Intra-operative Postperfusion Micronephrolithotomy for Renal Allograft Lithiasis: A Case Report

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ABSTRACT

Increasing demand drives the expansion of criteria for kidney donation, and nephrolithiasis is now considered a relative contraindication. We report for the first time a case of intra-operative, postperfusion kidney allograft micronephrolithotomy. A 64-year-old man with end-stage renal disease secondary to Alport syndrome underwent primary deceased donor kidney transplantation at our center. Pre-operative ultrasound of the donor identified a 7-mm calculus in the anterior, lower pole calyx. The kidney was extraperitoneally implanted in the right iliac fossa and reperfused homogenously. Stone retrieval with a flexible ureteroscope failed due to the narrow calyceal infundibulum. Instead, the calculus was removed using the micropercutaneous nephrolithotomy system under ultrasonographic guidance. The calyx was punctured using a 4.85 Fr needle and the stone was fragmented to dust using a Holmium laser. No bleeding was observed. The post-operative course was uneventful. Outpatient follow up demonstrated good function of the graft which was stone free on ultrasound. Postperfusion micropercutaneous nephrolithotomy for kidney allograft calculi offers a safe and feasible option when pre-operative or intra-operative retrograde intrarenal surgery fails.

PERSISTENT shortages of allografts have compelled transplant teams to widen criteria for organ donation. Historically, renal calculi were considered an absolute contraindication. However, with the increased detection of small, asymptomatic stones in functionally normal kidneys, there has been increasing recognition that renal calculi should be seen only as a relative contraindication. Improving experience in managing donor lithiasis is reflected in the variety of approaches applied to its management [1]. Miniaturized percutaneous nephrolithotomy (PCNL) such as the microperc system is increasingly being used to treat nephrolithiasis [2]. The procedure is generally performed under ultrasonography using a 3-component 4.85 Fr all-seeing needle. The 3-way port allows to simultaneously introduce a fiber optic device, a laser fiber, and an irrigation system. The main indication for miniaturized PCNL is solitary lithiasis of the kidney with low-density stones less than 1000 mm^3 in volume [3]. Nevertheless, successful treatment of ureteral, bladder, and urethral calculi has been recently reported [4].

We herein describe for the first time a case of successful intra-operative, postperfusion allograft micronephrolithotomy.

CASE REPORT

A 64-year-old man with end-stage renal disease secondary to Alport syndrome was admitted for a primary deceased donor kidney transplant on March 2017. Pretransplant comorbidities included hypertension, chronic gastritis, and secondary hyperparathyroidism. The donor was a 78-year-old man who died from spontaneous intracranial hemorrhage (expanded criteria donation after brain death donor). A routine ultrasound scan performed before the organ procurement showed a 7-mm stone in the

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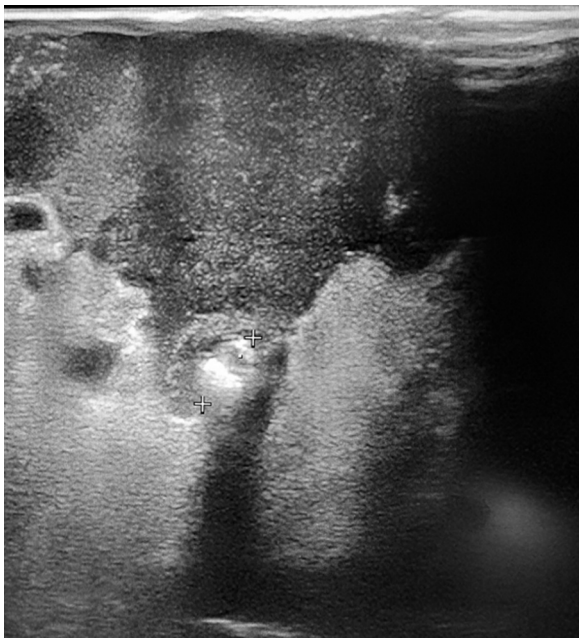

Fig 1. Renal ultrasound of the donor demonstrating a 7-mm calculus in the anterior, lower pole calyx.

anterior, lower pole calyx (Fig 1). Ante mortem serum creatinine concentration was 1.2 mg/dL with undetectable proteinuria. Organ procurement was uneventful with a warm ischemia time of 2 minutes. The allograft was preserved on static cold storage (Celsior organ preservation solution, Institut Georges Lopez, Lissieu, France) with a cold ischemia time of 12 hours and 40 minutes. The kidney was large-sized, had 1 artery, 1 vein, and 1 ureter. The donor and the recipient were blood-group compatible and had a 5 HLA antigen mismatch. The highest recipient panel reactivity antibody was 0%. Flow- and direct-microcytotoxicity cross-match were negative. The graft was extraperitoneally positioned in the right iliac fossa. The renal vein was anastomosed end-to-side to the common iliac vein and the renal artery was anastomosed side-to-end to the external iliac artery with two 5/0 prolene running sutures. After unclamping, the kidney reperfused slowly but homogenously. At this stage, stone retrieval was attempted with flexible ureteroscopy. However, the calyceal infundibulum was too narrow to accommodate the ureteroscope and the procedure was abandoned. Instead a microperc PCNL set was used to remove the calculus (Polydiagnost GmbH, Hallbergmoos, Germany). Under ultrasound guidance (Fig 2), the calyx was punctured using a 4.85 Fr needle and a tract was developed (Fig 3). The stone was visualized and fragmented to dust using a Holmium laser (Fig 4). No bleeding was observed at the puncture site. The lithotripsy took 35 minutes with no immediate complications (supporting video 1). A double JJ 6 Fr ureteral stent was placed and the transplant ureter anastomosed to the bladder according to the Lich-Gregoire technique using 5/0 polydioxanone sutures. The entire procedure took 240 minutes and the intra-operative blood loss was 100 mL. Immunosuppression consisted of anti-thymocyte globulin (Thymoglobulin, Sanofi-Aventis Canada Inc., Quebec, Canada), tacrolimus (Adoport, Sandoz International GmbH, Holzkirchen, Germany), mycophenolate mofetil (Myfenax, Teva B.V., Haarlem, Netherlands), and

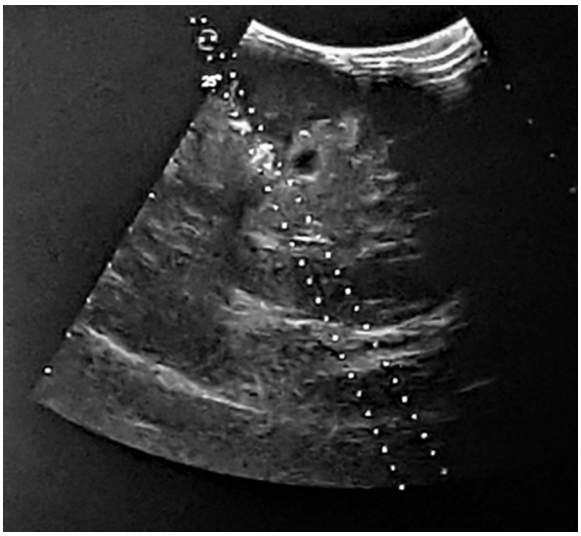

Fig 2. Ultrasound-guided puncture of the anterior, lower pole calyx of the transplanted kidney.

a steroid. The postoperative course was uneventful. The recipient was discharged after 9 days with no hematuria and improving graft function. The stent was easily removed by flexible cystoscopy on postoperative day 30. Outpatient follow up on day 44 demonstrated good graft function with ultrasound confirming the absence of allograft lithiasis.

DISCUSSION

Given the high demands on the limited organ supply, the drive to extend the potential donor pool has been a key challenge facing transplant surgeons. Although recurrent stone-formers and patients with metabolic stone diseases are still considered not suitable for donation, there is now a significant body of evidence to support the transplantation of renal allografts found to have calculi [5].

Most of the time, small stones (< 4 mm) can safely be left in situ and followed up with ultrasound for early signs of complications [5]. For calculi that require intervention a

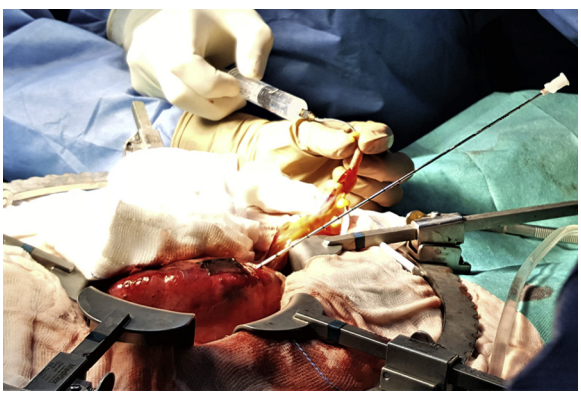

Fig 3. Puncture of the anterior, lower pole calyx of the transplanted kidney.

Fig 4. Micronephrolithotomy holmium laser fragmentation of the calculus.

number of options are available. Direct nephrotomy with stone removal and parenchymal suture represents the traditional approach. A 2-stage procedure can be employed whereby retrograde intrarenal surgery (RIRS) or shockwave lithotripsy is used to render the graft stone-free before transplantation [6]. Recent data have shown that single-stage procedures can be equally effective. Most commonly, ex vivo RIRS is performed and stones either removed directly using a basket or fragmented with laser lithotripsy [7–9]. The technique appears safe with a good success rate but a number of failed attempts at RIRS have been reported. In the majority of cases, surgeons proceeded to transplantation with the stone in situ [7,9,10].

Despite the evidence that small stones may not necessarily affect graft function or jeopardize outcome, the risk of stone-related complications in transplant recipients should not be underestimated. Denervated allografts may not present with classic renal colic rather less specific signs of reduced urine output, rising creatinine or hydronephrosis. Immunosuppressed patients are also more susceptible to infections than general population and treatment options may be often limited by comorbidities, suboptimal renal function, or drug-related side effects. Furthermore, should a calculus within a graft require intervention at a later stage, access to a transplant ureter is much more difficult. As a result, it can be argued that all attempts should be made to render the allograft stone-free before implantation.

Compared to standard nephrotomy, the micro-nephrolithotomy technique herein described allows surgeons to reduce the risk of bleeding, urinary leakage, and scarring. It also offers a further minimally invasive approach for patients in whom RIRS is not possible or has failed.

Stone removal by RIRS or nephrotomy in a kidney allograft is generally performed ex vivo, under cold preservation. Even though there are no studies comparing pre-operative and intra-operative stone removal techniques in kidney transplantation, it is common opinion that ex vivo procedures are easier and potentially safer than their in vivo counterparts. In this case, we opted for post-perfusion stone removal because we did not want to excessively extend cold ischemia time, which was already over 12 hours. It is well known that cold ischemia time has a detrimental impact on graft outcomes and this is particularly true for fast track, expanded criteria, and donation after circulatory death kidneys [11]. At the time we benched the organ, there were no urologists available to attempt RIRS as they were in theater for an emergency operation. Rather than leaving the stone in situ or further increasing cold ischemia time, we preferred to proceed with the transplant and remove the stone after reperfusion. The micronephrolithotomy was not planned in advance, but was proposed by urologists after RIRS failure. As far as we know, there are no reports describing such a procedure in a transplant peri-operative setting either ex vivo or in vivo. Certainly, it may be argued that in vivo techniques can be more challenging, however, they may also offer several theoretical advantages such as prompt assessment of any intrarenal injury and avoidance of unnecessary manipulation of the kidney [12].

Our report demonstrates the feasibility of intra-operative, postperfusion micronephrolithotomy for renal allograft stone removal. This encouraging result in vivo may serve as a basis for further investigation both in vivo and ex vivo.

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