

Early Urological Complications After Live Related Renal Transplantation: An Update

Hossain TMS¹, Karim T²

¹Department of Urology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh; ²Department of Paediatric Cardiology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

Abstract

Background: Kidney transplant is the standard of care for end stage kidney disease and associated with immunological, vascular and urological complications. Urological complications remain the most common type of surgical complication in the early post-transplant period, inspite of major procedural advances many grafts are still being lost due to same.

Objectives: The purpose of this review was to discuss the different presentations, compare various ureterovesical anastomosis techniques and provide a basic overview for the management of post-transplant urological complications hence to improve graft and patient survival.

Methods: This study was a narrative review. Recent available literature was searched by keywords. The most recent information from relevant articles were collected and reviewed. This write up was compiled after the review of articles from the last 50 years.

Results: Majority of these complications could be traced back to the time of retrieval and anastomosis of ureter. So, the high degree of suspicion, early detection, accurate diagnosis and timely management of urological complications occurring after kidney transplant were the key tasks of transplant team managing the patients. A delay in diagnosis or management of these complications could lead to morbidity to the recipient even graft loss and or mortality.

Conclusion: To minimize the early complications of post kidney transplantation high degree of suspicion and prompt intervention is needed for graft and patient survival.

Keywords: Live related renal transplant, Early urological complications, Urine leak, Ureteroneocystostomy

Introduction

Kidney transplantation remains the best renal replacement option for most patients of end stage kidney diseases.¹ Despite of refinements in surgical technique it is not devoid of complications. Urological complications have been seen since the earlier days of Renal Transplantation and causing significant morbidity and even mortality. In the early days the reported incidence of urological complications in between 10% and 25% with an associated mortality 20-30%.²⁻⁵ The incidence has decreased significantly over the past 40 years with advancement of surgical procedures and improvement of suture materials and current reports it declines to 2.8% and 15.5%.^{6,7} A review of literature indicates that there are many different techniques for ureteroneocystostomy, in addition, some centres use DJ ureteral stent routinely while others use selectively and some other do not use at all.

Still number of renal allografts are lost due to urological complications especially in early post-transplant period (within 90 days).⁸

The purpose of this review was to discuss different presentations and provide an evidence-based management plan for recipients who present with such complications in early post-transplant period.

Operative Procedure: A detailed operative description for kidney transplant was not the purpose of this review. However, a basic understanding of the procedure and the regional anatomy is necessary for better understand the possible complications.

The surgical technique for kidney transplant has changed very little from the original pelvic operation described in 1951 by Kuss et al.⁹ The most common operation in now a days extra peritoneal right iliac fossa because it allows early access of future graft biopsy and on the right side the more superficial location of the iliac vein. However, the left iliac fossa may be used when there is previous history of transplant or significant arterial disease on the right side or recipient is the candidate for future pancreas

*Correspondence: Dr. Tohid Mohammad Saiful Hossain, Department of Urology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh; email: dr.tms@yaho.com. ORCID: 0000-0002-4856-3625

transplant. Another option is to place the kidney in an intra-abdominal position through the midline position when a recipient had history of both iliac fossa transplant, in paediatric renal transplant or option is useful when a pancreas transplant is being performed simultaneously.

With the standard pelvic operation the dissection is extra peritoneal, the renal vein is anastomoses with external iliac vein in end to side and the renal artery is anastomosed with external iliac artery in end to side fashion or with internal iliac artery in end to end fashion. To minimize the risk of lymphocele formation only a modest length of artery is dissected free and the lymphatics overlying the artery are cauterized or ligated.

Urinary continuity can be restored by a number of different techniques – The most common technique are posterior leadbetter politano or Lich Gregoir technique. Regardless the technique used the anastomosis must be tension free, water light, well vascularized and protected by at least a 1 cm submucosal tunnel.

Outline of early urological complications: The incidence of urological complications following kidney transplantation as described in early studies (i.e. including patients between 1970-1990s) ranged between 4.2% to 14.1% (10-14), while in later studies (i.e including patients between 1990-2000) it ranged between 3.7-6.0%.¹⁵⁻¹⁷

The reported early urological complications are - perurethral catheter related problems like block leads to retention, peri catheter leakage, hematuria, peri transplant fluid collection, urinary leaks and or obstruction urine leaks can result in the formation of urinomas. These collections can compress vascular structure or urine outflow causing graft dysfunction.^{18,19} In addition, urine leaks are associated with increased risk of surgical site infection which can lead to perinephric abscess.^{20,21}

Ultrasonography is the first line imaging modality for graft evaluation in immediate post-transplant period, especially when suspecting vascular problems, fluid collections and or obstruction, it can also give additional information on graft function by measuring the intrarenal resistivity indices.²²⁻²⁴ Differentiating between different types of collection on ultrasound can be difficult. A urinoma usually appears as a well-defined, rapidly enlarging non-echoic fluid collection without septations, lymphoceles are hypoechoic to anechoic, occasionally with internal septa and debris whereas a hematoma usually has a complex and echogenic appearance with numerous septation.²²⁻²⁵ CT scan many assist in the diagnosis by further

elucidating the ultrasound findings such as the extent or exact relationship of the fluid collection to the transplant kidney.²³ ^{99m}Tc, MAG-3 radionuclide isotope scan is useful to confirm the presence of urine leak outside the anatomical space of urinary tract.²⁶

A cystogram can provide additional information to establish the exact site of urine leak. Particularly if it is at the ureterovesical junction. Antegrade pyelography through nephrostomy tube remains the investigation of choice to identify the exact size and extent of urine leak and also the site of obstruction. Ultrasound and or CT guided needle aspiration followed by biochemical and bacteriological analysis is essential in diagnosing the exact etiology of fluid collections.¹⁸ A fluid creatinine above the serum level indicates a urine leak as opposed to a lymphocele which has levels similar to that of serum. Gram stain and Cultures are important to find out any infection.²⁰

Presentation and management of urological complications (early):

1. *Per urethral catheter related:* Immediate post-operative period catheter drainage may blocked by hardens of jelly, small blood clot which can be managed by simple milking of catheter or flush by water, may need change of catheter. For some reason catheter may placed beneath the high and get compressed or kinked, so take it above the high and fixed it at the thigh. Sometimes peri catheter leakage is seen, that is probably due to trigonal irritation of catheter balloon, so fix the catheter above the thigh and antimuscarinic may help.
2. *Hematuria:* Mild hematuria is not uncommon. It is usually observed in the first 12-24 hours after transplant which resolves spontaneously in most cases. More extensive bleeding may results in retained blood clots and urinary tract obstruction, which may be the cause of sudden caseation of urine output. Continuous bladder irrigation will usually restore output if not cystoscopic evacuation of clot may be necessary.
3. *Urine leaks:* Urine leaks usually present in immediate or early post-operative period (3 month).²⁷ Presentation includes pain and swelling in the transplant area, rising creatinine. Oliguria, and or signs of systemic infection.²⁸ In the immediate post-transplant period urine leaks can manifest via the drains or through the wound leading to delayed healing and increased risk of infection.²⁹ In addition, leaking urine can translocate in the

retroperitoneal space, pelvis and occasionally in the presacral and scrotal region.³⁰ The leaking of infected urine could lead to perinephric infections and abscess. Most urological complications can be traced back to technical errors during retrieval, bench dissection or implantation.²⁹ The majority of leaks occur at the distal portion of the ureter most commonly at the site of ureteroneocystostomy.²⁷ Distal ureteral ischemia and necrosis secondary to compromised blood supply is thought to be the main factor for early ureteral complications in most patients in the absence of technical difficulties during transplant operation.³¹ In contrast to native ureters which derive their blood supply via both renal arteries and pelvic collateral, the transplanted ureter depends solely on branches of renal artery that passes in peri ureteric tissue. It may be believe that gentle handling of the ureter and peri ureteric tissue and keeping the length of the ureter as short as possible without tension is of key importance.

The ureterovesical anastomosis associated with lowest rate of complications is a subject of debate. In a recent meta-analysis which included two randomized control studies and 24 observational studies, the Lich-Gregoir technique was found to significantly reduce the incidence of ureteral leaks which compared to the leadbetter politano and Taguchi techniques.³² Currently many centers adopted the routine use of ureteric stent during kidney transplant. A meta-analysis which included seven randomized controlled studies confirmed that prophylactic JJ stenting is well tolerated and reduces major urological complications.³³ Despite some opposition due to the higher incidence of urinary tract infection, current evidence recommends the routine use of prophylactic JJ stenting.

Management of urine leaks either conservative or reconstructive depending on the site, cause and extent of the leak. Transplant surgeons should keep in mind that the treatment strategies are not based on robust scientific evidence and may vary between centres. The current best available evidence is based on retrospective studies, a conservative approach usually involves insertion of percutaneous nephrostomy followed by antegrade stenting together with a foley catheter replacement. Retrograde JJ stenting of transplant ureter is technically demanding and often impossible due to atypical position of neoureteric orifice. This procedure diverts the urine flow

away from the leaking site and fully decompresses the collecting system in order to allow for healing to take place. Foley catheter is removed once the leak has resolved and many centres report stent deployment for a period of 6-12 weeks.^{34,35}

Surgical exploration is required if the urine leak fails to resolve following maximal decompression. During the surgical procedure, the necrotic ureter should be resected proximally until healthy tissue is found, followed by reimplantation. If the remaining viable ureter is short an ipsilateral uretero-ureterostomy, pyeloureterostomy, pyelovesicostomy, pssoashitch, boariflap, or fashioning an ileal ureter are alternative techniques that could be done for tension free anastomosis.³⁶ Traditionally, urine leaks have been corrected by open surgical reconstruction, over the last two decades advances in interventional radiology have allowed several patients to be managed by percutaneously. This conservative approach has been shown to be successful in a number of retrospective studies, with a success rate varying between 30% and 87%.^{15,17,37-41} We believe that outcome largely depends on the etiology, site and extent of urine leak and early intervention is the key to prevent graft loss and even morbidity and mortality. Surgical reconstruction is usually successful in the majority of cases.^{15,17} Moreover, some patients required more than one surgical procedure for complete resolution.

4. *Obstruction:* Early obstruction may be due to edema, blood clots, hematoma, peri transplant fluid collection and kinking. Presentation is usually with elevated serum creatinine level, which must be differentiated from other surgical and non-surgical causes of early graft dysfunction. Ultrasounogram and furosemide renogram is useful tool for diagnosis. Antegrade study is the most specific test to see the level of obstruction and percutaneous nephrostomy is obviously helpful for decompression and or internal/external JJ stenting may help. If such approach is not successful the surgical intervention is indicated.⁴²

Limitations

This narrative update aimed to provide a gross overview of the early urological complications after live related kidney transplantation. Here, it was performed extensive literature search but the selected articles have not been subjected to quality evaluation.

Conclusion

Among the early post kidney transplant urological complications urine leaks remain the most common and challenging. High degree of suspicion for diagnosis and early management is the key to prevent significant morbidity and graft loss and even occasional mortality. Preservation of peri ureteric tissue during donor kidney retrieval, Lich-Gregoir uretero-neocystostomy technique, routine prophylactic ureteral stenting has been associated with lower incidence of such complications.

Conflict of interest: None

Funding: None

Submitted: 30th June, 2020

Final revision received: 26th July, 2020

Accepted: 30th July, 2020

Published: 1st August, 2020

References

1. Wolfe RA, Ashby VB, Milford EL, Ojo AO, Ettenger RE, Agodoa LY, Held PJ, Port FK. Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. *N Engl J Med* 1999; 341: 1725-1730. DOI: 10.1056/NEJM199912023412303
2. Starzl TE, Groth CG, Putnam CW, et al. Urological complications in 216 human recipients of renal transplant. *Ann Surg*. 1970; 172:1e22.
3. Loughlin KR, Tilney NL, Richie JP. Urologic complications in 718 renal transplant patients. *Surgery*. 1984;95:297e302.
4. Colfry AJ, Schlegel JU, Lindsey ES, et al. Urological complications in renal transplantation. *J Urol*. 1974; 112:564e6.
5. Mundy AR, Podesta ML, Bewick M, et al. The urological complications of 1000 renal transplants. *Br J Urol*. 1981; 53:397e402.
6. Davari HR, Yarmohammadi H, Malekhosseini SA, et al. Urological complications in 980 consecutive patients with renal transplantation. *Int J Urol*. 2006; 13:1271e5.
7. Praz V, Leisinger HJ, Pascual M, Jichlinski P. Urological complications in renal transplantation from cadaveric donor grafts: a retrospective analysis of 20 years. *Urol Int*. 2005; 75: 144e9.
8. Wojciech K, Janusz D, Anna K, Bartosz M, Krzysztof T, Michał M, Paweł C, Maria B, Marian K, Romuald Z. Urological complications after renal transplantation – a single centre experience. *Cent European J Urol*. 2016; 69: 306-311. DOI: 10.5173/ceju.2016.833
9. Abhinav Humar, Arthur J. Matas Surgical Complications After Kidney Transplantation. *Seminars in Dialysis*. 2005; 18: 505-10.
10. Streeter EH, Little DM, Cranston DW, Morris PJ. The urological complications of renal transplantation: a series of 1535 patients. *BJU Int*. 2002; 90: 627-34. DOI: 10.1046/j.1464-410X.2002.03004.x
11. Jaskowski A, Jones RM, Murie JA, Morris PJ. Urological complications in 600 consecutive renal transplants. *Br J Surg*. 1987;74: 922-25. DOI: 10.1002/bjs.1800741015
12. Loughlin KR, Tilney NL, Richie JP. Urologic complications in 718 renal transplant patients. *Surgery*. 1984; 95: 297-302. PMID: 6367124
13. Rigg KM, Proud G, Taylor RM. Urological complications following renal transplantation. A study of 1016 consecutive transplants from a single centre. *Transpl Int*. 1994; 7: 120-26 DOI:10.1111/j.1432-2277.1994.tb01231.x
14. Mäkilä H, Eklund B, Salmela K, Isoniemi H, Kyllönen L, Höckerstedt K, Halme L, Ahonen J. Urological complications after 2084 consecutive kidney transplantations. *Transplant Proc*. 1997; 29:152-53 DOI: 10.1016/S0041-1345(96)00044-9
15. Buresley S, Samhan M, Moniri S, Codaj J, Al-Mousawi M. Postrenal transplantation urologic complications. *Transplant Proc*. 2008; 40:2345-2346 DOI: 10.1016/j.transproceed.2008.06.036
16. Yigit B, Tellioglu G, Berber I, Aydin C, Kara M, Yanaral F, Titiz I. Surgical treatment of urologic complications after renal transplantation. *Transplant Proc*. 2008; 40: 202-04. DOI: 10.1016/j.transproceed.2007.11.024
17. Samhan M, Al-Mousawi M, Hayati H, Abdulhalim M, Nampoory MR. Urologic complications after renal transplantation. *Transplant Proc*. 2005; 37: 3075-76. DOI: 10.1016/j.transproceed.2005.07.047
18. Humar A, Matas AJ. Surgical complications after kidney transplantation. *Semin Dial*. 2005; 18:505-10 DOI: 10.1111/j.1525-139X.2005.00097.x
19. Haberal M, Boyvat F, Akdur A, Kırnar M, Özçelik Ü, Yarıbuğ Karakayalı F. Surgical Complications After Kidney Transplantation. *Exp Clin Transplant*. 2016; 14: 587-595. PMID: 27934557
20. Rao PS, Ravindran A, Elsalamoty H, Modi KS. Emphysematous urinoma in a renal transplant patient. *Am J Kidney Dis*. 2001; 38: E29 DOI: 10.1053/ajkd.2001.28626
21. Capocasale E, De Vecchi E, Mazzoni MP, Dalla Valle R, Pellegrino C, Ferretti S, Sianesi M, Iaria M. Surgical site and early urinary tract infections in 1000 kidney transplants with antimicrobial perioperative prophylaxis. *Transplant Proc*. 2014; 46: 3455-58. DOI: 10.1016/j.transproceed.2014.07.071
22. Kolofousi C, Stefanidis K, Cokkinos DD, Karakitsos D, Antypa E, Piperopoulos P. Ultrasonographic

- features of kidney transplants and their complications: an imaging review. *ISRN Radiol.* 2012; 2013:480862. DOI:10.5402/2013/480862
23. Vernuccio F, Gondalia R, Churchill S, Bashir MR, Marin D. CT evaluation of the renal donor and recipient. *Abdom Radiol. (NY)* 2018. DOI: 10.1007/s00261-018-1508-1
 24. Schwarz C, Mühlbacher J, Böhmig GA, Purtic M, Pablik E, Unger L, Kristo I, Soliman T, Berlakovich GA. Impact of ultrasound examination shortly after kidney transplantation. *Eur Surg.* 2017; 49:140-144. DOI: 10.1007/s10353-017-0467-z
 25. Park SB, Kim JK, Cho KS. Complications of renal transplantation: ultrasonographic evaluation. *J Ultrasound Med.* 2007; 26: 615-33. DOI: 10.7863/jum.2007.26.5.615
 26. Irshad A, Ackerman S, Sosnouski D, Anis M, Chavin K, Baliga P. A review of sonographic evaluation of renal transplant complications. *Curr Probl Diagn Radiol.* 2008; 37: 67-79. DOI: 10.1067/j.cpradiol.2007.06.001
 27. Kumar A, Verma BS, Srivastava A, Bhandari M, Gupta A, Sharma R. Evaluation of the urological complications of living related renal transplantation at a single center during the last 10 years: impact of the Double-J* stent. *J Urol.* 2000; 164: 657-60. DOI: 10.1016/S0022-5347(05)67275-8
 28. Sabnis RB, Singh AG, Ganpule AP, Chhabra JS, Tak GR, Shah JH. The development and current status of minimally invasive surgery to manage urological complications after renal transplantation. *Indian J Urol.* 2016; 32: 186-91. DOI: 10.4103/0970-1591.185100
 29. Hamouda M, Sharma A, Halawa A. Urine Leak After Kidney Transplant: A Review of the Literature. *Exp Clin Transplant.* 2018; 16:90-95. PMID: 29409437
 30. Son H, Heiba S, Kostakoglu L, Machac J. Extraperitoneal urine leak after renal transplantation: the role of radionuclide imaging and the value of accompanying SPECT/CT - a case report. *BMC Med Imaging.* 2010; 10: 23. DOI: 10.1186/1471-2342-10-23
 31. Karam G, Maillet F, Parant S, Soullou JP, Giral-Classe M. Ureteral necrosis after kidney transplantation: risk factors and impact on graft and patient survival. *Transplantation.* 2004; 78: 725-29. DOI: 10.1097/01.TP.0000131953.13414.99
 32. Alberts VP, Idu MM, Legemate DA, Laguna Pes MP, Minnee RC. Ureterovesical anastomotic techniques for kidney transplantation: a systematic review and meta-analysis. *Transpl Int.* 2014; 27: 593-605. DOI: 10.1111/tri.12301
 33. Wilson CH, Rix DA, Manas DM. Routine intraoperative ureteric stenting for kidney transplant recipients. *Cochrane Database Syst Rev.* 2013; CD004925. DOI: 10.1002/14651858.CD004925.pub3
 34. Wilson CH, Rix DA, Manas DM. Routine intraoperative ureteric stenting for kidney transplant recipients. *Cochrane Database Syst Rev.* 2013; CD004925. DOI: 10.1002/14651858.CD004925.pub3
 35. Dinçan A, Tekin A, Turkyilmaz S, Kocak H, Gurkan A, Erdogan O, Tuncer M, Demirbas A. Early and late urological complications corrected surgically following renal transplantation. *Transpl Int.* 2007; 20: 702-707. DOI: 10.1111/j.1432-2277.2007.00500.x
 36. Charlesworth M, Marangoni G, Ahmad N. High ureteric injury following multiorgan recovery: successful kidney transplant with Boari flap ureterocystostomy reconstruction. *Arab J Nephrol Transplant.* 2011; 4: 155-158. DOI: 10.4314/ajnt.v4i3.71028
 37. Shokeir AA, Shamaa MA, Bakr MA, el-Diasty TA, Ghoneim MA. Salvage of difficult transplant urinary fistulae by ileal substitution of the ureter. *Scand J Urol Nephrol.* 1993; 27: 537-540. DOI: 10.3109/00365599309182291
 38. Iezzi R, la Torre MF, Santoro M, Dattesi R, Nestola M, Posa A, Romagnoli J, Citterio F, Bonomo L. Interventional radiological treatment of renal transplant complications: a pictorial review. *Korean J Radiol.* 2015; 16: 593-603. DOI: 10.3348/kjr.2015.16.3.593
 39. Matalon TA, Thompson MJ, Patel SK, Ramos MV, Jensik SC, Merkel FK. Percutaneous treatment of urine leaks in renal transplantation patients. *Radiology.* 1990; 174: 1049-1051. DOI: 10.1148/radiology.174.3.174-3-1049
 40. Campbell SC, Strem SB, Zelch M, Hodge E, Novick AC. Percutaneous management of transplant ureteral fistulas: patient selection and long-term results. *J Urol.* 1993; 150: 1115-1117. DOI: 10.1016/S0022-5347(17)35701-4
 41. Alcaraz A, Bujons A, Pascual X, Juaneda B, Martí J, de la Torre P, Guirado L, Díaz JM, Ribal MJ, Solá R, Villavicencio H. Percutaneous management of transplant ureteral fistulae is feasible in selected cases. *Transplant Proc.* 2005; 37: 2111-14. DOI: 10.1016/j.transproceed.2005.03.118
 42. Rosenthal JT. Surgical management of urological complications after kidney transplantation. *Semin Urol.* 1994; 12: 114-22.