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Case Report

Paclitaxel-coated balloon therapy for refractory ureteral stenosis in a kidney transplant recipient

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ABSTRACT

Ureteral stenosis is a frequent urologic complication after kidney transplantation and a relevant cause of graft dysfunction, often requiring repeated interventions due to high rates of restenosis following conventional balloon dilatation. Strategies targeting the underlying fibrotic remodeling remain limited. We report a novel clinical application of paclitaxel-coated balloon ureteroplasty in a transplanted ureter. A kidney transplant recipient developed recurrent distal ureteral stenosis at the ureterovesical anastomosis, with hydronephrosis and graft dysfunction despite standard endourologic management, including balloon dilatation and ureteral stenting, complicated by recurrent urinary tract infections. Paclitaxel-coated balloon dilatation was performed as a stent-free strategy, combining mechanical expansion with local delivery of an antiproliferative agent. The procedure resulted in restoration of urinary drainage, resolution of hydronephrosis, and improvement of graft function, without the need for further stenting. This case illustrates a novel application of drug-coated balloon technology in the transplanted ureter and suggests a potential role for this minimally invasive approach in reducing restenosis of transplant ureteral strictures. By targeting fibroproliferative pathways, paclitaxel may offer

Abbreviations: PCB, paclitaxel-coated balloon; PTD, posttransplant day; sCr, serum creatinine; US, ureteral stenosis; UTI, urinary tract infection.

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a therapeutic advantage over conventional dilatation alone. Further studies are warranted to assess safety and durability in this setting.

1. Introduction

Ureteral stenosis (US) is among the most frequent urologic complications after kidney transplantation, with a reported incidence ranging from 2.8% to 18%,¹ and represents a relevant cause of graft dysfunction. This condition is associated with substantial morbidity, including impaired graft function and recurrent urinary tract infections (UTIs), and may negatively affect long-term graft survival.² The distal ureter and ureterovesical anastomosis are most commonly involved, where surgical manipulation combined with ischemic injury and local inflammatory responses predispose to progressive fibrotic stricture formation.

Management strategies for transplant US range from minimally invasive endourologic procedures to open surgical reconstruction. Endourologic approaches are generally favored as first-line therapy due to their lower invasiveness and acceptable safety profile. However, conventional balloon dilatation is limited by high rates of restenosis, particularly in ischemic anastomotic strictures, often necessitating repeated interventions and prolonged urinary drainage.²

Paclitaxel-coated balloon (PCB) technology has been successfully adopted in vascular medicine to prevent restenosis through local inhibition of cellular proliferation and fibrotic remodeling. More recently, PCBs have demonstrated efficacy in selected urologic applications, including nontransplant US and urethral strictures. However, these conditions differ substantially from transplant US, which is predominantly driven by ischemic

injury at the ureterovesical anastomosis. Therefore, evidence from native urinary tract disease cannot be directly extrapolated to the transplant setting.^{3,4} Despite these advances, the use of drug-coated balloon technology for the treatment of US after kidney transplantation has not been previously reported. We report a novel application of paclitaxel-coated balloon ureteroplasty for transplant US.

2. Case presentation

A timeline summarizing the patient's clinical course is shown in Figure 1. A 24-year-old woman with end-stage kidney disease secondary to congenital right renal hypoplasia and left renal agenesis underwent pre-emptive living-related kidney transplantation from her father (posttransplant day [PTD] 0). At the time of transplantation, serum creatinine was approximately 7.0 mg/dL and estimated glomerular filtration rate was 8 mL/min/1.73 m². No additional congenital urologic abnormalities were identified, and the transplant procedure was uneventful without technical complications involving ureteral implantation. Induction immunosuppression consisted of basiliximab, followed by maintenance therapy with tacrolimus, mycophenolic acid, and prednisone.

Early graft function was good, with serum creatinine (sCr) stabilizing at approximately 1.5 mg/dL during the early post-transplant period. During the early postoperative course (PTD 10-15), the patient developed an *Enterococcus faecalis* UTI, which resolved after targeted antibiotic therapy with piperacillin-tazobactam.

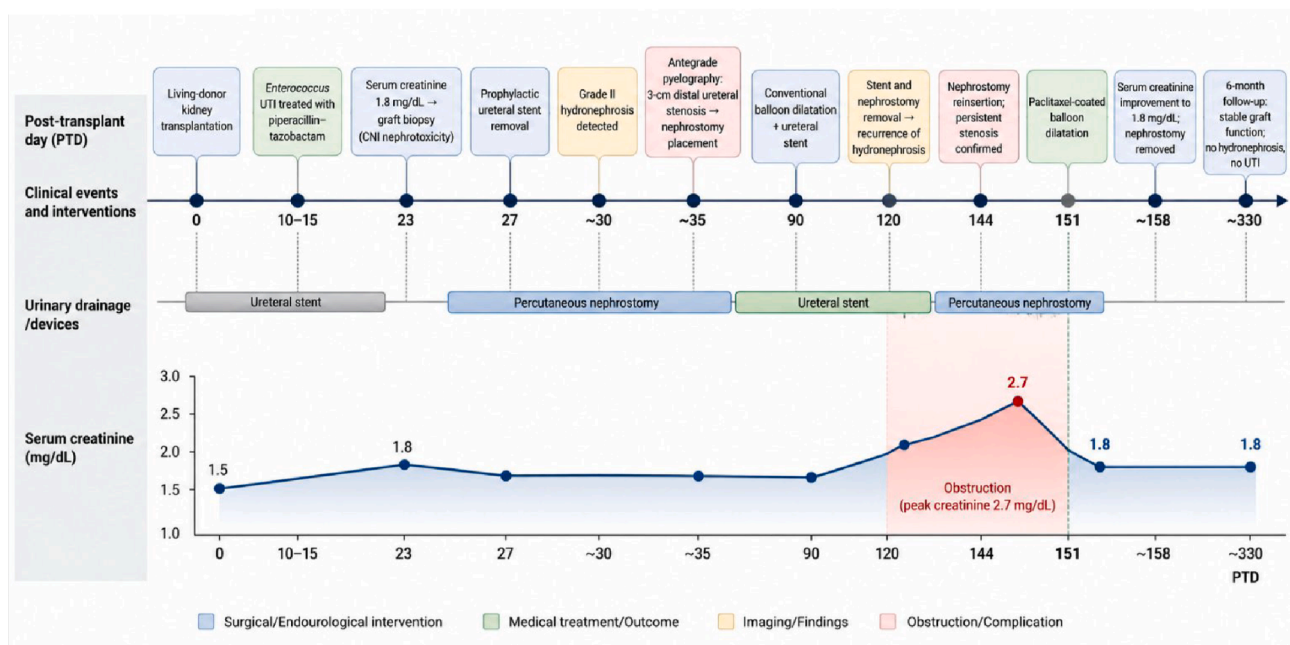


Figure 1. Timeline of Clinical Course, Interventions, and Renal Function Following Kidney Transplantation. Abbreviations: PTD, post-transplant day; UTI, urinary tract infection.

On PTD 23, sCr increased to 1.8 mg/dL; allograft biopsy excluded rejection and demonstrated calcineurin inhibitor nephrotoxicity. At that time, tacrolimus trough levels were 10 to 11 ng/mL. After tacrolimus dose reduction, targeting trough levels of 6 to 8 ng/mL, renal function progressively improved, with sCr decreasing to 1.5 mg/dL.

The prophylactic ureteral stent was removed at PTD 27 due to ultrasound evidence of stent calcification. Subsequent ultrasound imaging revealed grade II hydronephrosis. Further imaging and antegrade pyelography identified a severe distal US involving both the ureterovesical anastomosis and the adjacent proximal transplant ureter. The stenotic segment measured approximately 3 cm in length and was associated with only minimal, filiform passage of contrast medium, consistent with high-grade obstruction (Fig. 2A). Percutaneous nephrostomy was performed shortly thereafter to relieve obstruction. On PTD 90, the patient underwent conventional balloon dilatation with ureteral stent placement.

The postoperative course was complicated by recurrent *E faecalis* UTIs requiring repeated antibiotic treatments. After removal of both the ureteral stent and the nephrostomy tube (approximately PTD 120), hydronephrosis rapidly recurred. A nephrostomy tube was reinserted on PTD 144, and antegrade pyelography confirmed persistent anastomotic US. Given the persistence of obstructive uropathy despite conventional endourologic management, PCB dilatation was performed on PTD 151 using a Ranger PCB (Boston Scientific; 4.0 × 40 mm, nominal pressure 6 atm, 120-s inflation). Balloon size was selected to ensure complete coverage of the approximately 3-cm stenotic segment involving both the ureterovesical anastomosis and the adjacent ureteral segment (Fig. 2B).

The procedure was performed through the existing percutaneous nephrostomy tract using an antegrade approach. Under fluoroscopic guidance, the balloon was positioned across the stenotic segment involving the ureterovesical anastomosis and adjacent distal ureter and inflated for 120 seconds.

Due to the patient's history of recurrent UTI, ureteral stent reinsertion was deliberately avoided. Procedural details are provided in the Supplemental Material. Follow-up antegrade pyelography showed restored urinary drainage after PCB (Fig. 3).

sCr decreased from 2.7 mg/dL before the procedure to 1.8 mg/dL within approximately 1 week, allowing for uncomplicated removal of the nephrostomy tube. Subsequent imaging confirmed resolution of hydronephrosis. Follow-up was conducted monthly for up to 6 months. Renal function remained stable throughout, with sCr maintained ~1.8 mg/dL, and urinalysis consistently showed no evidence of infection. Serial ultrasound assessments confirmed persistent resolution of hydronephrosis, with no evidence of urinary tract dilatation; a representative 6-month follow-up image is provided (Fig. 3).

3. Discussion

US is a common cause of graft dysfunction after kidney transplantation.¹ Its pathogenesis is multifactorial, with ischemia, surgical injury, and inflammation driving progressive fibrotic narrowing.⁵

Prophylactic ureteral stenting is widely adopted to reduce early urologic complications; however, its use is associated with an increased risk of UTI and may contribute to recurrent inflammation and stricture formation.^{6,7} In clinical practice, management of US therefore requires a careful balance between maintaining urinary drainage and minimizing infection-related morbidity.⁸

Endourologic approaches, including conventional balloon dilatation with or without temporary stent placement, represent first-line therapeutic options due to their minimally invasive nature.⁹ Nevertheless, restenosis rates remain substantial, particularly in ischemic or anastomotic strictures, suggesting that mechanical dilatation alone may be insufficient to counteract ongoing fibrotic remodeling of the ureteral wall.²

Originally developed for vascular restenosis, PCBs combine mechanical dilatation with local antiproliferative therapy. Through microtubule stabilization and cell-cycle arrest, paclitaxel inhibits fibroproliferative remodeling, a key mechanism of restenosis. After ischemic or mechanical injury, fibroblast activation, myofibroblast differentiation, and extracellular matrix deposition drive progressive luminal narrowing. Paclitaxel may counteract this fibroproliferative process by inhibiting fibroblast migration and activation, reducing myofibroblast differentiation,

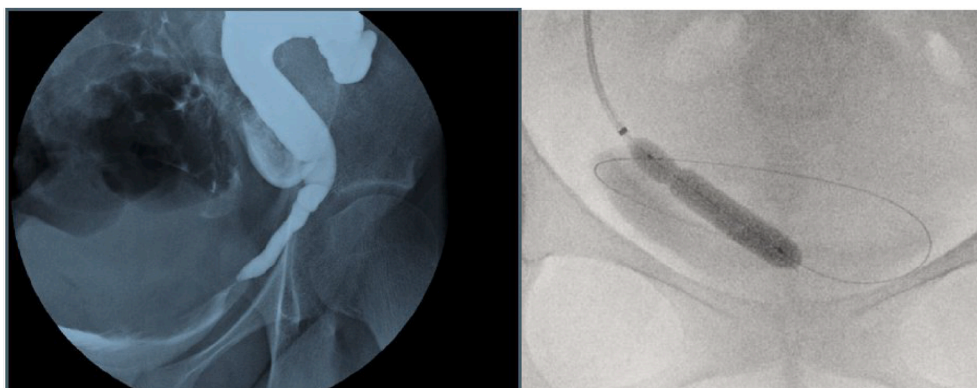


Figure 2. Pre-treatment and intra-procedural imaging. (A) Antegrade pyelography demonstrating grade II hydronephrosis of the transplanted kidney with delayed urinary drainage, consistent with distal ureteral stenosis at the ureterovesical anastomosis. (B) Balloon dilatation of the distal ureteral stricture using a paclitaxel-coated balloon at the ureterovesical anastomosis.

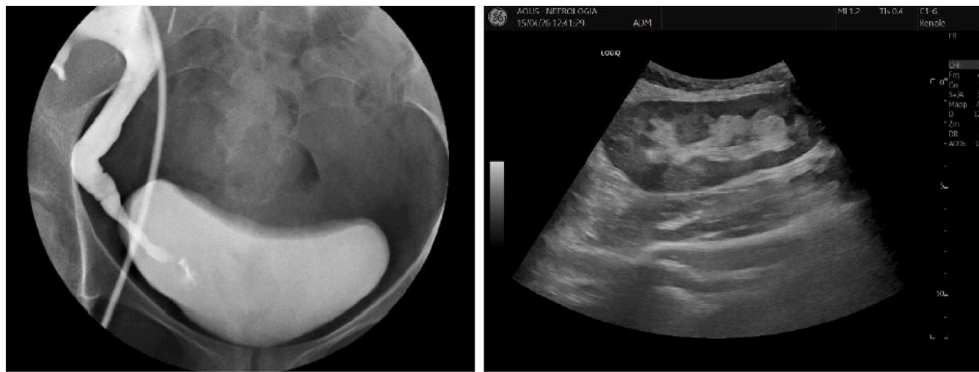


Figure 3. Post-treatment imaging and follow-up. (A) Post-procedure pyelography showing resolution of hydronephrosis with restored urinary drainage after paclitaxel-coated balloon ureteroplasty. (B) Six-month follow-up ultrasound confirming sustained ureteral patency and absence of hydronephrosis.

and modulating profibrotic pathways, including transforming growth factor- β signaling. Experimental studies have also demonstrated reduced expression of fibrotic markers such as α -smooth muscle actin and fibronectin after local paclitaxel exposure. Due to its high lipophilicity, paclitaxel is rapidly absorbed by the ureteral wall during balloon inflation and remains locally retained, providing sustained antiproliferative activity while minimizing systemic exposure.

In the present case, PCB ureteroplasty was performed after failure of conventional endourologic management and in the setting of recurrent UTI, which discouraged further ureteral stent placement. The intervention resulted in durable resolution of ureteral obstruction, with recovery of graft function and no evidence of restenosis during follow-up. Although causality cannot be established in a single-case report, the favorable clinical course supports the feasibility of this approach in selected patients with refractory transplant US. The relatively short follow-up and the absence of systematically collected data on cumulative radiation exposure and contrast medium volume represent important limitations of the present study. To our knowledge, this represents a novel clinical application of PCB technology in a kidney transplant recipient. The key teaching points of this case are summarized in the Table.

Table

Main teaching points from the present case.

Ureteral stenosis is a frequent urologic complication after kidney transplantation and may significantly compromise graft function.
Conventional balloon dilatation represents a minimally invasive treatment option but is associated with substantial rates of restenosis.
Paclitaxel-coated balloons combine mechanical dilatation with local delivery of an antiproliferative agent targeting fibrotic remodeling.
Paclitaxel inhibits cellular proliferation and extracellular matrix deposition, mechanisms implicated in ureteral stricture recurrence.
This case illustrates a novel application of paclitaxel-coated balloon ureteroplasty in a kidney transplant recipient.

4. Conclusion

US after kidney transplantation remains a relevant cause of graft dysfunction, particularly when recurrent or refractory to standard endourologic treatment. In this case, PCB ureteroplasty was associated with sustained ureteral patency and stable graft function without the need for further stenting. Although limited to a single patient, this report suggests that drug-coated balloon technology may represent a feasible minimally invasive option in selected transplant recipients. Further comparative studies are needed to determine its benefit over conventional balloon dilatation.

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Declaration of competing interest

The authors of this manuscript have no conflicts of interest to disclose as described by *American Journal of Transplantation*.

Ethical statement

The authors declare that they have obtained consent from the patients discussed in the report.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ajt.2026.06.022>.

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