Symbiosis

www.symbiosisonline.org
www.symbiosisonlinepublishing.com

Review Article | Journal of Urology and Nephrology Open Access | Open Access

Management of Urine Leak Following Renal Transplantation: An Evidence-Based Approach

Rajan Veeratterapillay[1,2], Ajay Sharma[2,3] and Ahmed Halawa[2,4*]

[1]*Freeman Hospital, Newcastle Upon Tyne, UK*

[2]*Faculty of Health and Science, Institute of Learning and Teaching, University of Liverpool, UK*

[3]*Royal Liverpool University Hospital, Liverpool, UK*

[4]*Sheffield Teaching Hospitals, Sheffield, UK*

Received: July 23, 2018; Accepted: July 31, 2018; Published: August 14, 2018

***Corresponding author:** Ahmed Halawa, Consultant Transplant Surgeon, Sheffield Teaching Hospitals Senior Lecturer, University of Liverpool,UK; Tel: 00447787542128; E-mail: ahmed.halawa@sth.nhs.uk*

Abstract

Renal transplantation [RT] is associated with a significant rate of surgical complications which contribute to patient morbidity and can result in graft loss. Urological complications occur in 9% of RT and account for a significant proportion of surgical problems. They are thought to be related to the quality of the ureterovesical anastomosis and that of the donor ureter. Urological problems can occur in the early postoperative period [most often comprising of urinary leaks and ureteric obstruction/compression] or occur late [mainly comprising of ureterovesical anastomosis stenosis or vesicoureteric reflux]. From a clinical perspective, an elevated drain output in the early postoperative phase should alert to the possibility of a surgical complication [including haematoma, lymphocele or urinary fistula]. Biochemical analysis of the drain fluid is vital to confirm the diagnosis of urinary fistula. Imaging studies including ultrasonography, computed tomography and cystography can be helpful in diagnosis although the gold standard diagnostic test is a nephrostomy and antegrade pyeloureterogram if the graft is hydronephrotic. About two thirds of patients can be successfully treated with maximal decompression [catheter/drain/nephrostomy with or without stenting]. However, failures of this approach or large volume leaks require open exploration and reconstruction.

Keywords: Renal Transplantation; Complication; Urinary Fistula;

Introduction

Renal transplantation [RT] is the treatment of choice for patients with ESRD as it offers significant survival benefit and improved quality of life compared to maintenance dialysis [1]. RT is however associated with a significant rate of surgical complications which contribute to patient morbidity and can result in graft loss [2]. A large hospital database analysis of 4500 RT across 20 UK transplant centres revealed an overall surgical complication rate of 22.3% [including urological 7%, vascular 3%, wound 5.3% and graft nephrectomy 1.9%][3]. Urological complications account for a significant proportion of surgical problems and are associated with patient morbidity although infrequently result in graft loss. They are thought to be related to the quality of the ureterovesical anastomosis and that of the donor ureter[4, 5].Urological problems can occur in the early postoperative period [most often comprising of urinary leaks and ureteric obstruction/compression] or occur late [mainly comprising of ureterovesical anastomosis stenosis or vesicoureteric reflux][6]. Urological complications have been reported in large case series such as that by Streeter et al [2002] who noted a 9.2% complication rate in over 1500 RT [urine leak 2.9%, ureteric obstruction 3%] [7]. A further study of over 1600 RT reported a urological complication rate of 8% [8]. From a clinical perspective, an elevated drain output in the early postoperative phase should alert to the possibility of a surgical complication [including haematoma, lymphocele or urinary fistula]. In this report the causes of an elevated drain output post RT will be discussed and examined. In this article; the differential diagnosis of elevated drain output will be considered and then more specifically the management of postoperative urine leak will be discussed in light of available literature. The importance of clinical assessment, radiological imaging and biochemical result of drain fluid will be highlighted.

Differential Diagnosis of Elevated Drain Output Post RT

Collections post RT can be the result of bleeding, urine leakage or lymphocele all of which can further be complicated by infection especially in a patient on immunosuppression

Post-Operative Bleeding

Haematoma formation is not an uncommon finding after RT especially in patients receiving antiplatelet agents or those on anticoagulation [9]. Patients with active bleeding can be haemodynamically unstable with a high bloody drain output. Patients would typically show evidence of tachycardia, hypotension and falling haemoglobin. However, this may not always be the case and presentation can be more insidious with

slowly falling haemoglobin with evidence of delayed graft function [the drain output may not be elevated if the drain is blocked with clots]. Imaging can be helpful in confirming the diagnosis of bleeding. A Doppler USS would show an echoic collection although it is worth noting that USS may miss a haematoma[10]. A CT with angiogram phase is more useful but carries a small risk of contrast nephropathy [11]. In an unstable patient with suspicion of bleeding post RT, urgent surgical exploration is warranted as delaying this to obtain imaging may result in poor patient outcome. In cases of diagnostic doubt, imaging plays an important role.

Lymphocele

This is lymph collection around the transplanted kidney and incidence has been reported between 1-15% [12]. Lymphoceles are thought to arise due to injury to lymphatic channels around the recipient iliac vessels during dissection or in the graft kidney hilum [13, 14]. Lymphoceles typically present the second week following RT with ongoing elevated drain output with biochemistry of the drain fluid being similar to serum i.e. comparable level of potassium and creatinine. The use of routine post-operative USS has led to an increased detection of asymptomatic lymphoceles which do not generally require intervention [15]. However, large lymphoceles can cause complications such as ureteric compression leading to delayed graft function.

Interventions for lymphoceles include prolonged percutaneous drainage [which can carry a recurrence rate of up to 50%] or surgery [16].Surgical techniques traditionally comprised open drainage with creation of a large internal window to allow intraperitoneal drainage. Laparoscopic fenestration for lymphoceles is now accepted as a safe alternative to open surgery if no contraindications to this minimally invasive approach exist [17, 18].

Urine Leak

Urinomas complicate 2-6% of renal transplants [19]. They usually present in the early postoperative period with clinical features including high drain output, reduced urine output, prolonged wound leakage or delayed graft function. The diagnosis of urine leak is confirmed by biochemical analysis of drain fluid which will have a high creatinine and potassium level compared to a concurrent serum sample. USS usually shows an anechoic collection without septation[20].

Urine Leak Post-Transplant – Clinical, Biochemical and Radiological Features

Urine leaks occur most commonly within the first 2 weeks post-surgery [21]. A blocked urethral catheter can be the causative factor as it leads to high intravesical pressures in presence of a newly formed ureteroneocystostomy - this should be promptly identified [by flushing the catheter] as it is an easily corrected cause of urinary fistula. The commonest urine leak site is the ureteroneocystostomy[22]. Routine prophylactic ureteric stenting reduces the risk of urological complications following RT. A Cochrane systematic review of 7 RCT [over 1100 patients] found a 76% reduction in the rate of urological complications in stented patients [the stented group was however associated with a higher UTI rate] [23].

Other potential sites for urine leaks include the transplant ureter, the renal pelvicalyceal system or the bladder itself [19]. Urine leaks generally arise as a result of technical failure [which manifests clinically within the first 24-48h post operatively] or due to ureteric ischemia/necrosis [here clinical presentation is delayed and typically happens 1-2 weeks postop][6, 24]. Ureteric ischemia can be caused by long ureteric length or devascularisation of the peri-ureteric tissue during back benching. Ligation of a lower pole vessel can also contribute to ureteric ischaemia[24]. Therefore, from a technical perspective, prevention of ureteric ischaemia involves using a shorter length of ureter, avoiding stripping the ureter and preserving lower polar vessels. Rarely, urine leaks can arise proximally in the transplanted ureter due to perforation during intraoperative placement of a ureteric stent. Another uncommon cause is calyceal leak which could be due to local ischaemia following polar artery ligation [25].

From a clinical perspective, an elevated drain output [with high creatinine compared to serum] is the hallmark of a urinary fistula post RT. This may also be accompanied by a reduced urine output, wound fluid leakage and delayed graft function. Imaging with USS can show an anechoic collection but would not be diagnostic of a urinoma [this requires knowledge of the fluid biochemistry]. In addition, large urinomas can ureteric compression leading to graft hydronephrosis which is easily detected on ultrasonography [20]. CT scan with contrast [needs delayed phase imaging] may show the site of the urine leak, however there are risks to contrast nephropathy associated with CT imaging in this setting especially in the presence of delayed graft function[26]. A cystogram can show the presence of a bladder injury or leak from the ureteroneocystotomy[27]. Nephrostomy and antegrade ureteropyelogram [see Figure 1] is

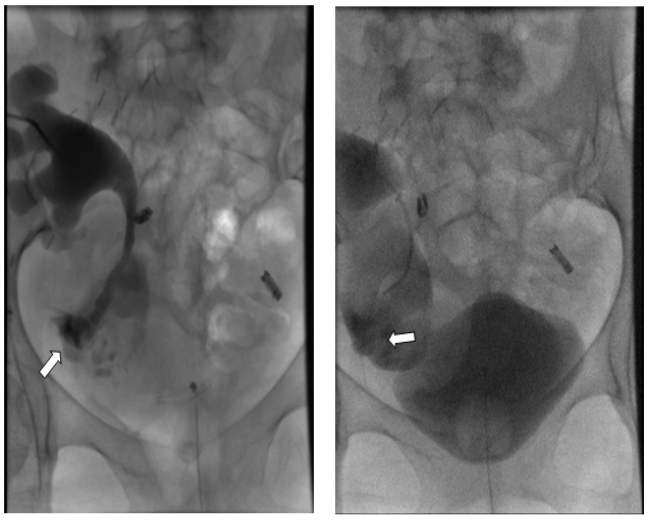

Figure 1: Antegrade nephrostogram post RT showing urine leak
A- Arrow shows site of urine leak
B- Arrow showing large urinoma

considered the gold standard imaging to identify the source of leak but generally requires the present of a hydronephrotic graft [28, 29]. Table 1 summarises the key radiological investigations in diagnosing urine leak

Table 1: Radiological investigations for suspected urine leak post renal transplant

Imaging modality	Utility and pitfalls
Ultrasound	• Cheap and easy access • Urinoma appears as anechoic peri-graft collection • Not diagnostic for urinoma and does not show leak site
Computed tomography	• Can diagnose urine leak and potentially site (on delayed phase) • Risk of contrast nephropathy
Cystogram	• Can show urine leak at ureterovesical anastomosis/ bladder
Nephrostomy and antegrade study	• Excellent visualisation of site and degree of leak • Requires a hydronephrotic graft to perform • Invasive procedure with risk of graft injury

Management of Urine Leak

Figure 2 summarises the treatment for urine leaks. The principles of management include initial maximal decompression of the urinary system which is achieved by placement of urethral catheter together with a nephrostomy or ureteric stent [30]. The drain is left in situ to control the urinary fistula. For patients who have not responded to this approach or those with extensive extravasation, surgical exploration is required to reimplant the transplant ureter[31].

In the absence of hydronephrosis in patients with ureteric stents in situ, simple conservative management with prolonged drainage with catheter/drain may be successful but retrograde change of the stent may be required [6, 29]. When hydronephrosis is associated with a small urine leak, percutaneous nephrostomy [PCN] placement allows diversion of urine away from the leak site and healing to occur. PCN is a safe and effective procedure for the treatment of ureteric obstruction / urinary fistula post-transplant[32].In a large retrospective series of 100 RT from a European centre, 2.9% developed urinary fistulae within 72h of RT and 55% of those were managed with nephrostomy drainage [the remaining 45% had open surgery]. Nephrostomy placement [with or without stenting] resulted in a 62.5% resolution of the fistula [33].

Open exploration remains the treatment of choice for patients who have failed management with maximal decompression, those with large volume extravasation or proximal fistulae [6, 19]. For large volume extravasation presenting within the first 24h postop due to technical failure of the ureterovesical anastomosis, open re-anastomosis should be performed over a ureteric stent [if this was not previously sited]. For patients with ureteric necrosis presenting later, resection of the necrotic part and reimplantation is required. If the length of the remaining ureter is short, reconstruction using a Boari flap or use of the native ureter should be considered [34].

Conclusion

Urinary fistula should be borne in mind in the presence of an elevated drain output in the early post-operative RT period. Biochemical analysis of the drain fluid is vital to confirm the diagnosis. About two thirds of patients can be successfully treated with maximal decompression [catheter/drain/nephrostomy with or without stenting]. However, failures of this approach or large volume leaks require open exploration and reconstruction.

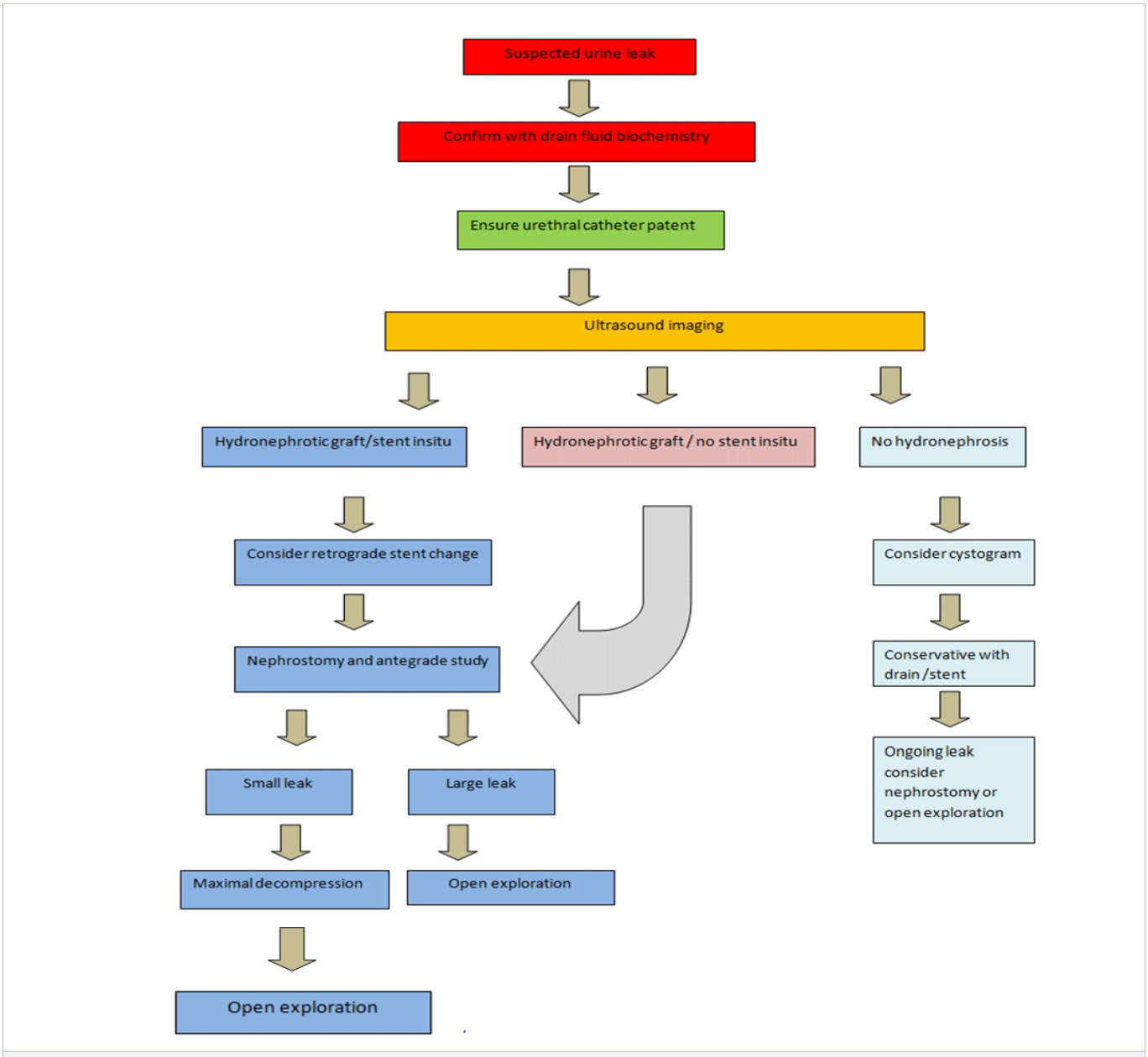

Figure 2: Flowchart for management of urine leak post renal transplant

References

1. Tonelli M, Wiebe N, Knoll G, Bello A, Browne S, Jadhav D, et al. Systematic review: kidney transplantation compared with dialysis in clinically relevant outcomes. Am J Transplant. 2011;11(10):2093-2109. Doi: 10.1111/j.1600-6143.2011.03686.x
2. Humar A and Matas AJ. Surgical complications after kidney transplantation. Semin Dial. 2005;18(6):505-510. Doi: 10.1111/j.1525-139X.2005.00097.x
3. Fotheringham J, Campbell M, El-Nahas M, Shretha B, McKane W. Surgical Complication Rates in Patients Receiving Kidney Transplants in England: Analysis by Transplant Centre Using Linked Registry and Hospitalisation Data. Am J Transplant. 2013;13(5).
4. Ghasemian SM, Guleria AS, Khawand NY, Light JA. Diagnosis and management of the urologic complications of renal transplantation. Clin Transplant. 1996;10(2):218-223.
5. Hau HM, Tautenhahn HM, Schmelzle M, Krenzien F, Schoenberg MB, Morgul MH, et al. Management of urologic complications in renal transplantation: a single-center experience. Transplant Proc. 2014;46(5):1332-1339. Doi: 10.1016/j.transproceed.2014.04.002
6. Branchereau J and Karam G. Management of Urologic Complications of Renal Transplantation. European urology supplements. 2016;15(9):408-414. Doi: 10.1016/j.eursup.2016.08.001
7. Streeter EH, Little DM, Cranston DW, Morris PJ. The urological complications of renal transplantation: a series of 1535 patients. BJU Int. 2002;90(7):627-634.

8. Lempinen M, Stenman J, Kyllonen L, Salmela K. Surgical complications following 1670 consecutive adult renal transplantations: A single center study. Scand J Surg. 2015;104(4):254-259. Doi: 10.1177/1457496914565419
9. Ringenberg T, Desanto H, Opsha Y, Costello J, Schiller D. Evaluation of bleeding rates in renal transplant patients on therapeutic intravenous heparin. Hosp Pharm. 2013;48(11):936-957. Doi: 10.1310/hpj4811-936
10. Horrow MM. Sonographic Detection of Perirenal Transplant Hematomas. AJR Am J Roentgenol. 2016;206(4):58. Doi: 10.2214/AJR.15.15723
11. Kirbas I, Tutar NU, Emiroglu FK, Coskun M, Haberal M. Multidetector computed tomography angiography in detection of active bleeding in renal and liver transplant recipients. Transplant Proc. 2007;39(4):1111-1115. Doi: 10.1016/j.transproceed.2007.04.005
12. Choudhrie AV, Kumar S, Gnanaraj L, Devasia A, Chacko N, Kekre NS. Symptomatic lymphocoeles post renal transplant. Saudi J Kidney Dis Transpl. 2012;23(6):1162-1168. Doi: 10.4103/1319-2442.103554
13. Mihaljevic AL, Heger P, Abbasi Dezfouli S, Golriz M, Mehrabi A. Prophylaxis of lymphocele formation after kidney transplantation via peritoneal fenestration: a systematic review. Transpl Int. 2017;30(6):543-555. Doi: 10.1111/tri.12952
14. Golriz M, Klauss M, Zeier M, Mehrabi A. Prevention and management of lymphocele formation following kidney transplantation. Transplant Rev (Orlando). 2017;31(2):100-105. Doi: 10.1016/j.trre.2016.11.001
15. Kim N, Juarez R, Levy AD. Imaging non-vascular complications of renal transplantation. Abdom Radiol (NY). 2018. Doi: 10.1007/s00261-018-1566-4
16. Kim JK, Jeong YY, Kim YH, Kim YC, Kang HK, Choi HS. Postoperative pelvic lymphocele: treatment with simple percutaneous catheter drainage. Radiology. 1999;212(2):390-394. Doi: 10.1148/radiology.212.2.r99au12390
17. Bailey SH, Mone MC, Holman JM, Nelson EW. Laparoscopic treatment of post renal transplant lymphoceles. Surg Endosc. 2003;17(12):1896-1899. Doi: 10.1007/s00464-003-8814-5
18. Hsu TH, Gill IS, Grune MT, Andersen R, Eckhoff D, Goldfarb DA, et al. Laparoscopic lymphocelectomy: a multi-institutional analysis. J Urol. 2000;163(4):1096-1098.
19. Hamouda M, Sharma A, Halawa A. Urine Leak after Kidney Transplant: A Review of the Literature. Exp Clin Transplant. 2018;16(1):90-95.
20. Titton RL, Gervais DA, Hahn PF, Harisinghani MG, Arellano RS, Mueller PR. Urine leaks and urinomas: diagnosis and imaging-guided intervention. Radiographics. 2003;23(5):1133-1147. Doi: 10.1148/rg.235035029
21. Dinckan A, Tekin A, Turkyilmaz S, Kocak H, Gurkan A, Erdogan O, et al. Early and late urological complications corrected surgically following renal transplantation. Transpl Int. 2007;20(8):702-707. Doi: 10.1111/j.1432-2277.2007.00500.x
22. Englesbe MJ, Dubay DA, Gillespie BW, Moyer AS, Pelletier SJ, Sung RS, et al. Risk factors for urinary complications after renal transplantation. Am J Transplant. 2007;7(6):1536-1541. Doi: 10.1111/j.1600-6143.2007.01790.x
23. Wilson CH, Bhatti AA, Rix DA, Manas DM. Routine intraoperative ureteric stenting for kidney transplant recipients. Cochrane Database Syst Rev. 2005;19(4):CD004925. Doi: 10.1002/14651858
24. Nie ZL, Zhang KQ, Li QS, Jin FS, Zhu FQ, Huo WQ. Treatment of urinary fistula after kidney transplantation. Transplant Proc. 2009;41(5):1624-1626. Doi: 10.1016/j.transproceed.2008.10.103
25. Singh SK, Sakhuja V, Sharma SK, Mandal AK, Gupta KL, Kohli HS, et al. Unusual causes of ureteral obstruction in renal allografts: case reports. Transplant Proc. 2003;35(1):337-338.
26. Sebastia C, Quiroga S, Boye R, Cantarell C, Fernandez-Planas M, Alvarez A. Helical CT in renal transplantation: normal findings and early and late complications. Radiographics. 2001;21(5):1103-1117. Doi: 10.1148/radiographics.21.5.g01se131103
27. Jaeger P. Problems concerning the bladder in renal transplantation. Prognosis--replacement possibilities. Urol Int. 1992;49(2):94-98. Doi: 10.1159/000282401
28. Campbell SC, Streem SB, Zelch M, Hodge E, Novick AC. Percutaneous management of transplant ureteral fistulas: patient selection and long-term results. J Urol. 1993;150(4):1115-1117.
29. 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
30. Duty BD, Conlin MJ, Fuchs EF, Barry JM. The current role of endourologic management of renal transplantation complications. Adv Urol. 2013;1-6. Doi:10.1155/2013/246520
31. 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):529-534. Doi: 10.1111/tri.12508
32. Mostafa SA, Abbaszadeh S, Taheri S, Nourbala MH. Percutaneous nephrostomy for treatment of posttransplant ureteral obstructions. Urol J. 2008;5(2):79-83.
33. Alcaraz A, Bujons A, Pascual X, Juaneda B, Marti J, de la Torre P, et al. Percutaneous management of transplant ureteral fistulae is feasible in selected cases. Transplant Proc. 2005;37(5):2111-2114. Doi: 10.1016/j.transproceed.2005.03.118
34. Boonjindasup A, Smith A, Paramesh A, Rittenberg D, Buell J, Killackey M, et al. A Rationale to Use Bladder Boari Flap Reconstruction for Late Kidney Transplant Ureteral Strictures. Urology. 2016;89:144-149. Doi: 10.1016/j.urology.2015.10.028