CASE REPORT

Unroofing of Lower Pole Native Kidney Cysts in Patients with Autosomal Dominant Polycystic Kidneys at the Time of Kidney Transplantation

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To report our experience with unroofing of ipsilateral lower pole kidney cysts in five patients with adult-type polycystic kidneys [ADPKD] when free implantation of kidney allograft interfered with lower pole native kidney cysts. In all of these patients, the native kidneys extended to the ipsilateral pelvis and bilateral ADPKD caused enlargement of the abdomen on gross examination. Unroofing of lower pole kidney cysts was performed during the same session of allograft transplantation. The decision to unroof lower pole cysts of the ipsilateral kidney was made after observing interference of lower pole cysts with free implantation of the allograft. In patient A, bilateral native nephrectomy was performed 6 weeks after kidney transplantation after consultation with the patient, when there was evidence of the good function of the allograft and the recipient was on a low dose of immunosuppressive medications. In other patients, no need for native nephrectomy observed. This experience suggests the possibility that when large ipsilateral kidney cysts interfere with safe implantation of the allograft, there is an option of performing cyst unroofing at the same session and proceeding with allograft implantation. In many patients, there would be no need for native nephrectomy and of deemed necessary, it will be performed later, when there is evidence of the good function of the allograft and the patient is on good kidney function with a low dose of immunosuppressive medications and a less risk profile for the operation. To our best knowledge, there is no prior such report in the literature..

Keywords: transplantation; adult type polycystic kidneys; native nephrectomy

INTRODUCTION

Transplantation is the optimal choice for renal replacement therapy in patients with autosomal dominant polycystic kidney disease (ADPKD)[(1)]. The size of the polycystic kidney should be assessed before transplant surgery, preferably by a surgeon who will implant a new kidney[(2)]. If the size of the kidneys is so large that a transplant is not possible, native nephrectomy can be performed before or at the same time of transplantation[(3)]. Polycystic nephrectomy is best performed laparoscopically or through an open operation[(4)]. Native polycystic kidney nephrectomy is still under discussion and the right time is not well defined, especially for patients undergoing peritoneal dialysis as an alternative treatment due to the risk of peritoneal injury[(3)]. Most studies recommend that native nephrectomy be performed just before or during transplantation. Nephrectomy in peritoneal dialysis patients increases peritoneal damage and decreases diuresis volume, both leading to an unnecessary switch to hemodialysis[(2)]. Another option is cyst removal before transplantation which is usually done laparoscopically. Benefits of this approach include no need for erythropoietin and reduced risk of cyst infection[(5)]. We report our experience with unroofing of ipsilateral lower pole kidney cysts at the time of allograft implantation and follow-up of these patients.

CASE PRESENTATION

The patient A was a 50-year-old man with a history of ADPKD for 25 years. He suffered from end stage renal disease (ESRD) for several years and had been on hemodialysis for 2 months before transplantation. The patient was candidate to receive kidney from a deceased donor. On ultrasound and computed tomography (CT) scan, the patient had very large polycystic kidneys that filled the entire abdominal space and bilateral iliac fossa. The patient was scheduled for kidney transplant from a deceased donor in February 2021. Our surgical method for transplantation is through para-rectal incision and extra peritoneal approach, as previously described[(6)]. After exposing the implantation site, it was found that without removing lower pole cysts; it is not possible to create the necessary space for allograft implantation due to the pressure of the native kidney on the allograft. We decided to unroof ipsilateral lower pole cysts after ensuring provision of enough space for the allograft. The allograft renal vein was anastomosed end-to-side to the recipient external iliac vein by 6-0 polypropylene suture. Allograft renal artery was anastomosed end-to-side to the common iliac artery by 6-0 polypropylene sutures. The allograft ureter was anastomosed by extravesical modified lich leaving a double-pigtail (double-J) catheter in place. A DTPA Scan on the fifth postoperative day revealed normal perfusion and function of allograft with no leakage from native kid-

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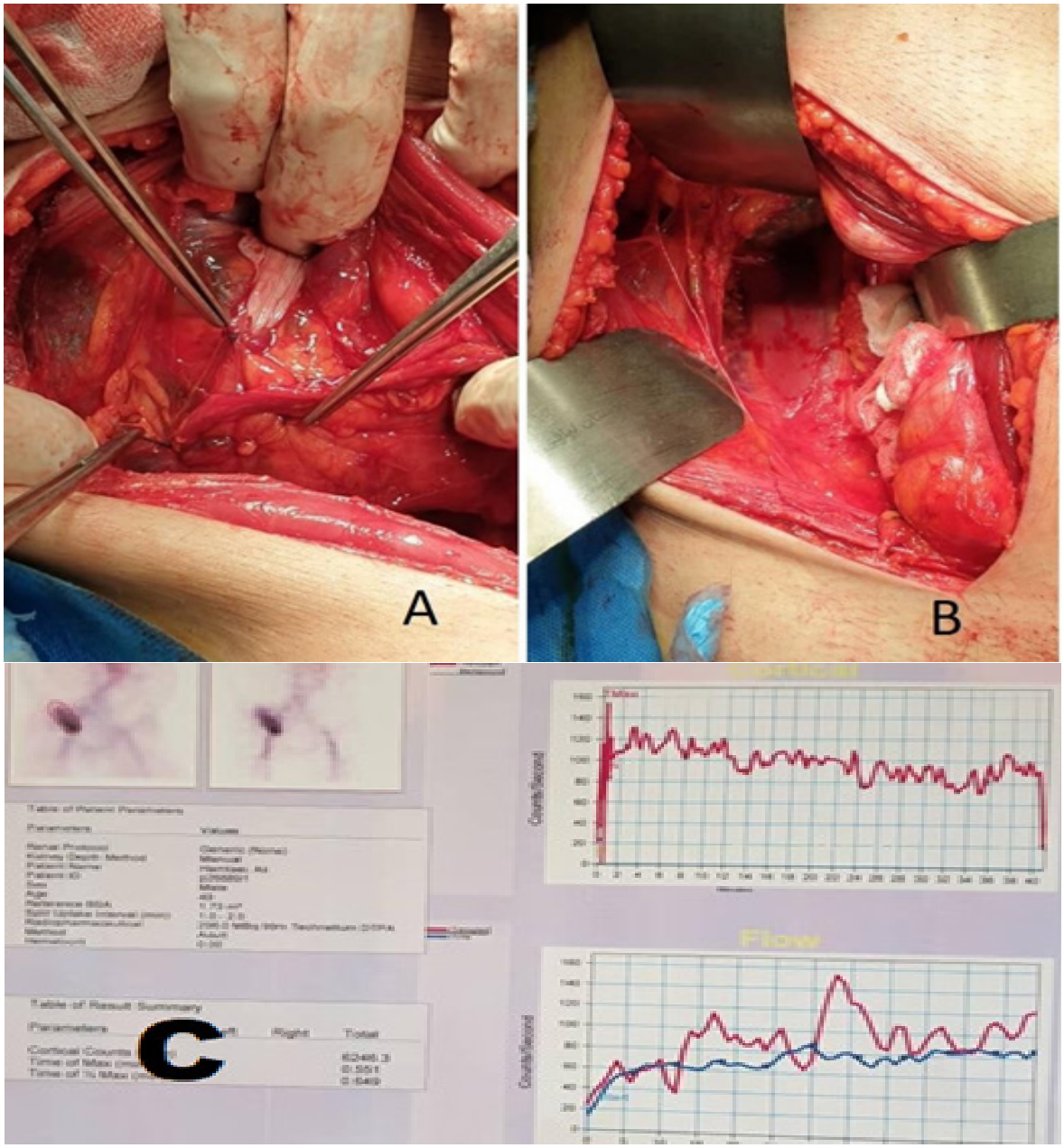

Figure 1. Patient A: **A:** Unroofing of lower pole ipsilateral kidney cysts to create necessary space for kidney implantation. **B:** Necessary space created for kidney implantation. **C:** DTPA scan performed 5 days after kidney implantation documenting proper function of the allograft

neys (**Figure 1**). A non-contrast CT scan also revealed the normal location of kidney allograft in the pelvis. Foley catheter was removed on the fifth postoperative day and double-pigtail ureteral catheter after 4 weeks. Serum creatinine was 1.4mg/dL one month after transplantation. Bilateral native nephrectomy was performed through an open midline transperitoneal operation 6 weeks after transplantation, when serum creatinine was normal and the patient was on a low dose of immunosuppressive medications. The weights of bilaterally removed native kidneys were 15kg. The follow up of this patient is 24 months. Native nephrectomy was done based on consultation with the patient and his desire for removed of native kidneys due to their very large size.

The patient B was a 48-year-old woman with a history of ADPKD for 20 years. She suffered from ESRD for several years and had been on hemodialysis for 1 year. The patient was a candidate to receive a kidney from a familiar living donor. On ultrasound and computed tomography (CT) scan, the patient had very large polycystic kidneys that filled the entire abdominal space and bilateral iliac fossa. The patient was scheduled for a kidney transplant from a living donor in September 2021. Similar to the condition of the previous patient, after exposing the implantation site, it was found that without removing lower pole cysts, it is not possible to create the necessary space for allograft implantation due to the pressure of the native kidney on the allograft. The allograft renal vein, artery, and ureter were anas-

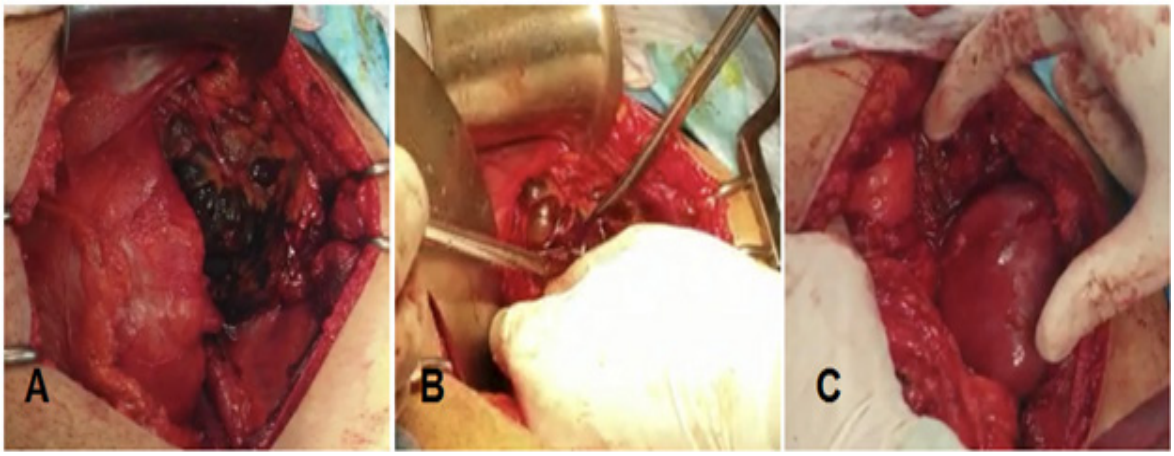

Figure 4. Patient E: **A:** there is not enough space for an allograft kidney. **B:** unroofing ipsilateral lower pole cysts of kidney. **C:** provision of enough space for the allograft kidney.

tomosed to the places and with the same technique as patient A. Foley catheter was removed on the fifth postoperative day and finally, the patient was discharged on the seventh day after surgery with serum creatinine equivalent of 1.3mg/dL. The patient was scheduled for double-J removal 4 weeks later. Creatinine was 1.3mg/dL two weeks after transplantation. The follow up of this patient is 17 months (**Figure 2**).

The patient C was a 61-year-old woman with a history of ADPKD for 23 years. She had been on hemodialysis for 5 years. The patient was a candidate to receive a kidney from a familiar living donor. On ultrasound and computed tomography (CT) scan, the patient had very large polycystic kidneys that filled the entire abdominal space and bilateral iliac fossa. The patient was scheduled for a kidney transplant from a living donor in September 2022. After exposing the implantation site, it was found that due to the large space occupied by the kidney and its cysts, there is not enough space for an allograft kidney. So similar to previous patients, we decided to unroof ipsilateral lower pole cysts after ensuring the provision of enough space for the allograft. The allograft renal vein, artery, and ureter were anastomosed to the external iliac vein, internal iliac artery and bladder. The patient had no evidence of leak or more than usual discharge from the drain and had normal vascular flow of the transplanted kidney in color Doppler ultrasound A Foley catheter was attached to the double-pigtail ureteral catheter and both were removed on postoperative day 14 and after 2 days the patient was discharged with serum creatinine of 1.8 mg/dL. Creatinine was 1.3mg/dL two weeks after transplantation. The patient was scheduled for double-J removal 4 weeks later. The follow up of this patient is 5 months.

The patient D was a 42-year-old man with ESRD in the context of ADPKD for 10 years. She had been on hemodialysis for two years. The patient was a candidate to receive a kidney from a familiar living donor. On imaging before surgery, the patient had very large cysts in bilateral kidneys that filled the entire abdominal space and bilateral iliac fossa. The patient was scheduled for a kidney transplant from a living donor in May 2022. Our surgical method for transplantation was similar to previous patients and due to not enough space in iliac fossa we decided to unroof ipsilateral right kidney lower pole cysts after ensuring the provision of enough space for the allograft kidney. The anastomosis of allograft renal vein, artery, and ureter were similar to previous patient. The patient had no evidence of leak or more than usual discharge from the drain and had normal vascular flow of the transplanted kidney in color Doppler ultrasound. A Foley catheter was attached to the double-pigtail ureteral catheter and both were removed on postoperative day 10 and after 2 days the patient was discharged with serum creatinine equivalent of 1.8 mg/dL. . Creatinine was 1.6 mg/dL two weeks after transplantation. The patient was scheduled for double-J removal 4 weeks later. The follow up of this patient is 9 months

The patient E was a 55-year-old man with ESRD in the field of ADPK for 20 years. He had been on hemodialysis for six years. This patient was similar to the previous patients and on imaging before surgery had very large cysts in bilateral kidneys that filled the entire abdominal space and bilateral iliac fossa. During transplantation surgery in October 2022 we decided to unroof ipsilateral right kidney lower pole cysts for provision of enough space for the allograft kidney. The anastomosis of allograft renal vein, artery, and ureter were similar to previous patient. Post-operative conditions went well and we had no evidence of leakage or collection. The post-operative function of the transplanted kidney was also checked with color doppler ultrasound, which was normal. Foley catheter was removed on the seventh postoperative day and finally, the patient was discharged on the ninth day after surgery with serum creatinine of 1.6mg/dL. Creatinine was 1.5mg/dL two weeks after transplantation. The patient was scheduled for double-J 4 weeks later. The follow up of this patient is 4 months.

In all cases, the unroofing technique was such that we opened the cysts with metz and immediately, suctioned the fluid inside the cysts. In case of bleeding from the edge of cyst, we sew the edges with 2-0 chromic or vicryl sutures.

DISCUSSION

These cases show a technique of performing renal transplantation in the presence of large ipsilateral polycystic kidneys. The benefits of such an approach are obviating the necessity of native nephrectomy which will remove native kidneys that are sources of erythropoietin secretion and to avoid imposing an operation to the patient

by our approach in some cases. Furthermore, in case native nephrectomy is deemed necessary, it is postponed for weeks to months after transplantation when the condition of the recipient is stable and the risk of operation is lower and there is assurance of the proper function of the allograft. To our best knowledge, there is no prior report of such a procedure in the transplant literature. Furthermore, in case the transplantation fails due to rejection, a major native nephrectomy operation has not been imposed on the recipient.

As indicated previously, the timing of native nephrectomy is a matter of debate. Many recent publications suggest that pretransplant nephrectomy may be associated with a higher rate of morbidity and mortality[7-11]. Sulikawski et al. reported 30 patients with a history of polycystic kidney disease. Patients were divided into two groups. Eleven procedures entailed laparoscopic cyst excisions. In the remaining 19 patients, nephrectomy was done. They found that laparoscopic cyst removal results were more favorable than nephrectomy results including a less operative time, less postoperative pain scores, shorter hospitalization stay, and less time for recovery. Also, other benefits of laparoscopic cyst removal included maintaining urination and no need for erythropoietin substitution, as well as reduced risk of cyst contamination. When eligible for renal transplantation, patients after laparoscopic cyst removal have smaller kidneys that do not interfere with the graft and the risk of infection during immunosuppression seems lower [5]. Nevertheless, this approach incorporates a separate operation for cyst unroofing before transplantation. Kanaan et al. limited native prophylactic nephrectomy to patients with a history of cyst infection or recurrent bleeding or those in whom a space must be created for the implant to be implanted[12]. In a retrospective analysis of ADPKD patients, patients who underwent nephrectomy before and after transplantation at a single center between January 2003 and December 2009 were compared. There were 35 individuals in the cohort. The authors concluded that pretransplant nephrectomy has many complications and suggested post-transplant nephrectomy as a safer approach with fewer complications [13]. Another larger retrospective study including 121 patients compared the timing of native nephrectomy in relation to transplantation considering outcomes of transplant and operation complications. These authors also observed that pretransplant nephrectomy was associated with a higher profile of complications however not statistically significant. Native nephrectomy timing was not associated with the outcomes of transplantation [14]. Another alternative therapy for unilateral nephrectomy in ADPKD patients is embolization. The experience with this technique is limited. In a recent report, Pierre et al. compared the outcomes of unilateral nephrectomy versus embolization in 37 ADPKD patients (unilateral nephrectomy in 16 and embolization in 21 patients) undergoing peritoneal dialysis. They reported fewer switches to permanent hemodialysis after embolization in comparison with unilateral nephrectomy. However, embolization failed in 6 patients (29%) in whom 4 patients needed nephrectomy[15]. In this manuscript, we report the feasibility of lower pole ipsilateral kidney ADPKD cysts reroofing creating necessary space when interference with allograft implantation was observed. Follow up investigation revealed that remained native polycystic kidney had no adverse effect on the allograft including displacement or hydronephrosis. There is evidence that ADPKD kidneys can shrink after transplantation. This evidence suggests that in case nephrectomy of ADPKD kidneys can be obviated before transplantation, there could be a low need for native nephrectomy after transplantation. Keeping native kidney is associated with the benefits of erythropoietin synthesis in case transplanted kidneys are rejected later in life and will remove the risk of a postoperative condition from the patient. In case needed, posttransplant elective native nephrectomy can be performed weeks to months later when serum creatinine is in the normal range and the risk of operation for the patient is decreased and the patient is on a low dose of medications. We could not find any report of this technique in the transplantation literature.

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