Acta Clin Croat (Suppl. 2) 2023; 62:127-131
doi: 10.20471/acc.2023.62.s2.18

Case Report

FLEXIBLE URETERORENOSCOPY AND LASER LITHOTRIPSY IN A PATIENT WITH A STONE IN THE TRANSPLANTED KIDNEY: A CASE REPORT

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SUMMARY – We report a case of a 31-year-old patient with obstructive ureterolithiasis in a transplanted kidney, treated endoscopically with flexible ureterorenoscopy and laser lithotripsy. The patient presented with biochemical signs of acute renal failure and ultrasonographically detected hydronephrosis. Emergency nonenhanced computed tomography scan revealed an obstructive 5-mm stone in the ureter of the transplanted kidney with resulting hydronephrosis. The patient received a double J stent to relieve allograft obstruction. Since the stone size was deemed favorable for conservative treatment, the patient was discharged. Two months later, he was readmitted for leucopenia caused by mycophenolate mofetil. After recuperation of his white blood cell count, he was referred to extracorporeal shock wave lithotripsy, but since the stone was radiolucent, an endoscopic procedure was indicated. Retrograde endoscopic flexible ureterorenoscopy with 'dusting' of the stone was successfully performed. One year after the procedure, the patient was stone free and with good allograft function.

Key words: *Renal allograft lithiasis; Flexible ureterorenoscopy*

Introduction

Renal transplantation is the optimal treatment option for patients with end-stage renal disease. Urolithiasis is an uncommon complication after renal transplantation with the incidence being reported around 1%[1,2]. Many metabolic and urodynamic risk factors have been shown to induce the formation of stone in the allograft after transplantation[3]. Stone formation is facilitated by urine stasis which can occur in the case of stenosis at the site of ureteric implantation to the bladder or due to an ischemic lesion of the ureter during explantation. It can also be facilitated by repeated urinary tract infections, secondary hyperparathyroidism, or metabolic disorders such as hypercalciuria, hyperuricuria, or hypocitraturia which can be induced by some immunosuppressive drugs. In all reported series, calcium oxalate monohydrate stones were most common, followed by infectious and uric acid stones[4]. Allograft stones can also be 'donor gifted', which is most common in the cases of cadaveric kidney transplantation[5]. Clinical presentation of an obstructive renal allograft stone is not classic renal colic due to the lack of organ innervation. In many cases, the main findings are anuria, oliguria, and elevated serum creatinine, but fever and sepsis can also be present due to infection and obstructive pyelonephritis. Methods of treatment depend on the stone size and location. Since the patient with transplanted kidney usually has only one functioning organ, emergency drainage of the allograft is the first

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step (either with percutaneous nephrostomy (PNS) or a double J stent) followed by definitive treatment (extracorporeal shock wave lithotripsy (ESWL), percutaneous nephrolithotripsy (PCNL), endoscopy, or rarely open surgery).

Case Report

A 31-year-old patient whose renal failure was due to polycystic kidney disease and had received a cadaveric renal transplant two months before presenting to the emergency department with oliguria and a rise in serum creatinine level. Ultrasound and later non-enhanced computed tomography (CT) of the pelvis was done, which revealed grade III hydronephrosis of the allograft caused by a 5-mm stone in the ureter. Laboratory tests showed an elevated serum creatinine level of 210 μmol/L. Upon admission, a double J stent was placed in the transplanted ureter to ensure proper drainage of the kidney. Given the size and position of the stone, there was a reasonably high chance of spontaneous elimination, so conservative approach was taken. The patient was discharged from the urology department with a double J stent in place. After two months, the stone did not pass spontaneously and was radiolucent on native x-ray imaging, which made ESWL difficult, so we decided to perform retrograde flexible ureteroscopy. The patient was in spinal anesthesia and was placed in a supine lithotomy position. After removal of the JJ stent, a 0.038-inch hydrophilic guidewire was introduced into the ureter using a 70° lens cystoscope and a 6 Fr torque ureteral catheter,

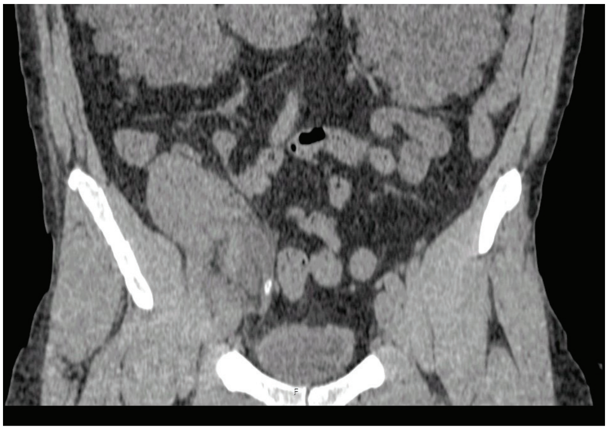

Fig. 1. Computed tomography scan of the obstructing stone in the ureter of the allograft.

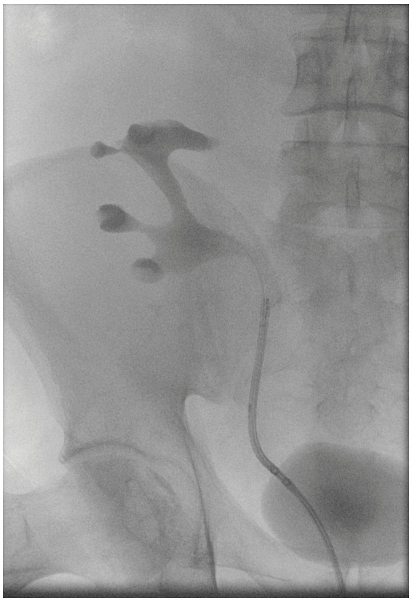

Fig. 2. Retrograde ureteropyelography during flexible ureterorenoscopy.

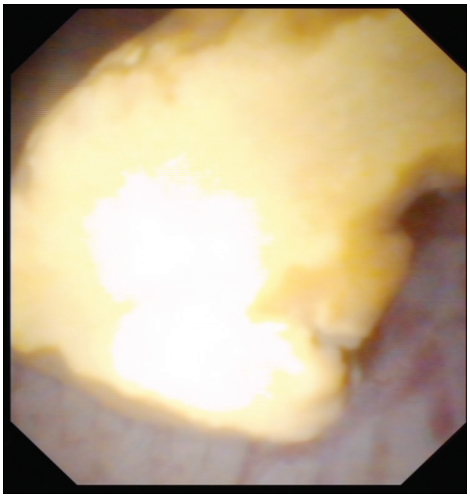

Fig. 3. Stone in renal allograft before dusting.

which enabled us to position the guidewire. During transplantation, ureteroneocystostomy was performed using an extravesical technique in which the ureter is directly anastomosed to the bladder without tunneling using so-called full-thickness anastomosis, which greatly facilitated intubation of the ureter with a JJ stent and performance of the endoscopic procedure after. Using the guidewire, we managed to position the 8.4 Fr Olympus flexible ureteroscope into the ureter. During manipulation, the stone migrated to the kidney, so we positioned the instrument proximally using the guidewire to straighten the ureter and facilitate the progression of the flexible ureteroscope. After radiographic confirmation of the position and visualization of the stone in the transplanted kidney, HoYag laser dusting lithotripsy was performed using a 200-μm laser fiber, energy was set to 0.5 J and frequency to 15 Hz. After complete disintegration of the stone, a double J stent was placed over the guidewire which was placed into the allograft over the working channel of the flexible ureteroscope during extraction of the instrument. Two weeks later, the JJ stent was removed, and the ultrasound examination showed complete stone clearance. During one-year follow up, the patient was stone free and with a satisfactory allograft function.

The patient provided signed informed consent for publication of the case report and accompanying images. Consent to conduct and publish the study was obtained from the Ethics Board of the Zagreb University Hospital Center, Zagreb, Croatia.

Discussion

Transplant recipients often have predisposing conditions for developing urolithiasis, such as hyperfiltration, excessively alkaline urine, renal tubular acidosis, recurrent urinary tract infections, and increased serum calcium caused by persistent secondary hyperparathyroidism. Furthermore, in renal transplant patients who have urolithiasis we can frequently diagnose metabolic disorders such as hyperuricemia and hyperparathyroidism. Despite all this, the incidence of *de novo* urolithiasis in renal transplant recipients is low. In the case of a renal transplant recipient who presents with graft nephrolithiasis, two different situations may be observed, i.e., a kidney with 'donor gifted' stone, and *de novo* stone formation in the allograft. Since the introduction of CT to assess the kidneys of living donors, it has been found that a significant proportion of potential donors have clinically invisible kidney stones with an incidence of up to 10%[6]. Usually, potential donors are excluded from donation if they have medical history of recurrent urolithiasis or have a metabolic disease which increases the chance of stone formation in the solitary kidney after nephrectomy[7]. It is generally agreed that non-symptomatic stones under 4 mm in diameter could be left *in situ* and the kidney can be safely transplanted[8-11].

In a living donor situation where the stone is larger than 4 mm, three options exist:

1) treating the stone before explantation,
2) *ex vivo* prior to transplant, and
3) in the case of a stone that was not detected during donor workup, after transplantation.

The method of treatment of living donor lithiasis before explantation is dependent on the size and location of the stone. Recently, numerous authors have shown the feasibility and safety of *ex vivo* stone extraction just before transplantation[12-15]. This can be achieved either by ureteroscopy or in cases of larger stones using a smaller nephroscope through pyelothomy. The procedure does not significantly prolong cold ischemia time nor does it increase the incidence of potential complications. Potential cadaveric donors in general are not systematically screened for renal lithiasis[5]. With that in mind, our patient probably received the stone together with the allograft, given the fact that only two months had passed since the cadaveric transplantation. As mentioned before, renal allograft is not innervated, which can obscure clinical presentation of obstructive urolithiasis. The stone is usually found during routine ultrasonography or in diagnostic procedures for other complications such as fever, infection, hematuria, and/or renal dysfunction. In our patient, renal dysfunction (elevated serum creatinine) led to ultrasound, which revealed allograft hydronephrosis, and CT scan performed after elucidated the cause of hydronephrosis. After alleviating the obstruction, either by placing a PNS or JJ stent, definitive stone management must be performed. The treatment of kidney transplant calculus may be challenging because of the extra-anatomic location of the allograft. The treatment options for renal allograft stone which exceeds 4 mm in diameter include ESWL, endoscopic, percutaneous or open surgical approach. In the case of our patient, we initially opted for conservative approach because of the relatively small stone size (5 mm) and the fact that we routinely anastomose the ureter extravesically without tunneling. The ureter is relatively short and directly anastomosed to the bladder without forming an intramural angle that is present in the Lich-Gregoir reimplantation method, which can potentially impair spontaneous elimination of the stone. ESWL can be a good option for non-obstructive stones up to 15 mm[16,17]. Pelvic bones can complicate radiological localization of the stone and can attenuate the shock waves, both of which are important for successful localization and disintegration of the stone. This method can also be complicated by stone debris, especially in cases of a larger stone burden, causing painless ureteral obstruction demanding regular follow up with ultrasound. Our patient had a radiolucent stone, which made localization difficult with x-ray and ultrasound. Radiolucency can imply that its composition is purely uric acid, which can be treated by alkalinization of the urine. We decided against alkalinization in an immunosuppressed patient because of the increased chance of bacterial colonization and infection in an alkaline medium. PCNL is a proven method for the treatment of large renal stones. However, in cases of renal allograft stones, perinephric fibrosis can complicate the formation of a working canal and can limit maneuverability of the nephroscope; furthermore, due to the extra-anatomic site of the allograft, the risk of intestinal injuries, albite small, does exist. To minimize the risk, upper pole calyx puncture of the graft is performed under ultrasound and x-ray guidance. In recent years, this method has become well established in the treatment of renal allograft stones that are too large for ESWL[18-20]. With the introduction of mini PCNL, the safety profile of the procedure has been upscaled rendering open procedure obsolete in almost every case[21,22]. Open surgery is usually performed when there is a large renal stone burden combined with the need to correct ureteral stenosis or other pathology obstructing the urine flow and causing stasis. Endoscopic lithotripsy can be complicated due to the site of the ureteral anastomosis to the bladder, which is usually on the lateral side of the dome making cannulation difficult. Still, it is a proven method of lithotripsy of stones in renal allograft which are not amenable to ESWL[23]. At our institution, we perform anastomosis of the ureter to the bladder in an extravesical manner using full-thickness anastomosis without the formation of the antireflux tunnel. This method has proven to be safe (a small percentage of stenosis and urine leaks) and does not have a detrimental effect on the allograft function at long term despite the reflux[24]. Also, avoiding angulation between the ureter and its neo-orifice, facilitates retrograde instrumentation, as well as the chance of spontaneous elimination of smaller stones.

References

1. Branchereau J, Timsit MO, Neuzillet Y, Bessède T, Thuret R, Gigante M, Tillou X, Codas R, Boutin J, Doerfler A, Sallusto F, Culty T, Delaporte V, Brichart N, Barrou B, Salomon L, Karam G, Rigaud J, Badet L, Kleinklauss F. Management of renal transplant urolithiasis: a multicentre study by the French Urology Association Transplantation Committee. World J Urol. 2018 Jan;36(1):105-9. doi: 10.1007/s00345-017-2103-8. Epub 2017 Oct 22. PMID: 29058024.
2. Cheungpasitporn W, Thongprayoon C, Mao MA, Kittanamongkolchai W, Jaffer Sathick IJ, Dhondup T, Erickson SB. Incidence of kidney stones in kidney transplant recipients: a systematic review and meta-analysis. World J Transplant. 2016 Dec 24;6(4):790-7. doi: 10.5500/wjt.v6.i4.790. PMID: 28058231; PMCID: PMC5175239.
3. Harper JM, Samuell CT, Hallson PC, Wood SM, Mansell MA. Risk factors for calculus formation in patients with renal transplants. Br J Urol. 1994;74(2):147-50.
4. Emiliani E, Daniel J, Regis F, Angerri O, Palou J, Lee R. Over 30-yr experience on the management of graft stones after renal transplantation. Eur Urol Focus [Internet]. 2018;6-11. Available from: https://doi.org/10.1016/j.euf.2018.06.007
5. Tonyali S, Aydin AM. Evaluation of Deceased Kidney Donors for Renal Stone Disease: Is Computed Tomography Needed? Curr Urol. 2018 Mar;11(3):113-6. doi: 10.1159/000447204. Epub 2018 Feb 20. PMID: 29692689; PMCID: PMC5903464.
6. Harraz AM, Kamal AI, Shokeir AA. Urolithiasis in renal transplant donors and recipients: an update. Int J Surg [Internet]. 2016;36:693-7. Available from: http://dx.doi.org/10.1016/j.ijsu.2016.11.032
7. Monaco AP, Morris PJ. Care of the live kidney donor: consensus on the ultimate gift. Transplantation. 2005;79(S2):491-2.
8. Martin G, Sundaram CP, Sharfuddin A, Govani M. Asymptomatic urolithiasis in living donor transplant kidneys: initial results. Urology. 2007 Jun;70(1):2-5. discussion: 5-6.
9. Devasia A, Chacko N, Gnanaraj L, Cherian R, Gopalakrishnan G. Stone-bearing live-donor kidneys for transplantation. BJU Int. 2005 Feb;95(3):394-7. doi: 10.1111/j.1464-410X.2005.05307.x. PMID: 15679801.
10. Tatapudi VS, Modersitzki F, Marineci S, Josephson MA, Goldfarb DS. Medical evaluation of living kidney donors with nephrolithiasis: a survey of practices in the United States. Clin Exp Nephrol. 2020 Mar;24(3):259-67. doi: 10.1007/s10157-019-01814-6. Epub 2019 Nov 6. PMID: 31696378.
11. Strang AM, Lockhart ME, Amling CL, Kolettis PN, Burns JR. Living renal donor allograft lithiasis: a review of stone related morbidity in donors and recipients. J Urol. 2008 Mar;179(3):832-6. doi: 10.1016/j.juro.2007.10.022. Epub 2008 Jan 25. PMID: 18221961.
12. Olsburgh J, Thomas K, Wong K, Bultitude M, Glass J, Rottenberg G, Silas L, Hilton R, Koffman G. Incidental renal stones in potential live kidney donors: prevalence, assessment and donation, including role of ex vivo ureteroscopy. BJU Int. 2013 May;111(5):784-92. doi: 10.1111/j.1464-410X.2012.11572.x. Epub 2012 Oct 30. PMID: 23110544.
13. Janczak D, Bolanowska B, Jankowski P, Dorobisz T, Dorobisz K, Chabowski M, Janczak D, Szydelko T. Ex vivo pyelotomy, nephroscopy and holmium laser lithotripsy of a staghorn stone in a donor kidney prior to renal transplant. Wideochir Inne Tech Maloinwazyjne. 2015 Jul;10(2):286-9. doi: 10.5114/wiitm.2015.52556. Epub 2015 Jun 25. PMID: 26240630; PMCID: PMC4520852.

14. Sarier M, Duman I, Yuksel Y, Tekin S, Ozer M, Yucetin L, Yavuz AH, Demirbas A, Kukul E. *Ex vivo* stone surgery in donor kidneys at renal transplantation. Int J Urol. 2018 Oct;25(10):844-7. doi: 10.1111/iju.13755. Epub 2018 Jul 19. PMID: 30027658.
15. Rashid MG, Konnak JW, Wolf JS Jr, Punch JD, Magee JC, Arenas JD, Faerber GJ. *Ex vivo* ureteroscopic treatment of calculi in donor kidneys at renal transplantation. J Urol. 2004 Jan;171(1):58-60. doi: 10.1097/01.ju.0000101757.69344.de. PMID: 14665843.
16. Cassini MF, Cologna AJ, Andrade MF, Lima GJ, Albuquerque UM, Martins ACP, *et al.* Lithiasis in 1,313 kidney transplants: incidence, diagnosis, and management. Transplant Proc [Internet]. 2012;44(8):2373-5. Available from: http://dx.doi.org/10.1016/j.transproceed.2012.07.052
17. Li SD, Wang QT, Chen WG. Treatment of urinary lithiasis following kidney transplantation with extracorporeal shockwave lithotripsy. Chin Med J (Engl). 2011 May;124(9):1431-4. PMID: 21740759.
18. Wyatt J, Kolettis PN, Burns JR. Treatment outcomes for percutaneous nephrolithotomy in renal allografts. J Endourol. 2009 Nov;23(11):1821-4. doi: 10.1089/end.2008.0115. PMID: 19814697.
19. Oliveira M, Branco F, Martins L, Lima E. Percutaneous nephrolithotomy in renal transplants: a safe approach with a high stone-free rate. Int Urol Nephrol. 2011 Jun;43(2):329-35. doi: 10.1007/s11255-010-9837-1. Epub 2010 Sep 17. PMID: 20848196.
20. McAlpine K, Leveridge MJ, Beiko D. Outpatient percutaneous nephrolithotomy in a renal transplant patient: World's first case. Can Urol Assoc J. 2015 May-Jun;9(5-6):E324-8. doi: 10.5489/cuaj.2414. PMID: 26029308; PMCID: PMC4439237.
21. Ji ZG, Tian Y, Chen YQ, Liu Z, Lin J, Wang JM, Ma LL, Guo HB, Tang YW, Xie ZL, Sun W, Zhang L. A retrospective study of minipercutaneous laser lithotripsy for treatment of allograft kidney lithiasis obstruction. Transplant Proc. 2013 Nov;45(9):3298-301. doi: 10.1016/j.transproceed.2013.06.007. PMID: 24182804.
22. Markić D, Krpina K, Ahel J, Gršković A, Španjol J, Rubinić N, Materljan M, Mikolašević I, Orlić L, Rački S. Treatment of Kidney Stone in a kidney-transplanted patient with mini-percutaneous laser lithotripsy: a case report. Case Rep Nephrol Dial. 2016 Mar 2;6(1):26-31. doi: 10.1159/000444251. PMID: 27066492; PMCID: PMC4821147.
23. Sevinc C, Balaban M, Ozkaptan O, Karadeniz T. Flexible ureterorenoscopy and laser lithotripsy for the treatment of allograft kidney lithiasis. Transplant Proc [Internet]. 2015;47(6):1766-71. Available from: http://dx.doi.org/10.1016/j.transproceed.2015.06.020
24. Kayler L, Zendejas I, Molmenti E, Chordia P, Schain D, Magliocca J. Kidney transplant ureteroneocystostomy: comparison of full-thickness *vs.* Lich-Gregoir techniques. Clin Transplant. 2012 Jul-Aug;26(4):E372-80. doi: 10.1111/j.1399-0012.2012.01655.x. Epub 2012 Jun 4. PMID: 22672515.

Sažetak

FLEKSIBILNA URETERORENOSKOPIJA I LASERSKA LITOTRIPSIJA U BOLESNIKA S KAMENCEM U PRESAĐENOM BUBREGU: PRIKAZ SLUČAJA

M. Marić, T. Kuliš, L. Penezić, V. Andrijašević, I. Mokos i *Ž. Kaštelan*

Prikazujemo slučaj 31-godišnjeg bolesnika s opstruktivnom ureterolitijazom u transplantiranom bubregu liječenog endoskopski fleksibilnom ureterorenoskopijom i laserskom litotripsijom. Bolesnik se pezentirao sa biokemijskim znakovima akutnog zatajenja bubrega i hidronefrozom na ultrazvučnom pregledu. Hitna kompjutorizirana tomografija otkrila je opstruktivni kamenac od 5 mm u ureteru presađenog bubrega s posljedičnom hidronefrozom. Pacijentu je učinjena intubacija uretera sa JJ protezom radi otklona opstrukcije alografta. Budući da je veličina kamenca ocijenjena povoljnom za konzervativno liječenje, bolesnik je otpušten na kućnu njegu. Dva mjeseca kasnije ponovno je primljen zbog leukopenije uzrokovane mikofenolat mofetilom. Nakon oporavka broja bijelih krvnih zrnaca, upućen je na ekstrakorporalnu litotripsiju, no budući da je kamenac bio radiolucentan, indiciran je endoskopski zahvat. Uspješno je izvedena retrogradna endoskopska fleksibilna ureterorenoskopija s dezintegracijom kamenca. Godinu dana nakon zahvata pacijent je bez kamenaca i s dobrom funkcijom alografta.

Ključne riječi: *Litijaza bubrežnog alografta; Fleksibilna ureterorenoskopija*