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Original Article

Percutaneous treatment of obstructive uropathy in renal transplant recipients: outcomes of nephrostomy tube placement within and after 30 days of transplantation

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ABSTRACT

Purpose: To evaluate outcomes of percutaneous nephrostomies (PCN) in renal transplant recipients, and compare outcomes of PCN placement before and after 30 days from transplant.

Material and methods: A retrospective audit of 1041 transplants undergoing PCN was performed. PCN population was classified into early-PCN and late-PCN groups (<30/>30 days from transplant). Graft survival (GS) was compared between early/late groups and transplants with and without PCN.

Results: 79 (7.6%, n = 79/1041) transplants underwent 89 PCN procedures. 67 (75%, n = 67/89) underwent nephroureteral stent (NUS) placement and 12 (25%, n = 12/89) were simple PCN placements. Procedure-related complications in early-vs. late-PCN were 4.3%, (n = 1/23) and 3.0% (n = 2/66) $p > 0.05$. Catheter-related complications in early-PCN vs. late-PCN were 13%, (n = 3/23) and 11% (n = 7/66) $p > 0.05$. Graft survival at 12, 36, and 48 months after PCN placement for early-PCN vs. late-PCN was 86% ± 7, 81 ± 8, and 81 ± 10 vs. 93% ± 3, 75 ± 8, and 66 ± 9, respectively ($p = 0.50$). Graft survival at 1, 4, and 10 years after transplant in early-PCN vs. late-PCN was 86% ± 7, 86 ± 8, and 29% ± 17 vs. 96% ± 2, 81 ± 6, and 61 ± 13, respectively ($p = 0.01$). Graft survival for all PCN vs. no-PCN transplants at 1, 4, and 10 years were 94% ± 3, 83% ± 5, and 55% ± 11 vs. 92% ± 1, 80% ± 1, and 59% ± 3, respectively ($p = 0.50$).

Conclusion: PCN in renal transplantation is safe and effective with no effect on graft survival. Early PCN poses no additional risk to the graft; however, it is a poor prognostic indicator for long-term graft survival.

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1. Introduction

The number of renal transplants performed in the United States has doubled to over 16,000 since 1988 as of 2013, and renal transplantation has become the treatment of choice for end-stage kidney disease (ESKD).[1,2] Despite advances in surgical technique and improvements in immunosuppressive regimens, the rate of urologic complications remains 2–10%.[3–5] Of these, stricture and obstruction are the most common, resulting in obstructive uropathy, typically presenting with pain, decreased urinary output, and increase in serum Creatinine, as well as hydronephrosis by imaging.[6–8]

Decompression of the transplanted collecting system is standard therapy for transplant kidneys with obstructive uropathy.[4,9–12] Other indications include nephrolithiasis, urinary tract infection (UTI), urinary fistula, and need for access for other interventions.[13] While ureteral complications have not been shown to threaten patient or graft survival when treated expediently, it was the development of interventional and endourogolic techniques which has allowed surgeons and patients to avoid open surgical repair.[9] Interventional radiology has become essential in the management of urologic complications in renal transplants, and expedient relief of obstruction is paramount to prevent significant morbidity and mortality.[13–15] The purpose of this study was to evaluate the efficacy and safety of percutaneous nephrostomy (PCN) placement in a large series of patients by determining the effects of PCN on long term graft survival and function, in addition to evaluating the safety of PCN placement in recently placed grafts without fibrotic encapsulation.

2. Patients and methods

After approval by the Institutional Review Board, a retrospective audit of 1041 transplants from January of 1998 to December of 2010 was performed. Patients who received kidney transplants and underwent PCN were identified and demographic information was collected and analyzed using standard statistical tests (Log Rank Test, Wilcoxon, Fisher's Exact Test, and Pearson's Exact Test). All patients had undergone renal transplantation and required PCN for decompression of the collecting system after presenting with worsening allograft function. Patients receiving PCN were divided into early (<30 days from transplant) and late (>30 days from transplant) groups. Technical success was defined as the ability to place a percutaneous nephrostomy tube into the transplant kidney collecting system. Peak serum creatinine before decompression was recorded, with the highest value available 1–7 days before the procedure. The trough in serum creatinine after decompression within 1–14 days was recorded. Serum creatinine values were then compared for the early and late groups at pre- and post-nephrostomy tube placement via ANOVA and ANCOVA, respectively.

Complications were defined as procedure-related and catheter-related. Procedure-related complications included complications secondary to obtaining access into the collecting system such as hemorrhage, renal pelvic perforation, puncture site infection, and death. Catheter-related complications were defined as complications arising after successful attainment of access into the collecting system, and included tube dislodgement, dislodgement requiring new access, UTI, urinary leak, hemorrhage, and death. Graft survival and intubation time from the time of tube placement was estimated via Kaplan–Meier estimator, and compared with a modified Gehan–Wilcoxon test. If the 95% confidence interval (CI) was not estimable, it was denoted with an "n/e."

3. Results

Between January 1, 1998 and December 31, 2010, 1041 renal transplants in our institutional database were identified. Seventy nine (7.6%, n = 79/1041) transplants underwent 89 PCN procedures. Sixty seven (75%, n = 67/89) eventually underwent nephroureteral stent (NUS) placement with or without balloon ureteroplasty, and 12 (25%, n = 12/89) were simple PCN without additional interventions. A total of 40 patients underwent NUS placement with balloon ureteroplasty (50.6%, n = 40/79). Demographic information can be reviewed in Table 1. Sixty patients required PCN due to anastomotic strictures alone. Nine patients had anastomotic strictures with urinary leaks, while 3 had obstructions due to clot in the collecting system (2 were post-biopsy complications). Two patients had obstruction due to nephrolithiasis, and 2 required urgent decompression due to complications related to indwelling stents placed at the time of transplant. A single patient became obstructed during pregnancy, while another had a pelvic mass. One patient required decompression from obstruction due to a mycetoma.

All 79 patients had technically successful procedures (100%, 89/89). Procedure-related complications in the early group occurred in 4.3%, (n = 1/23) and in 3.0% in the late group (n = 2/66) $p > 0.05$. In the early group, a single case of non-obstructive clot in the collecting system was observed, which did not require transfusion. The two complications observed in the late group included 1 hemorrhage resulting in non-obstructive clot, and 1 case of sepsis resulting in death. Catheter-related complications in early-PCN vs. late-PCN were 13%, (n = 3/23) and 11% (n = 7/66) $p > 0.05$. Catheter related complications in the early group included 2 partial migrations and a single blood clot, neither requiring additional intervention. The 7 complications in the late group included 3 partial dislodgements, 1 case of cystitis, 1 case of fungal pyelonephritis, 1 puncture site abscess, and one dislodgement requiring de-novo access.

Mean serum creatinine before decompression in the early group was 3.61 and 3.36 in the late group ($p = 0.641$). Serum creatinine dropped by 1.49 in the early group ($p = 0.005$), and by 1.21 in the late group ($p < 0.001$). There was no significant difference in the improvement in mean serum creatinine between the late and early groups ($p = 0.769$). Pre- and post-nephrostomy tube placement serum creatinine concentration is represented in Fig. 1. For the early group, transplants required indwelling PCN on average for 14 months, versus 8.7 months ($p = 0.798$), independent of the treatment modality utilized after PCN placement (NUS placement, balloon angioplasty, or neither) as seen in Fig. 2.