Crimson Publishers
Wings to the Research

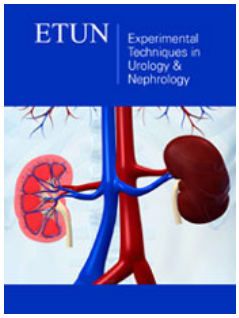
Mini Review

Current Insights on Urinary Leak in Renal Transplantation

Sujeet Poudyal*

Department of Urology and Kidney Transplant Surgery, Tribhuvan University Teaching Hospital, Kathmandu, Nepal

ISSN: 2578-0395



***Corresponding author:** Sujeet P Department of Urology and Kidney Transplant Surgery, Tribhuvan University Teaching Hospital, Kathmandu, Nepal

Submission: May 06, 2020

Published: May 21, 2020

Volume 3 - Issue 1

How to cite this article: Sujeet P. Current Insights on Urinary Leak in Renal Transplantation. Exp Tech Urol Nephrol. 3(1). ETUN.000555.2020.
DOI: 10.31031/ETUN.2020.03.000555

Abstract

Urine leak is a common urological complication leading to considerable morbidity, graft loss and even mortality. Most common cause being the technical error, it can be avoided by following good surgical principles during ureterocystoneostomy in renal transplantation. Clinical findings, imaging and biochemical analysis of the drained or collected fluid around the graft form the basis of early detection of urine leak postoperatively. It can be managed endourologically with percutaneous nephrostomy with or without ante grade DJ stenting. Early surgical exploration has high success rate and should be carried out for extensive urine leak and the leak which could not be managed endourologically or conservatively. Optimal management of urine leak has equivalent graft survival rate when compared with those without urological complications.

Introduction

Kidney transplantation is the standard of treatment for end stage renal disease [1]. It is a major undertaking in a state of end stage renal disease which leads to myriad of physiological and metabolic derangements in the body. With advancement in medical science and technology along with the better understanding of immunology, immunosuppressive therapy and surgical technique, overall medical and surgical complications of renal transplantations have dwindled down. Urological complications, which mostly rely on surgical techniques of graft retrieval and transplantation still occur and have been known to result in considerable morbidity and even mortality. Current literature shows wide variation in incidence of urological complications occurring in 3.4-14.1% out of which urine leaks have been observed in1-8.9% [2-5].

Etiology and Prevention

Urinary leak in renal transplant occurs as a consequence of compromised ureteral vascularity or from a technical error during construction of ureterocystoneostomy, the latter typically developing within the first 72 hours posttransplant [6]. The vascular supply to the ureter from the renal pedicle is tenuous and may be easily damaged during kidney harvesting. Technical causes during graft retrieval include direct surgical trauma to the ureter or to the golden triangle which contains important arterial branch supplying renal pelvis and ureter [7]. Sometimes tiny accessory renal arteries supplying lower pole may be severed resulting in devascularisation of ureter. Presence of multiple renal arteries has shown to be an independent risk factor for urological complications [8]. Similarly, urine leak may be brought about by technical errors which may occur during ureterocystoneostomy such as tunnel hematoma, distal stripping of the blood supply, improper ureteral and bladder anastomotic technique, undue tension created by the short ureter and or injury to renal pelvis during ureteric stent placement [9]. As most of the surgeons apply an extravesical ureteroneocystostomy technique, the shorter ureter decreases likelihood of ischemia, and a limited cystostomy rarely leads to urinary extravasation from the bladder [10-13]. Two cases of leakage have been reported through the anterior cystotomy and both required re-suturing of the bladder rent [14]. Bladder outlet obstruction due to blocked catheter and defunctionalized bladder have been shown to be postoperative risk factors for urine leak. Calycealurine leak due to injury to polar artery and infarction of renal parenchymahas been described in literature [8,15]. The vesicouretreic anastomosis was the commonest site of leak and theureteric ischemia was found to be the major cause of urine leak [16].

Cochrane database of systemic review has shown that routine prophylactic stenting reduces the incidence of major urological complications in kidney transplant recipients with the incidence of major urological complications ranging between 0-4% in stented patients (median 1.0%) and 0-17.3% (median 7.0 %) in the non-stented patients [17]. Nie et al. [18] reported thatureteroureterostomy and ureterocystoneostomy had similar incidences of urological complications with an apparent decrease in incidences of urine leakage after ureteroureterostomy [18].

Clinical presentation and investigation

Urine leak may present with decreased urine output and increased drain fluid immediate postoperatively. The drain fluid creatinine, urea and potassium which are well above the serum level or approximately equal to urine is consistent with urine and distinguish it from lymphatic and ascitic fluid [19]. Flore-Gama et al. reported that the postoperative drain represented a six-times higher possibility of urinary leak if the draincreatinine was six times higher than the plasma or the urine creatinine was less than three fold the drain creatinine [20]. This ratio may not hold true in those with low creatinine clearance rate where urine creatinine nears plasma creatinine. The volume of drain and urine output correlate with the severity of urine leakage. Late postoperatively, if drain has already been removed or if it is not functioning, patient may present with fever, pain and swelling at the graft site, lower abdomen or scrotum, urine leakage from wound site or even urosepsis. Large urinoma may compress graft ureter or renal vessels leading to renal dysfunction. It may be difficult to distinguish the signs and symptoms of urinary extravasation from those of rejection or obstructive uropathy. Systemic reabsorption of extravasated urine may elevateserum creatinine and simulate urinary obstruction. Ultrasound and CT scan aid in the early and definitive diagnosis of perigraft collection [21]. CT urography in the presence of good graft function or T2 magnetic resonance urography in presence of renal insufficiency can detect urine leak from collecting system, ureter or anastomotic site. Urinoma are homogenous and anechoic in early phase in ultrasound and may become septated with time due to infection. The biochemical analysis of aspirated fluid rich in creatinine distinguishes urinoma from lymphocele. Though not specific for a leakage, sonography is a sensitive tool for suggesting the possibility of leakage [22]. Single photon emission computed tomogram (SPECT) /CT images and magnetic resonance urography are very helpful and valuable to evaluate the anatomical relationships exactly [23,24]. Other investigations include isotope renal scanning which can show nuclear contrast extravasation and cystography which can delineate contrast extravasation from the site of cystotomy or anastomotic dehiscence [25]. Scintigraphic detection of urine leak in cases of poor renal functionmay be limited by poor excretion of the radionuclide [26].

Management

Patients presenting with a urine leak following removal of Foley catheter are initially managed with placement of a Foleycatheter. For urine leak following transplant with Foley catheter needs percutaneous nephrostomy tube to diverturine away from the region of extravasation. The extent and location of urine leak can be determined by antegrade pyelogram. A low volume leak at anastomotic site can be managed conservatively which requires maximal decompression with a nephrostomy tube, ureteral stent and bladder catheter. An overall success rate of 11.1- 87 % was reported with endourological management at a mean follow-up of 35 months (range 24-67 months) [14,27-29]. The presence of contrast medium flow into the bladder was a major prognostic factor for the outcome of the fistula [6]. Nephrostomy tube and Foley catheter can be removed once the leak subsides but the ureteral stent is removed 4-6 weeks later. Close monitoring for secondary ureteric stricture is still needed after stent removal. Fluid collections, if cause extrinsic ureteral obstruction or get infected, need urgent percutaneous drainage. The aspirated fluid should be examined for total cell count, gram stain, culture, creatinine and triglyceride. An extensive urine leak or the leak failing conservative management needs early exploration. The ischemic ureter should be resected till healthy and vascular segment is reached and the large defect may need Psoas hitch or Boari flap for ureterocystoneostomy or even pyelocystostomy if ureter is totally ischemic [14,30]. Use of methylene blue through nephrostomy tube or antegrade ureteric stenting prior to surgery may help find the graft ureter intraoperatively [31]. The healthy ureter of the transplant kidney can also be anastomosed to native ureter and even ileal substitution has been done for extensive necrosis of ureter and renal pelvis [32-34]. Other techniques mentioned in literature were anastomosis with contralateral native ureter for absence of ipsilateral ureter and anastomosis with ileal conduit for absence of functional bladder [31]. Surgical repair has been successful in majority of cases with recurrence occurring in upto 23% of the cases [35]. A study by Karam et al. reported that ureteral necrosis did not affect the 10-year patient and graft survival [36]. Similar finding was shown by Berli et al. [31] who found equivalent graft survival rate when compared with those without urological complications. Mortality in one of the studies has been reported to be 6.4% [32]. Use of artificial ureters (pyelovesical bypass graft) have been reported after failed endourologic or open management of ureteral strictures after renal transplantation [37].

Conclusion

Urine leak is a common urological complication encountered in renal transplantation. With good surgical technique, most of the urological complications can be avoided. Sound judgment of clinical findings, imaging and biochemical findings of drained or collected fluid is a must for timely identification. Optimal endourological or surgical management of urine leak reduces not only morbidity but prevents graft loss as well.

References

1. Abecassis M, Bartlett ST, Collins AJ, Davis CL, Delmonico FL, et al. (2008) Kidney transplantation as primary therapy for end-stage renal disease: A National Kidney Foundation/Kidney Disease Outcomes Quality Initiative (NKF/KDOQITM) conference. Clin J Am Soc Nephrol 3(2): 471-480.

2. Samhan M, Al-Mousawi M, Hayati H, Abdulhalim M, Nampoory MR (2005) Urologic complications after renal transplantation. Transplant Proc 37(7): 3075-3086.

3. Rigg KM, Proud G, Taylor RM (1994) Urological complications following renal transplantation, A study of 1016 consecutive transplants from a single centre. Transpl Int 7(2): 120-126.

4. Mäkisalo H, Eklund B, Salmela K, Isoniemi H, Kyllönen L (1997) Urological complications after 2084 consecutive kidney transplantations. Transplant Proc 29 (1-2): 152-153.

5. Mahdavi ZR, Taghavi R (2002) Urological complications following renal transplantation: assessment in 500 recipients. Transplant Proc 34(6): 2109-2110.

6. Alcaraz A, Bujons A, Pascual X, Juaneda B, Martí J et al. (2005) Percutaneous Management of Transplant Ureteral Fistulae Is Feasible in Selected Cases. Transplantation Proceedings 37(5): 2111-2114.

7. Krol R, Ziaja J, Chudek J, et al. (2006) Surgical treatment of urological complications after kidney transplantation. Transplant Proc 38(1): 127-130.

8. Rahnemai A, Gilchrist BF, Kayler LK (2015) Independent risk factors for early urologic complications after kidney transplantation. Clinical Transplantation 29(5): 403-408.

9. Rosenthal JT (1994) Surgical management of urological complications after kidney transplantation. Semin Urol 12(2): 114-122.

10. Gibbins WS, Barr JM, Hefty TR (1992) Complications following un-stented parallel incision extra vesicalur eteroneocystostomy in 1,000 kidney transplants. J Urol 148(1): 38-40.

11. Thrasher JB, Temple DR, Spees EK (1990) Extravesical versus Leadbetter-Politano ureteroneocystostomy: a comparison of urological complications in 320 renal transplants. J Urol 144(5): 1105-1109.

12. Slagt IKB, Klop KWJ, IJzermans JNM, Terkivatan T (2012) Intravesical Versus Extravesical Ureteroneocystostomy in Kidney Transplantation. Transplant J 94(12): 1179-1184.

13. Nane I, Kadioglu TC, Tefekli A, Kocak T, Ander H, Koksal T (2000) Urologic complications of extra vesicalureteroneocystostomy in renal transplantation from living related donors. Urol Int 64: 27-30.

14. Streeter EH, Little DM, Cranston DW, Morris PJ (2002) The urological complications of renal transplantation: a series of 1535 patients. BJU Int 90(7): 627-634.

15. Hricko GM, Birtch AG, Bennett AH, Wilson RE (1973) Factors responsible for urinary fistula in the renal transplant recipient. Ann Surg 178(5): 609-615.

16. Nie ZL, Zhang KQ, Li QS, Jin FS, Zhu FQ (2009) Treatment of urinary fistula after kidney transplantation. Transplant Proc 41(5): 1624-1626.

17. Wilson CH, Rix DA, Manas DM (2013) Routine intraoperative ureteric stenting for kidney transplant recipients. Cochrane Database of Systematic Reviews 6: CD004925.

18. Nie ZL, Zhang KQ, Li QS, Jin FS, Zhu FQ (2009) Urological complications in 1,223 kidney transplantations. Urol Int 83(3): 337-341.

19. Chughtai SA, Sharma A, Halawa A (2018) Urine Leak Following Kidney Transplantation: An Evidence-based Management Plan. J Clin Exp Nephrol 3(3): 14.

20. Flores GF, Bochicchio RT, Mondragon G (2010) Determination of creatinine in drained liquid. Urinary leak or lymphocele? Cirugia y cirujanos 78(4): 327-332.

21. Park SB, Kim JK, Cho KS (2007) Complications of Renal Transplantation Ultrasonographic Evaluation. J Ultrasound Med 26(5): 615-633.

22. Buresley S, Smahan M, Moniri S, Codaj J, Al-Mousawi M (2008) Postrenal transplantation urologic complications. Transproc 40(7): 2345-2346.

23. Yazici B, Oral A, Akgün A (2018) Contribution of SPECT/CT to Evaluate Urinary Leakage Suspicion in Renal Transplant Patients. Clinical Nuclear Medicine 43(10): 378-380.

24. Sjekavica I, Novosel L, Rupčić M, Smiljanić R, Muršić M, Duspara V (2018) Radiological Imaging In Renal Transplantation. ActaClin Croat 57(4): 694-712.

25. Yu JQ, Zhuang H, Xiu Y, El-Haddad G, Kumar R (2005) Small urine leak after renal transplantation: detection by delayed 99mTc-DTPA renography--a case report. J Nucl Med Technol 33(1): 31-33.

26. Son H, Heiba S, Kostakoglu L, Machac J (2010) Extraperitoneal urine leak after renal transplantation: the role of radionuclide imaging and the value of accompanying SPECT/CT - a case report. BMC Medical Imaging 10:23.

27. Duty BD, Barry JM (2015) Diagnosis and management of ureteral complications following renal transplantation. Asian J of Urol 2(4): 202-207.

28. Campbell SC, Streem SB, Zelch M, Hodge E, Novick AC (1993) Percutaneous management of transplant ureteral fistulas: patient selection and long-term results. J Urol 150(4): 1115-1117.

29. Matalon TA, Thompson MJ, Patel SK, Ramos MV, Jensik SC (1900) Percutaneous treatment of urine leaks in renal transplantation patients. Radiology 174(3): 1049-1051.

30. Mathews R, Marshall FF (1997) Versatility of the adult psoas hitch ureteral reimplantation. J Urol 158(6): 2078-2082.

31. Berli JU, Montgomery JR, Segev DL, Ratner LE, Maley WR, et al. (2015) Surgical management of early and late ureteral complications after renal transplantation: techniques and outcomes. Clin Transplant 29(1): 26-33.

32. Mazzucchi E, Souza GL, Hisano M, Antonopoulos IM, Piovesan AC, Nahas WC, et al. (2006) Primary reconstruction is a good option in the treatment of urinary fistula after kidney transplantation. Int. Braz J Urol 32(4): 398-404.

33. Salomon L, Saporta F, Amsellem D, Hozneck A, Colombel M et al. (1999) Results of pyeloureterostomy after ureterovesical anastomosis complications in renal transplantation. Urology 53(5): 908-912.

34. Shokeir AA, Shamaa MA, Bakr MA, Diasty TA, Ghoneim MA (1993) Salvage of difficult transplant urinary fistulae by ileal substitution of the ureter. Scand J Urol Nephrol 27(4): 537-540.

35. Nie ZL, Zhang KQ, Li QS, Jin FS, Zhu FQ, et al. (2009) Treatment of urinary fistula after kidney transplantation. Transplant Proc 41(5): 1624-1626.

36. Karam G, Maillet F, Parant S, Soulillou JP, Giral-Classe M (2004) Ureteral necrosis after kidney transplantation: risk factors and impact on graft and patient survival. Transplantation 78(5): 725-729.

37. Andonian S, Zorn KC, Paraskevas S, Anidjar M (2005) Artificial ureters in renal transplantation. Urology 66(5): 1109.