *PKD1* variant and to have preserved renal function. The left kidney, measuring 10.4×7.2×4.8 cm and weighing 160 g, was selected for transplantation. The operation was completed in 8 hours and 55 minutes, with a cold ischemia time of 80 minutes, warm ischemia time of 35 minutes, and rewarming time of 42 minutes. The graft was reperfused successfully, with immediate urine production. Postoperative recovery was uneventful, with the serum creatinine level improving from 4.15 mg/dL preoperatively to 0.75 mg/dL by POD 5. Doppler ultrasonography on POD 1 and radionuclide renography on POD 2 confirmed excellent perfusion and excretory function, while follow-up computed tomography (CT) on POD 4 showed only minimal perinephric fluid, consistent with expected postoperative changes. The Foley catheter was removed on POD 4, and she was discharged home on POD 5 in good condition without complications.

The key clinical, operative, and postoperative characteristics of the 2 recipients are summarized in **Table 1**.

The present study was conducted following the guidelines of the Declaration of Helsinki and with the approval of the Research Ethics Committee at Asan Medical Center (reference number: 2018-1210).

Immunosuppression Protocol

The patients received a standard immunosuppression protocol appropriate for lowimmunologicrisk living-donor KT. Induction therapy consisted of basiliximab, an interleukin-2 receptor antagonist, administered in 2 doses: the first on the day of transplantation and the second on postoperative day 4. This strategy was selected based on both patients' low immunologic risk profile, characterized by negative crossmatches, absence of donor-specific antibodies, and low panel-reactive antibody levels, which allowed the avoidance of lymphocyte-depleting agents.

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Maintenance immunosuppression consisted of a triple-drug regimen of tacrolimus (Tacrobell, Chong Kun Dang Pharmaceutical), mycophenolate mofetil (Myrept, Chong Kun Dang Pharmaceutical), and corticosteroids. Tacrolimus was initiated at a dose titrated to achieve target trough levels of 8 to 10 ng/mL during the first month after KT. Mycophenolate mofetil was started at 750 mg twice daily and adjusted as needed based on hematologic parameters and gastrointestinal tolerance. Corticosteroid therapy began with high-dose intravenous methylprednisolone (MPD4, Alvogen South Korea) administered perioperatively (500 mg on the day of surgery, 250 mg on postoperative day 1, and 125 mg on postoperative day 2), followed by transition to oral prednisone (Deltasone, Pfizer) with a gradual taper over the ensuing weeks, aiming for low-dose maintenance (≤5 mg/day) by 3 to 6 months after KT, in the absence of rejection.

Tacrolimus and mycophenolate mofetil were both initiated 2 days before surgery, to ensure adequate immunosuppressive levels at the time of graft reperfusion. Postoperatively, tacrolimus levels were monitored daily to guide dose adjustments, while mycophenolate mofetil dosing was modified based on leukocyte counts, gastrointestinal tolerance, and BK polyomavirus surveillance. Standard infection prophylaxis was provided, including trimethoprimsulfamethoxazole for *Pneumocystis jirovecii* and valganciclovir as indicated by cytomegalovirus risk stratification.

Surgical Procedure

Setup and Positioning

The patients were placed in a supine position on a padded operating table with both arms carefully adducted and tucked alongside the body to allow unobstructed movement of the robotic arms. Adequate padding was applied to all pressure points, and shoulder braces were secured to prevent cephalad sliding during table repositioning. Sequential compression devices were applied to the lower extremities for deep vein thrombosis prophylaxis. A warming blanket and temperature monitoring were used throughout the procedure to maintain normothermia.

Prior to port placement, a Foley catheter was inserted under sterile conditions. The bladder was then filled with approximately 200 mL of normal saline containing flomoxef (Flumarin, Ildong Pharmaceutical Co, Ltd, Seoul, South Korea) to enhance bladder wall visualization and facilitate identification of the vesical cuff for ureteroneocystostomy.

The table was adjusted to optimize surgical access for each phase. For the left nephrectomy, the patient was positioned in a slight reverse Trendelenburg (head-up) with approximately 15° to 20° of right tilt to shift the bowel away from the operative field. For the right nephrectomy, the tilt was adjusted to 15° to 20° to the left, while maintaining head-up orientation. After both native nephrectomies were completed, the table was repositioned to a steep Trendelenburg (approximately 25°-30°) with a slight left tilt to optimize exposure of the right iliac fossa for vascular anastomosis during KT.

Port Placement

For the bilateral nephrectomies, all robotic ports were placed under direct laparoscopic vision after pneumoperitoneum was established. A 6-cm subxiphoid upper-midline GelPort was introduced for hand assistance and specimen retrieval. To create a straight, coaxial working corridor, two 8-mm robotic instrument trocars were positioned along the midline with 8 to 10 cm spacing: one at the umbilicus, and an optical camera port positioned below the umbilicus. An additional 8mm robotic port was placed in the left lower quadrant along the midclavicular line to allow triangulation and enhance access to the left renal hilum (**Figure 2**). A 12-mm assistant port was positioned in the upper midline/epigastric region to facilitate suction, retraction, and introduction of staplers or specimen retrieval bags.

The GelPort served multiple purposes: it allowed hand assistance during challenging dissection, accommodated larger instruments when necessary, and enabled safe extraction of the bulky polycystic kidneys after complete mobilization. Each kidney, once the renal vessels were stapled and the ureter divided, was carefully placed in a specimen retrieval bag and extracted through the GelPort site to prevent cyst rupture or spillage of cyst contents. Hemostasis of the extraction site was confirmed before proceeding to the next phase of the operation.

For the right kidney nephrectomy, an additional 8-mm robotic port was placed in the right lower quadrant along the midclavicular line, complementing the existing 8-mm port in the left lower quadrant that had been used during the left nephrectomy, thereby providing optimal triangulation and instrument access for the right-sided dissection.

For the transplant phase, the port configuration was adjusted to provide optimal access to the right iliac fossa and more favorable angles for precise vascular anastomosis (**Figure 3**). The umbilical port was utilized as the dedicated camera port to centralize visualization. The right lower quadrant 8-mm robotic port served as the primary working arm for vascular suturing, while the existing left lower quadrant 8-mm port provided counter-traction and assistance. To further enhance triangulation and improve instrument maneuverability, an additional 8-mm robotic port was placed in the left lateral abdomen, positioned superior to the original left lower quadrant port – approximately at the level of the left anterior axillary line in the lower flank region. The epigastric assistant port remained available for suction, retraction, and introduction of suture

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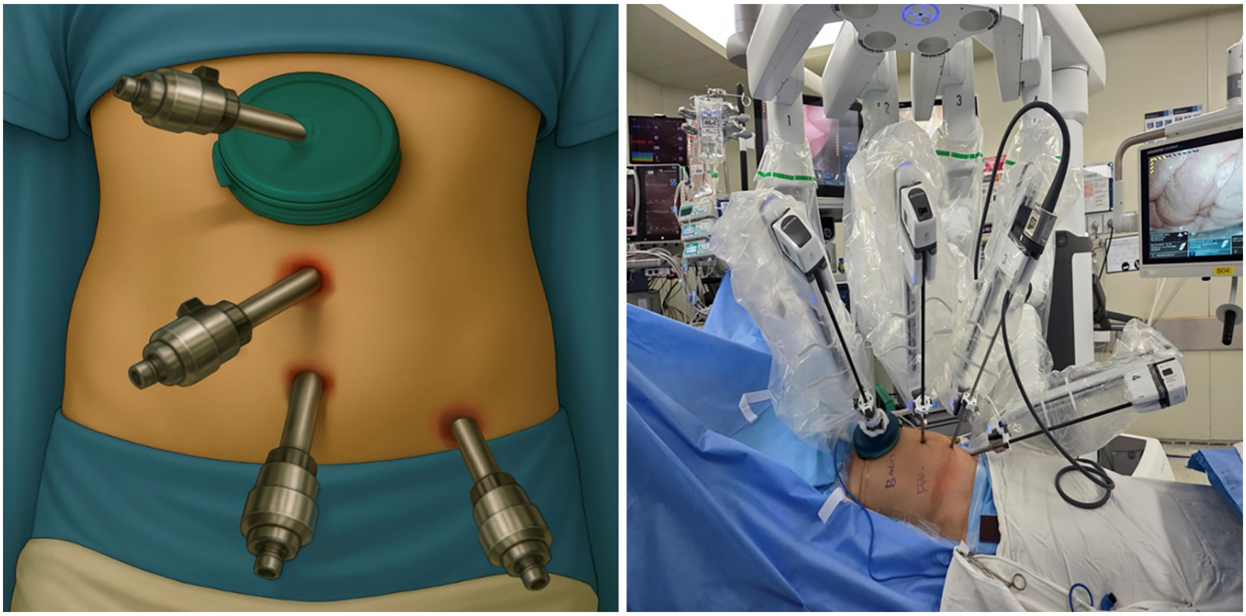

Figure 2. Port placement and robotic docking for the da Vinci Xi system during robotic-assisted bilateral nephrectomy and kidney transplantation. Port placement and robotic docking for the da Vinci Xi system during simultaneous bilateral nephrectomy and kidney transplantation. The left panel shows schematic port positioning with a midline GelPort and 3 triangulated 8-mm robotic ports; the right panel shows the intraoperative docking and instrument alignment.

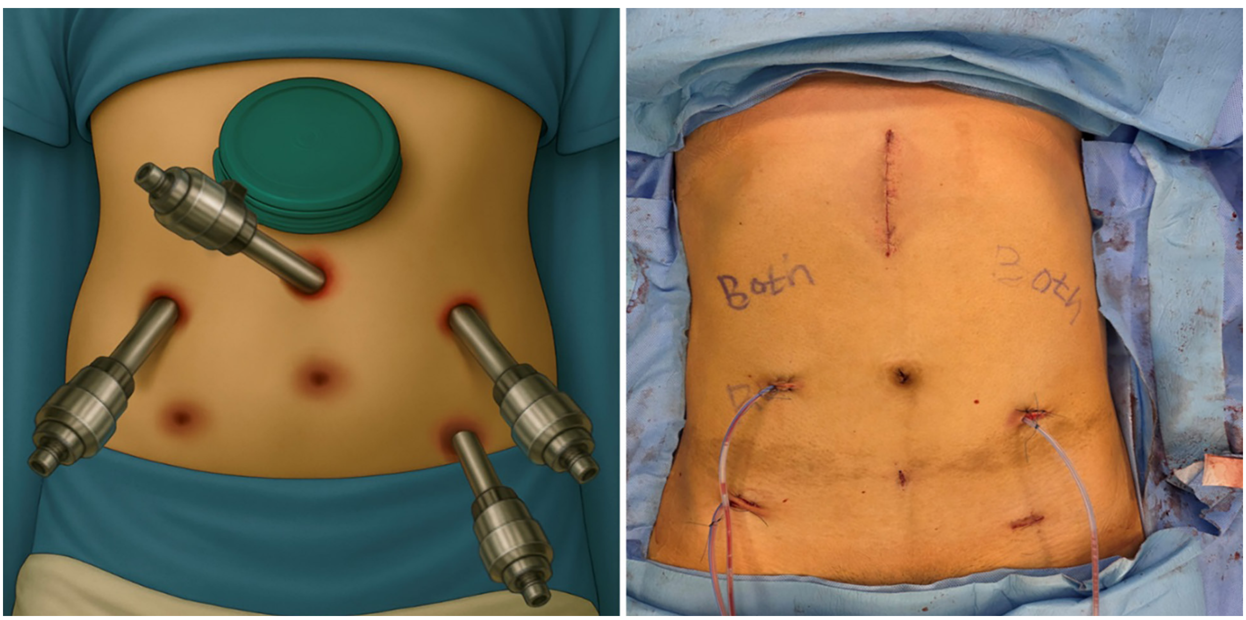

Figure 3. Port placement for right nephrectomy and kidney transplantation, and postoperative wound status. The left panel shows the intraoperative arrangement with a midline GelPort and 3 triangulated 8-mm robotic ports during right nephrectomy and subsequent kidney transplantation. The right panel depicts the closed wounds with 3 Jackson-Pratt drains, with 1 at each nephrectomy site and 1 near the graft anastomosis.

materials. The subxiphoid GelPort was used to introduce the donor graft kidney into the peritoneal cavity in an atraumatic manner and served as the extraction site for any residual specimens and as a conduit for larger instruments or manual assistance if needed.

The arrangement of ports followed established robotic transplant protocols, with careful attention to arm spacing (8-10 cm between trocars) to avoid instrument collision and to maintain a clear operative field during both nephrectomy and transplantation stages. This configuration allowed seamless transition between the 2 operative phases without the need for extensive repositioning or additional port placement, minimizing operative time and patient morbidity.

Left and Right Nephrectomies

After pneumoperitoneum was established (10-12 mmHg), the left nephrectomy was performed first. The descending colon was mobilized medially by incising the white line of Toldt. The Gerota fascia was opened, and the kidney was carefully dissected free from surrounding structures. The renal artery and vein were separately identified and ligated using Hem-o-lok clips and/or robotic vascular staplers. The ureter was clipped and divided near the pelvic brim. Large cysts were aspirated to reduce kidney volume and facilitate handling. The specimen was then morcellated within a retrieval bag and extracted through the GelPort.

For the right nephrectomy, the right colon and hepatic flexure were mobilized medially to expose the retroperitoneal space, with particular care taken around the duodenum and inferior vena cava. Dense adhesions and distortion of the renal hilum from the markedly cystic kidney required meticulous dissection with careful skeletonization of the vascular structures. The right renal vein, entering the inferior vena cava at a flattened angle due to mass effect, was precisely isolated and divided using a vascular stapler, followed by secure control and division of the renal artery. The ureter was transected near the pelvic brim after adequate mobilization. Once freed, the kidney was placed into a specimen retrieval bag and extracted through the subxiphoid GelPort. Hemostasis of the right nephrectomy bed was confirmed before the transition to the transplant phase.

Preparation for Transplantation

On the back table, the donor kidney underwent meticulous bench preparation under continuous cold perfusion with histidinetryptophanketoglutarate (HTK) solution to minimize warm ischemic injury and ensure optimal preservation. Residual perinephric fat and adherent lymphatic tissue were carefully dissected away to fully expose the renal artery, vein, and ureter. The graft was flushed repeatedly with cold HTK solution until the effluent from the renal vein was completely clear, confirming thorough removal of residual blood and preventing microthrombus formation. A 4.8-Fr, 12-cm double-J ureteral stent was inserted into the graft ureter to support the ureteroneocystostomy and reduce the risk of postoperative obstruction or leakage.

Throughout the bench preparation, the kidney was kept continuously cold by wrapping it in gauze soaked with chilled HTK solution and placing it on a bed of crushed ice. The graft remained in this hypothermic state until the recipient field was fully prepared, after which it was delivered atraumatically through the subxiphoid GelPort. Care was taken to maintain the proper orientation of the hilum and avoid any torsion or undue traction on the vascular pedicle during introduction into the abdominal cavity.

Vascular Anastomosis

The external iliac vein and artery were exposed and dissected free from surrounding tissues. Bulldog clamps were applied proximally and distally. An end-to-side venotomy was created using robotic Potts scissors, and the graft renal vein was anastomosed to the external iliac vein using a 5/0 expanded polytetrafluoroethylene (ePTFE) suture in a continuous fashion (**Figure 4A**). Arteriotomy followed, using the same technique. The graft renal artery was similarly anastomosed to the external iliac artery with a 7/0 ePTFE suture (**Figure 4B**). The vascular clamps were removed sequentially to allow for reperfusion. Immediately after reperfusion, 2.5 mg of indocyanine green (Diagnogreen, Jeil Pharmaceutical Co, Ltd, Seoul, South Korea) was administered intravenously, and the graft was assessed using the Firefly near-infrared fluorescence imaging mode on the da Vinci Xi system to confirm homogeneous cortical perfusion. The kidney demonstrated prompt and uniform fluorescence throughout the parenchyma, with no areas of segmental hypoperfusion (**Figure 4C**).

Ureteroneocystostomy

The bladder was distended with saline via the Foley catheter to allow precise identification. A small incision was made at the right lower corner, and the graft ureter was implanted using the Lich-Gregoir technique. The double-J stent was advanced into the bladder, and a running 5/0 PDS suture was used to complete the ureteral anastomosis (**Figure 4D**). The detrusor muscle was closed to create an anti-reflux tunnel.

Peritoneal Covering

To prevent graft torsion or migration after revascularization, the transplanted kidney was carefully secured within the iliac fossa with the use of mobilized peritoneal flaps anchored with locking polymer clips, ensuring the graft remained stable in its final position. A closed-suction drain was placed through one of the assistant port sites to monitor for postoperative collections. After confirming hemostasis, the pneumoperitoneum was evacuated, and all port sites, including the GelPort incision, were meticulously closed in multiple layers.

These procedural steps were performed according to our previously published RAKT protocol in the *Journal of Visualized Experiments*, with minor modifications for the present case [13]. This case series has been reported in line with the Preferred

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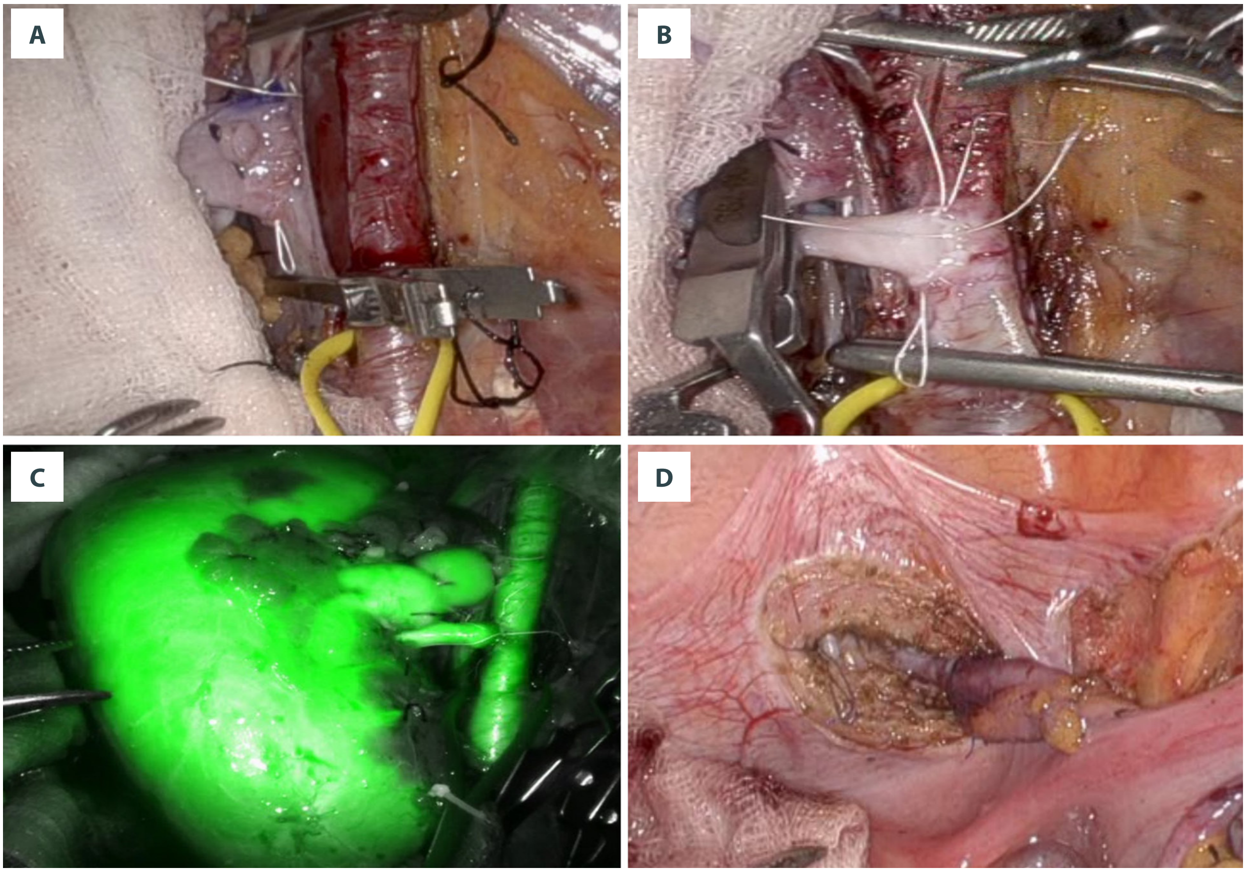

Figure 4. **Key intraoperative steps of robot-assisted kidney transplantation.** (**A**) Venous and (**B**) arterial end-to-side anastomoses to the external iliac vessels. (**C**) Near-infrared fluorescence (Firefly) imaging confirming uniform graft perfusion. (**D**) Completion of ureteroneocystostomy using the Lich-Gregoir technique with detrusor tunnel closure.

Reporting of Case Series in Surgery (PROCESS) 2025 criteria [14] and the Strengthening the Reporting of Cohort, Cross-Sectional and Case-Control Studies in Surgery (STROCSS) guidelines [15].

Both patients tolerated the procedures without intraoperative complications and were extubated in the operating room. In case 1, the total operative duration was approximately 10 hours, with a cold ischemia time of 90 minutes and rewarming time of 42 minutes. Immediate graft function was achieved, evidenced by urine output of 5160 mL in the first 24 hours and a decline in serum creatinine level from 7.26 mg/dL preoperatively to 0.99 mg/dL at discharge on POD 5. Imaging studies, including Doppler ultrasonography, radionuclide renography, and non-contrast-enhanced CT, confirmed excellent graft perfusion and no early complications. A single unit of packed red blood cells was transfused for asymptomatic anemia on POD 4; otherwise, recovery was uneventful.

In case 2, the operative time was 8 hours and 55 minutes, with a cold ischemia time of 80 minutes, warm ischemia time of 35 minutes, and rewarming time of 42 minutes. The patient exhibited immediate diuresis and progressive improvement in renal function, with the serum creatinine level decreasing from 4.15 mg/dL to 0.75 mg/dL by POD 5. Doppler ultrasonography on POD 1 demonstrated intact vascular flow with normal resistive indices and only minimal perinephric fluid. DTPA scan on POD 2 confirmed prompt perfusion and tracer excretion, and CT on POD 4 showed no abnormal postoperative findings. The Foley catheter was removed on POD 4, and the patient was discharged on POD 5 in excellent condition.

Discussion

This case highlights the feasibility, safety, and potential advantages of robot-assisted simultaneous bilateral nephrectomy and KT in patients with ADPKD. While RAKT has become increasingly popular in selected populations, its application in ADPKD remains limited due to anatomical challenges. The presence of massively enlarged kidneys and altered intra-abdominal anatomy can hinder pelvic access and safe vascular anastomosis.

Recent reports by Spaggiari et al and by Rofaiel et al demonstrated that simultaneous roboticassisted bilateral nephrectomy

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and KT can be performed safely even in patients with markedly enlarged native kidneys, provided that structured surgical strategies, such as intraoperative cyst decompression, controlled morcellation, and specimen retrieval through a protected access site, are used [16,17]. To the best of our knowledge, these are the only published descriptions of such a combined procedure, underscoring the feasibility of integrating advanced minimally invasive techniques in complex renal transplant candidates. The application of robotic technology in this context confers distinct advantages, including magnified highdefinition visualization, tremor filtration, and enhanced instrument articulation, which together facilitate precise dissection in anatomically challenging fields where distorted vasculature and limited working space are encountered. These technical capabilities are particularly beneficial in ADPKD, where massive cystic kidneys often obscure normal landmarks and encroach upon the iliac vessels and surrounding structures.

In our cases, the use of a sequential approach – performing bilateral nephrectomies before proceeding to the transplant phase – enabled safe removal of the bulky native kidneys while maintaining hemodynamic stability and preserving adequate exposure. The resulting increase in intraperitoneal space allowed for optimal placement of the renal allograft without the need for open conversion, and the robotic platform further facilitated delicate vascular anastomoses and ureteroneocystostomy within a confined pelvic field. These findings add to the growing body of evidence supporting the role of robotic technology in expanding the surgical options for patients with ADPKD requiring KT and highlight the importance of careful patient selection, preoperative planning, and adherence to refined minimally invasive techniques to achieve favorable outcomes.

An important determinant of successful RAKT in the setting of ADPKD is careful patient selection. Ideal candidates are typically younger individuals with minimal comorbidities, a body habitus that permits safe laparoscopic and robotic access, and the absence of severe aorto-iliac atherosclerotic disease or vascular calcification, which could otherwise complicate vascular anastomoses and compromise graft perfusion. In our cases, the recipients were relatively young, did not have obesity, and had no radiologic evidence of significant iliac vessel calcification, factors that have been associated with reduced operative difficulty and improved outcomes in minimally invasive transplantation approaches as noted in other studies [18,19]. Equally relevant was the choice of donor. In both cases, the grafts were procured from living sibling donors who, despite a family history of ADPKD, had undergone genetic testing confirming the absence of *PKD1* mutations, thereby eliminating concern for occult disease transmission to the allograft. The grafts presented with favorable anatomy, consisting of a single artery and vein with suitable caliber and length, simplifying anastomotic construction. Such graft characteristics have been consistently correlated with shorter ischemia times, fewer perioperative complications, and better long term graft survival [20-22].

The surgical strategy adopted in this case series was informed by elements described in previously published robotic protocols, including those by Vignolini et al [18] and Rofaiel et al [16], and the instructional methods documented in the video-assisted protocol for RAKT [13]. Key components included a stepwise peritoneal dissection to achieve wide exposure of the iliac vessels, precise vascular control with atraumatic clamps, and careful preparation of the recipient bed to accommodate the graft. A hybrid approach was deliberately chosen to maximize intraoperative flexibility: the GelPort, placed subxiphoid, served multiple complementary functions. It enhanced exposure by allowing hand-assisted retraction in challenging areas, permitted the introduction of ice slush to maintain graft hypothermia, enabled secure extraction of morcellated polycystic kidneys, and provided a controlled pathway for atraumatic graft insertion. This multi-functional use of the GelPort has been highlighted in several robotic transplant series as a technique that effectively bridges the benefits of minimally invasive surgery with the tactile assistance typically afforded by open approaches [12,23].

Vignolini et al recently described the first RAKT in a recipient with ADPKD using a brain-dead deceased-donor graft [18]. Their case confirmed the feasibility of RAKT in the setting of massively enlarged native kidneys but did not involve simultaneous bilateral nephrectomy, and the donor type differed fundamentally from our present cases. In deceased-donor transplantation, the ischemic profile is less constrained by the need to synchronize donor and recipient procedures, whereas in our living-donor cases, bilateral nephrectomy and RAKT were performed sequentially within the same operative session, creating significant logistical and technical challenges. At our center, simultaneous bilateral nephrectomy is the standard approach for patients with ADPKD undergoing transplantation. This strategy eliminates the persistent mass effect of native kidneys, resolves symptoms such as abdominal discomfort or early satiety, and maximizes available intraperitoneal space for optimal graft positioning [24,25]. In the present cases, cold ischemia and rewarming times were maintained within the range reported for standard RAKT, despite the added complexity of bilateral nephrectomy, through careful preoperative planning and close coordination between donor and recipient teams. This efficiency minimized ischemia-related risk while preserving the advantages of a minimally invasive approach. The prolonged operative duration observed in our cases should be interpreted in the context of the combined procedure, as both the bilateral nephrectomy and transplantation were performed sequentially within a single operative session. This approach avoids the need for staged surgeries but inevitably increases the total operative time.

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From our experience at our center, we would emphasize several technical tips that may be useful for similar procedures. First, when performing bilateral nephrectomy in polycystic kidneys, it is advisable to mobilize the colon early and widely to secure exposure of the massively enlarged kidneys; this reduces the risk of inadvertent colonic injury during later dissection. Second, the renal hilum should be approached in a stepwise manner, beginning with identification and control of the renal vein before tackling the renal artery. In polycystic kidneys, the vessels are often compressed and distorted, so sharp dissection with clips or staplers is safer than blind clamping. Third, when cyst puncture is planned, one should always anticipate inadvertent spillage of cyst fluid; therefore, we administered therapeutic antibiotics with a third-generation cephalosporin in advance. This peri-procedural coverage was particularly important in our setting, as spillage did occur, and no subsequent infectious complication was observed. Moreover, puncture should be performed at the most superficial and largest cysts, ideally those abutting the peritoneal or retroperitoneal surface, to minimize parenchymal tract length and reduce the risk of bleeding.

As the adoption of robotic technology in urologic and transplant surgery continues to expand, its application in anatomically and technically challenging scenarios such as ADPKD is likely to increase. Successful implementation in this context, however, remains highly dependent on institutional experience, structured training, and seamless multidisciplinary collaboration among transplant surgeons, anesthesiologists, nephrologists, and operating room teams. The development and dissemination of standardized protocols – including optimal port configurations, docking strategies, and stepwise procedural workflows – will be crucial to ensure reproducibility and to facilitate broader implementation across centers.

Conclusions

In conclusion, these 2 cases add to the growing body of evidence supporting the feasibility and safety of robotic platforms in complex renal transplantation. Simultaneous robotassisted bilateral nephrectomy and KT represents a technically demanding yet highly promising option in appropriately selected ADPKD patients. With careful patient selection and meticulous adherence to refined surgical techniques, this approach has the potential to expand the scope of minimally invasive strategies within the field of KT.

Acknowledgement

The authors would like to sincerely thank Ms. Seo Lee for her invaluable assistance in creating the illustrative figures that greatly enhanced the clarity and visual quality of this manuscript.

Ethics Approval And Consent To Participate

The present study was conducted with the approval of the Research Ethics Committee at Asan Medical Center (reference number: 2018-1210).

Consent for Publication

Written informed consent for publication of this case series, including clinical details and relevant imaging, was obtained from both patients. The consent process included specific permission to publish anonymized images and intraoperative photographs, where applicable.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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