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PERCUTANEOUS NEPHROSTOMY IN THE TREATMENT OF HYDRONEPHROSIS IN RENAL TRANSPLANT PATIENTS – CASE REPORT

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ABSTRACT

Percutaneous nephrostomy is a first-line minimal invasive treatment option for ureteral obstruction following kidney transplantation , with high effectiveness and a low complication rate. Percutaneous nephrostomy might be used as a temporary salvage therapy, providing acute decompression of the kidney collecting system and preventing graft loss. It can also function as a permanent and sometimes only possible option in transplant patients with frequent recurrences of ureteral stenosis who either fail an open surgical reconstruction or who are not good candidates for these procedures. We present two patients with acute decline in urine output after renal transplantation with radiologically verified hydroureteronephrosis of the transplanted kidney (graft) caused by stenosis of distal ureter. In both cases, nephrostomy was placed within 48 hours as a temporary salvage treatment that ameliorates renal function and prevents graft loss. The permanent nephrostomy was the only possible solution for the preservation of the graft's function in the first case because of the recurrences of ureteral stenosis after several percutaneous interventions and open-surgery ureteral reconstruction. A few episodes of nephrostomy tube-related infections were resolved with antibiotics in the first case. The second case was treated with open ureteroneocystostomy with resection of stenotic segment and reinsertion of the ureter into the bladder (ureterocystoneostomy) because of the length of the involved ureteral segment. Both patients had stable graft function in the follow-up period.

Keywords: nephrostomy, hydronephrosis, treatment, transplanted kidney, ureteral obstruction

INTRODUCTION

Urinary leak and ureteral stenosis are the most common urological complications following renal transplantation, with a reported incidence from 3% to 8% [1]. Early diagnosis and prompt management of these complications are crucial for a renal graft's survival. [1, 2]. Open surgical techniques were traditionally used for the correction of ureteral obstruction, but they were associated with higher morbidity and prolonged stay in the hospital [3]. Interventional radiology provided minimally invasive percutaneous techniques as an alternative to surgery with a comparable rate of success and fewer complications [1]. Percutaneous interventions used for the management of ureteral stenosis are: percutaneous nephrostomy (PCN), balloon dilatation of stenotic segment, insertion of double-J stent, and placement of metallic stent [1].

All mentioned techniques could be used together to achieve a better success rate with fewer treatments (i.e., balloon dilatation followed by percutaneous nephrostomy and antegrade placement of nephroureteral stent). The reported overall success rates of percutaneous techniques for all types of ureteral strictures were between 58% to 95% [2, 4, 5].

We present two patients with radiologically verified hydroureteronephrosis of the renal graft, successfully treated with percutaneous nephrostomy.

CASE PRESENTATION

Case 1

M-CHAT is a tool which is widely accepted anA 38-year old woman with kidney failure of undetermined etiology received a first renal transplant from a living-related donor in April 2015. The transplant surgeons performed prophylactic double J stenting of the ureter to protect ureteroneocystostomy anastomosis. She was treated with the standard induction therapy and standard triple maintenance immunosuppressive therapy. There was a primary graft function with excellent perfusion of the graft on control doppler ultrasound. The double J stent was removed three weeks after the transplantation. After the removal of double J stent from the ureter of the graft, elevated serum levels of creatinine were detected in control blood sampling. The doppler ultrasound revealed normal graft perfusion with preserved cortical thickness, but with detection of grade 2 hydronephrosis with hydroureter of the graft. A contrast-enhanced computer tomography (CT) scan confirmed the diagnosis of hydroureteronephrosis of the graft with suspect distal ureteral stenosis (Fig. 1A and 1B). A double J stent was re-inserted. Control ultrasound examinations showed progressive dilatation of pelvicalyceal system of the graft with additional graft function impairment. The double J stent was removed, and the patient was treated with the placement of temporary percutaneous nephrostomy tube (PCN) and balloon dilatation of the strictured section of the ureter. The success of the percutaneous intervention was temporary with re-stenosis of the distal ureter over the next two weeks. The patient was referred to transplant surgery for further open ureteral reconstruction. During the surgery, the stenotic section of the

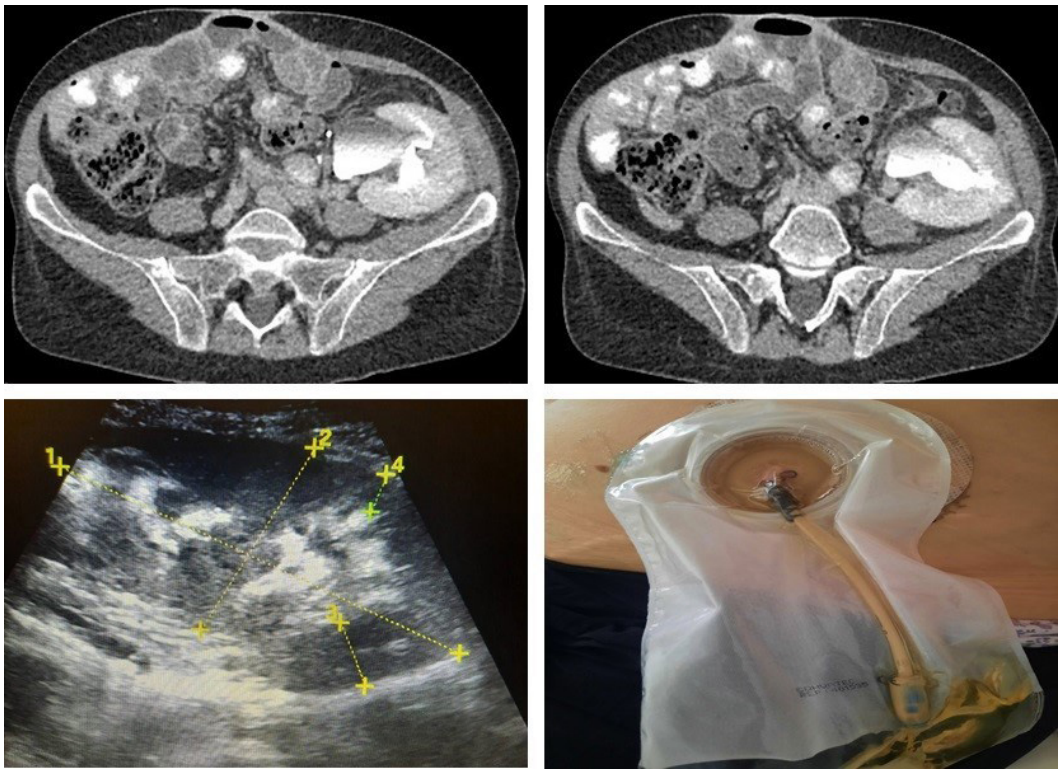


Figure 1. *CT scan showed grade 2 hydronephrosis with hydroureter of the kidney allograft and suspect distal ureteral stenosis (1A and 1B). Seven years after PCN insertion, control renal ultrasound showed still functional PCN with no signs of hydroureteronephrosis (1C and 1D).*

ureter was excised and simple a re-implantation technique with creation of a new ureteroneocystostomy was performed (Lich-Gregoir ureteral reimplantation technique). The pathohistological examination of the resected specimen showed fibrotic tissue with surrounding chronic inflammation. Urine cytology showed no decoy cells. Two months after the operation, a control CT scan documented re-stenosis of the distal ureter of kidney allograft. The patient was treated with the placement of a permanent percutaneous nephrostomy tube with periodic exchanges, as the only possible intervention for preservation of the graft's function. A few days later, the patient was dismissed from the hospital with a serum creatinine level of 151 μmol/L (normal 45-109 μmol/L). Over the next 7 years, the patient had several percutaneous nephrostomy tube-related infections (with Pseudomonas species, Enterococcus species, and Escherichia coli), and was successfully treated with antibiotics. To the present day, the PCN is still in function, with compelling graft function and stabile serum creatinine levels of 154 μmol/L on the last control appointment of the patient (Fig. 1C and 1D).

Case 2

A 46-year old man with kidney failure secondary to chronic glomerulonephritis underwent successful renal transplantation from a living-related donor in October 2016. The patient was treated with standard induction therapy and standard triple maintenance immunosuppressive therapy. The post-transplant period was uneventful, with stabile graft function. The prophylactic double J stent was removed four weeks after the transplantation. In March 2017, and the patient was admitted to the hospital due to gradual decline in urine output and increased serum creatinine level of 320 μmol/L (normal 45-109 μmol/L). The doppler ultrasound revealed normal graft perfusion with hydronephrosis grade 2 with hydroureter of the graft. The contrast-enhanced CT scan confirmed the diagnosis of hydroureteronephrosis of the graft and suggested the presence of a distal ureteral stenosis. Since retrograde imaging of the ureter and re-insertion of a double-J stent was not feasible, rapid decompression of the collecting system of the graft with placement of temporary percutaneous nephrostomy was performed. The ultrasonography of the graft in the follow-up period revealed milder residual hydronephrosis, with a decreased serum creatinine level at 180 μmol/L. Due to the length of stenotic ureteral segment (more than 3 cm), the patient was treated with open ureteral reconstruction. The strictured section of the ureter was identified and excised with an extraperitoneal approach. The isolated proximal non-strictured healthy ureter was not long enough to reach the bladder, and anastomosis to the right native ureter was performed. The postoperative course of the patient was uncomplicated, and he was discharged on postoperative day 4 with a serum level of creatinine at 130 μmol/L. Six years after the operation, the patient remained well, with stabile graft function and serum level of creatinine of 150 μmol/L on the last control appointment.

DISCUSSION

The ureteral obstructions in renal transplant recipients are classified as early (<3 months) or late obstructions (>3 months) depending on time of their occurrence after transplantation [1]. Early ureteral obstructions, in more than 90% of the cases, were caused by insufficient vascularization of the ureter which leaded to intrinsic stricture formation. Since the distal ureter is the farthest from the renal artery, it is the most vulnerable to ischemia and prone to repetitive stenosis due to its anatomical location. Vasculitis related to an acute rejection episode or vasoconstriction caused by immunosuppressant therapy (corticosteroids and calcineurin inhibitors) and recent cytomegalovirus (CMV) and BK infection could lead to ureteral ischemia and stricture [6]. Some mechanical causes (blood clots, mucosal edema or stone transplanted with kidney) or technical errors during creation of ureteroneocystostomy might also result with ureteral obstruction in the early postoperative period [1, 7]. Late ureteral obstructions were secondary to ureteral ischemia or rejection, although extrinsic compression from lymphocele, hematoma, abscess or fibrosis from immunosuppressant medications might also occur [7]. Ureteral obstructions were more common in allografts from donors older than 65 years, with two renal arteries, longer time of ischemia, and without placement of preventive ureteral stent [4-7].

The underlying etiology of ureteral stenosis in our patients was difficult to assess. Based on recommendation [8-10], the extra-vesical

Lich-Gregoir ureteric anastomosis technique and prophylactic ureteric JJ stents were used in both our patients to minimize urological complications. Since the pathohistological evaluation of the resected ureteric segment has shown fibrosis with chronic inflammation without signs of vasculitis, we assumed that impaired vascular integrity (ischemia) was the most likely explanation for repetitive urethral stenosis. Pelvic anatomy (position of the bladder and length of the transplant ureter), applied immunosuppressant therapy and some "yet-to-be identified" patient-specific profibrotic factors might also contribute to ureteral stenosis in reported cases.

The majority of early ureteral obstructions were managed with conservative treatment or percutaneous techniques. Late ureteral obstructions because of the fibrotic surrounding were prone to recurrences and have been treated by operation and resection of stenotic ureteral segment [1]. The timing of ureteral obstruction had an important impact on the success rate of the treatment. In a retrospective analysis by Bhaget VJ et al, 69% of the patients with early obstructive uropathy, were successfully treated with percutaneous procedures, whereas only 33% of the patients with late obstruction had successful treatment with percutaneous procedures [11].

Renal ultrasonography (US) is an excellent screening method with a sensitivity of almost 90% in the detection of hydronephrosis in patients [12]. A CT scan could identify the source of obstruction (intrinsic vs. extrinsic). Nuclear medicine scans and voiding cystourethrogram (for detection of vesico-ureteral reflux) might be helpful for some obscure cases [7].

The prompt treatment of hydronephrosis in renal transplants is the decompression of the collecting system, either with ureteral stent or the nephrostomy tube placement. According to the literature, percutaneous interventions including balloon dilatation with a temporary stenting of the ureter with a double-J stent or metallic stent are considered first-line therapy in most recipients [2,7]. Patents with long ureteral stricture, as it was in our case 2, could be managed by open ureteroneocystostomy with resection and reinsertion of the ureter or less aggressive new techniques like endoureterotomy with a cold knife or laser [7]. The case 1 patient developed an early ureteral obstruction because of distal ureteral stenosis (fibrotic tissue with surrounding chronic inflammation). Initially, the ureteral obstruction was treated with the placement of a percutaneous nephrostomy tube with balloon dilatation, but without success. After several unsuccessful attempts for percutaneous management of the ureteral obstruction, open surgery with resection of the stenotic ureteral segment and creation of new ureteroneocystostomy were done. Two months post operation, the case 1 patient developed distal ureteral stenosis again. The permanent percutaneous nephrostomy tube was placed as the only possible solution for the preservation of graft's function. Srinivasan D. et al. analyzed 58 renal transplant patients with ureteral stricture, 8 (14.2%) required surgical revision and 2 (3.5%) were with permanent PCN, as it was in our case 1 [3]. Many recent studies highlight the concept of prolonged ureteral stenting (more than 12 months) in order to provide sufficient dilatation of ureteral stenosis and to avoid open surgery [4, 12, 13]. The case 2 patient developed a late ureteral obstruction because of distal ureteral stenosis. The percutaneous nephrostomy tube was used as a temporary salvage therapy for the preservation of the graft function. The length of the stenotic ureteral segment imposed the need of open-surgery treatment.

Transplant percutaneous nephrostomy placement is a highly effective and safe procedure associated with low immediate and long-term complication rates [1]. The recent analysis of 389 transplant patients with percutaneous nephrostomy showed a major complication rate of 9.6%, with one dead patient from urosepsis, one colonic injury, three major renal bleeding with need of urgent surgical treatment, from which one patient lost the kidney allograft [14]. In the study of Srinivasan D. et al. only 2 out of 58 patients (3.5%) were treated with permanent PCN after exhausting of all other procedures with stabile graft function and no major complications during the follow-up of 34 months [3]. Patel et al. also reported a high technical and clinical success rate of percutaneous nephrostomy, with a 30-day major complication rate of 1.4%, an overall complication rate of 6.8% and no graft losses [15]. Based on the analysis of 21 kidney transplant patients with ureteral stenosis treated with PCN, Mostafa S. et al concluded that PCN provided long-term success with few recurrences and low morbidity and mortality rates. Namely, all the treated patients remained symptom free for a mean follow-up period of 34.2 +/- 20.1 months (range, 3 to 81 months) and there was no difference in patient and graft survival rates between the patients

undergoing PCN and other kidney recipients [16]. Besides PCN, repetitive transplant ureter JJ stenting might be viable option in patients who either fail an open surgical reconstructive or endourologic approaches, or who are deemed not to be good candidates for these procedures [17]. In both our cases, nephrostomy was performed within 48 hours of first radiological evidence of ureteral dilatation, with successfully preserved grafts function and without major complications.

CONCLUSION

Percutaneous nephrostomy is a first-line treatment option for ureteral obstruction following renal transplantation, with high effectiveness and a low complication rate. PCN might be used as a temporary salvage therapy that ameliorates graft function and prevents graft loss. However, in transplant patients with frequent recurrences of ureteral stenosis, the permanent percutaneous nephrostomy could be the only possible solution for preservation of graft's function.

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Резиме

ПЕРКУТАНА НЕФРОСТОМА ВО ТРЕТМАНОТ НА ХИДРОНЕФРОЗА КАЈ ПАЦИЕНТИ СО ТРАНСПЛАНТИРАН БУБРЕГ – ПРИКАЗ НА СЛУЧАЈ

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Перкутаната нефростома е високоефективна минимално инзвазивна техника за третман на уретералните опструкции што се јавуваат во посттрансплантациониот период. Перкутаната нефростома може да послужи како привремена „терапија на спасување“, која превенира губење на графтот, но може да се примени и како трајна и понекогаш единствено можна опција за пациенти со чести рекуренции на уретерална стиктура кај кои отворената хируршка интервенција не дала резултати. Ние даваме приказ на два пациенти што клинички се презентираа со намалено мокрење и пораст на деградацските продукти во серум во различен временски период по трансплантацијата на бубрег. Сликовните радиолошки дијагностички модалитети кај обата пациенти прикажаа постоење дистална уретерална стеноза со консекутивна дилатација на уретерот и пелвикалицеланиот систем на афектираниот бубрежен алографт. Кај обата пациенти беше поставена перкутана нефростома во првите 48 часа по поставување на дијагнозата, како привремена терапија на „спасување“, која ја олеснува бубрежната функција и превенира губење на графтот. Прекутаната нефростома беше единствената можна терапевтска опција кај првиот од опишаните пациенти, бидејќи и покрај неколку перкутани и отворено хируршки интервенции, повторно се јавуваше рестеноза на дисталниот дел од уретерот. Во периодот на следење, кај пациентката беа регистрирани неколку епизоди на инфекција асоцирани со перкутаната нефростома, кои се третираа соодветно со антибиотици. Вториот опишан пациент беше третиран оперативно, со отворена уретеронеоцистостомија и ресекција на стонотичниот сегмент поради неговата должина. Обата пациенти имаат стабилна функција на графтот во периодот на следење.

Клучни зборови: нефростома, хидронефроза, третман, трансплантиран бубрег, уретерална опструкција