https://doi.org/10.15218/zjms.2024.037

Incidence and management of ureteric stricture in renal transplantation: A local center with ten years of experience

Received: 30/08/2022 Accepted: 03/01/2023

Akram M. Mahmud [1*]

Abstract

Background and objective: Renal transplantation for patients with end-stage renal disease gives better long-term survival results and a better quality of life in comparison with maintenance dialysis. However, some general and urological complications may occur following kidney transplantation. One of those complications is ureteral stricture, but the harm of renal transplant can be avoided when treated in an accurate and timely manner. This study is carried out to determine the incidence of ureteral stricture of renal transplantation, and to appropriately diagnose and treat the conditions.

Methods: A retrospective study extended from July 2011 to February 2021. In this period, 1840 renal transplant performed by our team in Rizgary teaching and Zheen international hospitals, all from living donors.

Results: Among 1840 kidney transplant surgery, 17 patients were only admitted as ureteral stricture post-transplant operation (0.92%) that diagnosed by high serum creatinine in association with hydroureteronephrosis. Hydronephrosis subsided and renal function tests nearly normalized after drainage of transplanted kidney with percutaneous nephrostomy tube. Anastomosis site stricture was observed in 16 patients (94.1%), they were treated by ureteral re-implantation. DJ-stenting and upper ureteric stricture was observed in only one patient (5.9%) that treated through pyeloplasty technique.

Conclusion: Surgical treatment is the best choice of patients with ureteral stricture, post renal transplantation. For low grade stricture, endoscopic treatment may be offered although the rate of success is not high.

Keywords: Ureter; DJ-stent; Lich-Gregoir; Hydronephrosis; Nephrostomy.

Introduction

Renal transplantation is the treatment of choice for patients with end stage renal disease (ESRD). Marked improvements in immunosuppression drugs, surgical techniques and long-term graft function have made kidney transplantation alternative to dialysis.[1] Data from the Organ Procurement and Transplantation Network for transplants show that graft survival at 90 days post transplant was 97% or higher for deceased donor transplants and over 99% for living donor transplants and 1-year survival rate for deceased donor grafts is about 89% and for grafts from living donors is approximately 95%.[2,3]

Renal transplantation is complex procedure that is associated with different types of complications, early and late. Hyperacute rejection of the renal allograft happens in the operation room within hours of the transplant, when the graft becomes mottled and cyanotic. Acute rejection appears within the first 3 months after transplantation and affects approximately 15% of transplanted kidneys.[4]

Chronic rejection may occur more than years after transplantation and is a major cause of allograft loss.[5] Urinary tract infection (UTI) is the most common type bacterial infection in kidney transplant procedures that most of them developed

[1] Department of Urology, College of Medicine, Hawler Medical University, Erbil, Iraq.
Correspondence: akram.mahmud@hmu.edu.krd

https://doi.org/10.15218/zjms.2024.037

at least one infection but only 6.2% having recurrent infections.[6] Urinary fistulas also is common and predominantly occur during the first postoperative month in 2–9% of cases.[7]

Aside from UTI, ureteric stricture is one of the common complications that may occur in renal transplanted patients. The presence of ureteric stricture is responsible for morbidity but has only a limited impact on graft survival when it is treated rapidly.[8] The time of onset of the stricture depends on its etiology. Stenosis either occur early within one to three months after transplantation and the causes are mainly surgical technique and ischemic stricture, or after several years which often related to graft rejection phenomena or chronic infection.[7] Ureteric stricture is generally diagnosed by demonstrating pelvicalyceal dilatation in a context of impaired graft function. The first step of management consists of urinary diversion by a Double-J stent or nephrostomy tube.[9] Retrograde uretero-pyelography allows assessment of the stricture but often ureteric orifice is often difficult to catheterize in this setting.

Anterograde uretero-pyelography may be much easier to perform via a nephrostomy to evaluate the site and length of the ureteric stricture precisely. Nephrostomy is able to preserve graft function in 90–100% of cases and allows recovery of graft function until etiological treatment can be subsequently performed under good conditions.[10] Endoscopic treatment is theoretically simpler to perform and associated with lower morbidity. Simple Double-J stenting has been reported to have a 56% success rate. However, balloon dilatation is associated with a 3-year success rate of 51%.[11]

Endoscopic incisions have been proposed to improve the success rate. They are performed either by holmium laser endoureterotomy, Acucise balloon cutting device or electrocautery with the ‘‘T’’ loop of a resectoscope with the success rate of 79%, 78% and 55% respectively.[9]

A new ureterovesical anastomosis can be performed when the remaining ureter is sufficiently long and well vascularized and when the bladder can be easily mobilized.[12,13] Otherwise the native ureter is used for ureteroureterostomy or pyeloureterostomy.[14, 15]

The immediate postoperative results of endoscopic procedures appear to be very good, but the longer terms results are considerably less favorable for both early stricture (48%) and late stricture (33%).[11]

Recently, different series reported the use of robotic-assisted laparoscopic surgery instead of open surgery.[16] In particular, frail patients or after treatment failure, can be treated by a Double-J stent that must be changed regularly.[17] The use of a self-expanding, silicone-covered, metallic ureteric stent has also been described as an alternative to complex surgery in aim to get a chronic dilatation of the stricture and stabilize the fibrotic tissue.[18]

However, this kind of research studying the postoperative complications of renal transplantation has been carried out in other sites of the world but renal transplantation surgery is relatively new in our region. Also, surgical technique improvement and decreased ischemia time has a great influence on incidence of ureteric stricture. Based on above reasons, this study is aimed to re-evaluate the ureteric stricture post renal transplant through its incidence, risk factors, indicating a best way of management and to compare our results with other transplant centers.

Methods

Study design

This study was designed to investigate retrospectively the renal transplantation in Kurdistan/Erbil during July 2011 and February 2021 in Rizgary Teaching Hospital and Zheen international hospital in Erbil. Among 1840 kidney transplant surgery,17 patients were diagnosed as ureteral stricture post-transplant operation. Kidneys used for transplant surgery in the current study were all taken from living

https://doi.org/10.15218/zjms.2024.037

donors and then followed with at least six months follow-up. Most of the conditions diagnosed during the first 3 months of transplantation and Percutaneous nephrostomy tube placement performed for all the patients for drainage of transplanted kidney and within two weeks antegrade pyelography was also performed for all of them, and treatment plan decided accordingly. Techniques for ureteral re-implantation for all patients were ureteroneocystostomy, extravesical approach using Lich-Gregoir method over DJ-stent placement.

Data collection

The data collection method was based on the patient's identification code and case sheets covering patient age, gender, number of transplantations, and duration of stricture.

All patients were subjected to a full medical history, clinical, laboratory and radiological examinations. Laboratory tests were included, blood group, blood sugar, viral screening, blood urea, serum creatinine, and bleeding time. Measurement of serum creatinine was performed by pre and post-placement of percutaneous nephrostomy. After decompressing the hydronephrosis by percutaneous nephrostomy, the antegrade nephrostogram was performed to detect the exact site and severity of stricture.

Inclusion criteria and Exclusion criteria

Patients with the following criteria were taken under consideration: hydronephrosis on ultrasonography, high serum creatinine, ureteral stricture confirmed by antegrade nephrostogram. Patients with the following criteria were not considered and excluded from the study: hydronephrosis not related to ureteral stricture, high serum creatinine related to the kidney as acute tubular necrosis (ATN), Urine leakage (Fistula), Lymphocele.

Data analysis

Data were descriptively analyzed using the Statistical Package for Social Sciences (SPSS, version 21.0). Significant differences were calculated by Paired T-test and defined as P <0.05.

Results

A total of 17 patients were enrolled in this study. The results showed that the minimum age was 16 years old, the maximum age was 57 years old with a mean age of 42 years old. Two patients were between 16-25 years, one from 26-35, larger group ranged between 36-45 which were 7 patients, second most common age group were from 46-55 and 5 patients were present in this group and finally two patient presents in 56-65 years. Among them 12 patient's gender (70.6%) were male and 5 (29.4%) females (Table 1).

Table1 Age and gender distribution

	No.	(%)
Age (years)		
16-25	2	(11.8)
26-35	1	(5.9)
36-45	7	(41.2)
46-55	5	(29.4)
56-65	2	(11.8)
Gender		
Male	12	(70.6)
Female	5	(29.4)
Total	17	(100.0)

https://doi.org/10.15218/zjms.2024.037

The ureteral stricture lead to dilatation of renal pelvis and ureter, decrease in urine output and increase in renal function tests (Normal range: Blood urea 15-40 mg/dl and serum creatinine 0.8-1.2 mg/dl) that decrease to normal or near to normal and dramatic response in relieving of hydronephrosis after placement of percutaneous nephrostomy, the result of measurement of serum creatinine pre placement of percutaneous nephrostomy was ranges between 1.8 to 4.5 gm/dl with mean of 3.43 mg/dl, and serum creatinine post placement of percutaneous nephrostomy was ranges between 0.7 to 1.9 gm/dl with mean of 1.36 mg/dl (P = 0.069) (Table 2).

The result revealed that the ureteric stricture of sixteen patients (94.1%) diagnosed with distal ureteral stricture and only one patient (5.9%) with proximal ureter by antegrade nephrostogram (Table 3).

The result of current study demonstrated that attempt of antegrade and retrograde endoscopic placement of guide wire and JJ stent failed in 14 cases (82.3%) and succeeds only in three patients (17.7%) with distal ureteric stricture but after the stent removal stricture re-occur in two of them and operation done for them.

Sixteen patients had the following outcomes after the surgical intervention: One patient (5.9%) with proximal ureteral stricture managed with ureteropyelostomy with placement of double J stent. Among the remaining 15 patients, 11 patients (64.7%) managed extravesically by ureteroneocystostomy with excision of the stenotic segment and reimplantation according to Lich-Gregoir procedure through double J stent, four patients (23.5%) managed with ureteroureterostomy (two end to end and other two end to side anastomosis to the native ureter) over double J stent, because of long segment of stricture (Table 4).

Table 2 Pre and post percutaneous nephrostomy serum creatinine

	N	Minimum	Maximum	Mean	Std. Deviation	*P*-value
Pre- PCN serum creatinine	17	1.8	4.5	3.43	0.77	0.069
Post- PCN serum creatinine	17	0.7	1.9	1.36	0.40	

Table 3 Frequency and percent of site of ureteric stricture

Site of stricture	Frequency	(%)
Distal ureter	16	(94.1)
Proximal ureter	1	(5.9)
Total	17	(100.0)

Table 4 Types of surgery, percentage rate and frequency of patients

Types of surgery	Frequency	(%)
Ureteroneocystostomy	11	(64.7)
Ureteroureterostomy	4	(23.5)
Proximal ureter surgery	1	(5.9)
Double J-stent placement	1	(5.9)
Total	17	(100.0)

https://doi.org/10.15218/zjms.2024.037

Discussion

Ureteric stricture is one of the most common surgical complications after kidney transplantation. It has been reported that in large series of cases, the incidence of ureteric obstruction between 1-9%.[19-21] In our centers (Zheen International and Rizgary Teaching Hospitals in Erbil), incidence of ureteric stricture is approximately 1%. There are four causes for complications after transplantation: donor-related, recipient-related, medical management, and surgical technique.[22] These complications include urinary leakage, urinary obstruction, ureteral necrosis, fistulas, infection, malignancies, and calculi.[23] The causes of stricture may be fault techniques during the construction of ureteroneocystostomy as stent-free anastomosis, long ureteric length, tight anastomosis tunnel, or destruction of the lower polar artery that may cause ischemia to the ureter.[21]

The current study demonstrated that the majority of the patients developed a stricture within the first three months after kidney transplantation which is parallel to other studies results.[24-26] However, in one of the patients we followed-up ureteric stricture occurred 9 years after kidney transplantation.

In this study, 94% of the ureteric strictures were localized in the distal third of the ureter and the ureterovesical junction which are the most common locations of obstruction. The cause of stricture in the middle and proximal thirds of the ureter is most often a cicatrized stricture that occurs when the ureter of the kidney transplant is too long.[27]

The finding of current study is in line with other studies, they demonstrated that extravesicular-implantation are superior to intravesical technique in respect to operative time and frequency of complications,[12,28,29] and it is recommended by European Association of Urology 2019 guideline.[14] Our rate of < 1% for urinary stricture was lower than those reported previously.[19-21]

Conclusion

Ureteral stricture is one of the most common complications after kidney transplantation. On the basis of our study we believe that the management of the ureteral stricture must be performed by using a surgical method in order to preserve organ function. For the treatment of ureteral stricture, we recommend the following staged procedures: first, obstruction of the renal transplant should be promptly diagnosed by hydronephrosis on ultrasonography, elevated serum creatinine, and antegrade pyelography. Also, percutaneous nephrostomy is a safe and effective for immediate relief of ureteric obstruction. We also recommend Ureteral stenting for short, low-grade strictures if it is feasible, but open reconstruction is recommended for high-grade strictures with higher success rates. Large-scale studies are required in order to identify which treatment modality is more favorable.

Funding

Not applicable.

Competing interests

The author declares that he has no competing interests.

References

1. Farr M, Truby LK, Lindower J, Jorde U, Taylor S, Chen L, et al. Potential for donation after circulatory death heart transplantation in the United States: Retrospective analysis of a limited UNOS dataset. Am J Transplant 2020; 20(2):525–9. doi: 10.1111/ajt.15597
2. Matas AJ, Smith JM, Skeans MA, Thompson B, Gustafson SK, Stewart DE, et al. OPTN/SRTR 2013 Annual Data Report: kidney. Am J Transplant 2015; 15 Suppl 2:1–34. doi: 10.1111/ajt.13195
3. Hart A, Lentine KL, Smith JM, Miller JM, Skeans MA, Prentice M, et al. OPTN/SRTR 2019 Annual Data Report: Kidney. Am J Transplant. 2021; 21 Suppl 2:21–137. doi: 10.1111/ajt.16502
4. Solez K. History of the Banff classification of allograft pathology as it approaches its 20th year. Curr Opin Organ Transplant. 2010; 15(1):49–51. doi: 10.1097/MOT.0b013e328334fedb

5. Hassanein M, Augustine JJ. Chronic Kidney Transplant Rejection. StatPearls [Internet]: StatPearls Publishing; 2021.
6. Tawab KA, Gheith O, Al Otaibi T, Nampoory N, Mansour H, Halim MA, et al. Recurrent urinary tract infection among renal transplant recipients: risk factors and long-term outcome. Exp Clin Transplant 2017; 15(2):157–63. doi: 10.6002/ect.2016.0069
7. Kumar S, Ameli-Renani S, Hakim A, Jeon JH, Shrivastava S, Patel U. Ureteral obstruction following renal transplantation: causes, diagnosis and management. Br J Radiol 2014; 87(1044):20140169. doi: 10.1259/bjr.20140169
8. Giessing M. Transplant ureter stricture following renal transplantation: surgical options. Transpl Proc 2011; 43(1):383–6. Epub 2011/02/22. doi: 10.1016/j.transproceed.2010.12.014
9. Duty BD, Barry JM. Diagnosis and management of ureteral complications following renal transplantation. Asian J Urol 2015; 2(4):202–7. doi: 10.1016/j.ajur.2015.08.002
10. Fonio P, Appendino E, Calandri M, Faletti R, Righi D, Gandini G. Treatment of urological complications in more than 1,000 kidney transplantations: the role of interventional radiology. Radiol Med 2015; 120(2):206–12. doi: 10.1007/s11547-014-0407-y
11. 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(3):186–91. Epub 2016/08/25. doi: 10.4103/0970-1591.185100
12. Kayler L, Kang D, Molmenti E, Howard R. Kidney transplant ureteroneocystostomy techniques and complications: review of the literature. Transplant Proc 2010; 42(5):1413–20. doi: 10.1016/j.transproceed.2010.04.016
13. 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(6):593–605. doi: 10.1111/tri.12301
14. Breda A OJ, Budde K, Figueiredo A, LledóGarcía E, Olsburgh J, Regele H, et al. EAU guidelines on renal transplantation. Edn. presented at the European Association of Urology Annual Congress Barcelona 2019. [Available from: https://uroweborg/guideline/renal-transplantation/ Accessed June 2022.
15. Suttle T, Fumo D, Baghmanli Z, Saltzman B, Ortiz J. Comparison of Urologic Complications Between Ureteroneocystostomy and Ureteroureterostomy in Renal Transplant: A Meta -Analysis. Exp Clin Transplant: Official Journal of the Middle East Society for Organ Transplantation 2016; 14(3):276–81. doi: 10.6002/ect.2015.0161
16. Benamran DA, Klein J, Hadaya K, Wirth GJ, Martin PY, Iselin CE. Post-kidney Transplant Robot-assisted Laparoscopic Ureteral (Donor-receiver) Anastomosis for Kidney Graft Reflux or Stricture Disease. Urol 2017; 108:96–101. Epub 2017/07/02. doi: 10.1016/j.urology.2017.05.033
17. Chatterjee S, Swamy PS, Hedau S, Mathur P, Bain J, Raju KP. Post-transplantation surgical complications in renal transplant recipient patients–An institution based prospective study. Indian J Transpl 2016; 10(3):65–9.
18. Cao C, Kim JW, Shin JH, Li M, Hong B, Kim YH, et al. Temporary Covered Metallic Ureteral Stent Placement for Ureteral Strictures following Kidney Transplantation: Experience in 8 Patients. J Vasc Interv Radiol 2020; 31(11):1795–800. doi: 10.1016/j.jvir.2020.04.004
19. Black AJ, Harriman D, Nguan C. Contemporary risk factors for ureteral stricture following renal transplantation. Can Urol Assoc J 2022; 16(6):E321–E7. doi: 10.5489/cuaj.7648
20. Minkovich M, Famure O, Li Y, Ghanekar A, Selzner M, Kim SJ, et al. Ureteral strictures post-kidney transplantation: Trends, impact on patient outcomes, and clinical management. Can Urol Assoc J 2021; 15(10):E524–E30. doi: 10.5489/cuaj.7003
21. Pereira H, Buchler M, Brichart N, Haillot O, d'Arcier BF, Braguet R, et al. Ureteral stenosis after renal transplantation: Risk factors and impact on survival. Prog Urol 2011; 21(6):389–96. doi: 10.1016/j.purol.2010.11.002
22. Eufrásio P, Parada B, Moreira P, Nunes P, Bollini S, Figueiredo A, et al., editors. Surgical complications in 2000 renal transplants. Transplant Proc 2011; 43(1):142–4. doi: 10.1016/j.transproceed.2010.12.009
23. Cicerello E, Merlo F, Mangano M, Cova G, Maccatrozzo L. Urolithiasis in renal transplantation: diagnosis and management. Arch Ital Urol Androl 2014; 86(4):257–60. doi: 10.4081/aiua.2014.4.257
24. Uflacker A, Sheeran D, Khaja M, Patrie J, Elias G, Saad W. Outcomes of percutaneous management of anastomotic ureteral strictures in renal transplantation: chronic nephroureteral stent placement with and without balloon dilatation. Cardiovasc Intervent Radiol 2015; 38(3):693–701. doi: 10.1007/s00270-014-0952-8
25. Pike TW, Pandanaboyana S, Hope-Johnson T, Hostert L, Ahmad N. Ureteric reconstruction for the management of transplant ureteric stricture: a decade of experience from a single centre. Transpl Int 2015; 28(5):529–34. doi: 10.1111/tri.12508
26. Kroczak T, Koulack J, McGregor T, editors. Management of complicated ureteric strictures after renal transplantation: case series of pyelovesicostomy with Boari flap. Transplant Proc 2015; 47(6):1850–3. doi: 10.1016/j.transproceed.2015.02.020

27. Gil-Sousa D, Oliveira-Reis D, Teves F, Príncipe P, Castro-Henriques A, Soares J, et al., editors. Ureteral stenosis after renal transplantation—a single-center 10-year experience. Transpl Proc 2017; 49(4):777–82. doi: 10.1016/j.transproceed.2017.01.050
28. Baston C, Harza M, Preda A, Gener I, Manea I, Voinea S, et al. Comparative urologic complications of ureteroneocystostomy in kidney transplantation: transvesical Leadbetter-Politano versus extravesical Lich-Gregoir technique. Transpl Proc 2014; 46(1):176–9. doi: 10.1016/j.transproceed.2013.12.003
29. Slagt IK, Dor FJ, Tran TC, Kimenai HJ, Weimar W, Ijzermans JN, et al. A randomized controlled trial comparing intravesical to extravesical ureteroneocystostomy in living donor kidney transplantation recipients. Kidney Int 2014; 85(2):471–7. doi: 10.1038/ki.2013.464