

Giant kidney stone: multi-session percutaneous nephrolithotomy with 12 accesses

Dev böbrek taşı: On iki akses ile çoklu seans perkütan nefrolitotomi

Akif Erbin¹, Emrah Yürük², Murat Binbay², Ahmet Yaser Müslümanoğlu²

ABSTRACT

We report a case of a 37-year-old man with a body mass index of 28 kg/m² who presented to our outpatient clinic with intermittent left flank pain. Non-contrast abdominopelvic computed tomography revealed a giant coralliform calculus in the left kidney. This giant kidney stone was successfully treated with 3 sessions of percutaneous nephrolithotomy (PNL) with a total 12 accesses. There was no significant reduction in the split function of the kidney after PNL.

Key words: Coralliform calculi; kidney; percutaneous nephrolithotomy.

ÖZ

Otuz yedi yaşında ve vücut kitle indeksi 28 kg/m² olan erkek hasta aralıklı sol yan ağrısı şikayeti ile kliniğimize başvurdu. Yapılan kontrastsız bilgisayarlı tomografisinde sol böbrekte dev koraliform taş tespit edildi. Hasta 3 seans perkütan nefrolitotomi (PNL) ile toplamda 12 giriş yapılarak başarılı bir şekilde tedavi edildi. PNL operasyonları sonrasında böbrek fonksiyonunda belirgin düşme görülmedi.

Anahtar kelimeler: Koraliform kalkül; böbrek; perkütan nefrolitotomi.

Introduction

With an incidence of 11.1%, urinary stone disease is endemic in Turkey.^[1] Staghorn calculi, defined as branched stones that fill the renal pelvis and multiple calices, usually result in complete loss of renal function if left untreated. The currently available treatment options are percutaneous nephrolithotomy (PNL), extracorporeal shock wave lithotripsy (SWL), a combination of PNL and SWL, and anatomic nephrolithotomy.^[2] Treatment of staghorn calculi is one of the most challenging problems in endourology and selection of a treatment modality depends both on patient-related factors and on the experience of the surgeon. Here we present the case of a patient with a giant complete coralliform stone in his left kidney that was treated with 3 sessions of PNL through 12 accesses.

Case presentation

A 37-year-old male with a body mass index of 28 kg/m² presented to our outpatient clinic

with intermittent left flank pain. He did not notice any lower urinary tract symptoms. His previous medical history did not reveal any stone-related events, such as history of spontaneous stone passage, SWL treatment, or stone surgery. His family history was also negative for urinary stone disease. Physical examination revealed mild left costovertebral angle tenderness. His hemoglobin and serum creatinine levels were 14.9 g/dL and 1 mg/dL, respectively. Urine analysis demonstrated microhematuria with a density of 1025 mg/dL, and urine culture was sterile. Kidney-ureter-bladder (KUB) radiography and intravenous urography (IVU) were consisted with a giant stone in the left kidney (Figure 1). Preoperative nuclear renography with ^{99m}Tc-labeled diethylenetriaminepentaacetic acid (DTPA) revealed a split function of 29.9% with an overall glomerular filtration rate (GFR) of 80 mL/min. All possible treatment modalities, including endoscopic and open surgical interventions, were discussed with the patient and he preferred multi-session PNL. Written informed

¹Clinic of Urology,
Dr. Munif İslamoğlu State
Hospital, Kastamonu, Turkey

²Clinic of Urology, Bağcılar
Training and Research Hospital,
İstanbul, Turkey

Submitted:
25.10.2014

Accepted:
20.11.2014

Available Online Date:
18.02.2015

Correspondence:
Akif Erbin,
E-mail: akiferbin@hotmail.com

©Copyright 2015 by Turkish
Association of Urology

Available online at
www.turkishjournalofurology.com



Figure 1. Preoperative KUB radiography
KUB: kidney-ureter-bladder

consent was obtained from the patient for the operations and for publishing his details in the form of a “case report.”

Session 1: In the first session, PNL was performed through a single middle calyceal access. In brief, all procedures were performed under general anesthesia with the patient in a prone position. Accesses were performed under fluoroscopic guidance access tracts were created using balloon dilators. Stones were fragmented using an ultrasonic lithotripter. At the end of the procedure, a 14-Fr nephrostomy tube was placed. Total operation time was 120 min. Overall hemoglobin decrease was 1.8 g/dL and no complication was noticed. The patient was discharged uneventfully on postoperative 2nd day.

Session 2: Ten days later, the second PNL was performed using 2 lower pole, 2 middle calyceal, and 2 upper pole (intercostal) accesses for the remaining stones. Flexible nephroscopy was also performed to reach a lower calyceal stone from upper pole accesses. At the end of the procedure, 2 nephrostomy tubes were placed. The total operation time was 220 min. Perioperative blood transfusion (1 unit of erythrocyte suspension) was required and the total hemoglobin decrease was 3.3 g/dL. Postoperative serum creatinine level was 0.86 mg/dL. Apart from peroperative bleeding necessitating transfusion, no other complication was observed. Nephrostomy



Figure 2. Thirty minutes IVU after the third session of PNL
IVU: intravenous urography; PNL: percutaneous nephrolithotomy

tubes were removed on postoperative day 2 and the patient was discharged.

Session 3: Three months later, the third session of PNL was performed using 2 lower pole and 3 upper pole (2 intercostal) accesses. The total operation time was 120 min and the total hemoglobin decrease was 2.2 g/dL. Postoperative serum creatinine level was 0.78 mg/dL. At the end of the procedure, the patient was stone-free. A total of 12 accesses were needed to achieve the stone-free status.

IVU was performed 6 weeks after the last operation (Figure 2). Control DTPA renography showed a split function of 27.5% and a GFR of 119 mL/min. Stone analysis revealed the composition to be magnesium ammonium phosphate.

Discussion

The European Association of Urology guidelines emphasize that treatment of large-volume stones is more difficult than treatment of low-volume stones because of the potential for treatment-related complications.^[3] Treatment of staghorn stones is likewise difficult because these stones vary in size, location, and chemical composition within kidney. Staghorn stones may affect collecting system anatomy as well as renal function, mak-

ing treatment one of the most challenging problems of urological practice.

Conservative treatment of staghorn calculi will eventually result in complete destruction of the kidney. Patients may experience recurrent infections and sepsis. In fact, a combination of stone and obstruction with recurrent infection may result in xantho-granulomatous pyelonephritis. Several series have reported a mortality rate of up to 30% in long-term follow-up of staghorn calculi.^[4] Because of the high complication rates of conservative management, the American Urological Association (AUA) guidelines recommend active treatment of staghorn stones for patients whose overall medical condition, body habitus, and anatomy permit performance of any of the 4 accepted active treatment modalities, including use of anesthesia. The currently available treatment options are PNL, SWL, a combination of PNL and SWL, and anatomic nephrolithotomy.^[2]

Most authors offer PNL as the first-line treatment for complex renal stones.^[5] The AUA urolithiasis guidelines demonstrated that the stone-free rates of PNL, PNL combined with SWL, SWL alone, and open surgery were 78, 66, 54, and 71%, respectively.^[6] The same study showed that the mean number of sessions required to achieve a stone-free status with PNL, PNL combined with SWL, SWL alone, and open surgery were 1.9, 3.3, 3.9, and 1.4%, respectively. It appears that modern minimally invasive techniques require more repetitive sessions to achieve complete clearance of stones when compared with open surgery. However, shorter hospitalization and lower complication rates per procedure with PNL may balance the increased number of sessions. As is in this case, the patient was discharged on postoperative 2nd day after all 3 procedures, and the only complication reported was transfusion of a single unit of blood after the second procedure. We were able to perform the second operation on postoperative 10th day and we believe that open anatomic nephrolithotomy cannot be repeated within such a short period of time.

Achievement of a complete stone-free status is particularly important in case of struvite stones, the main constituent of staghorn calculi. Indeed, even the smallest residual fragments can behave as a nidus to form a new stone. In order to clear all stone fragments from the collecting system, the surgeon should be familiar with all possible modalities, including flexible nephroscopy. Flexible nephroscopy, particularly second-look nephroscopy, may aid in clearing residual stones while preventing creation of a new access tract. However, although we tried to fragment stones with laser lithotripsy (particularly in second session PNL), the high stone burden led to an increased operation time without facilitating stone removal.

One of the most important drawbacks of multi-access PNL is the potential effect of access tracts on renal function. In their experimental animal study, Handa et al.^[7] showed that single- and multi-access PNL in pigs resulted in similar renal function; both GFR and effective renal plasma flow significantly decreased immediately after access and remained depressed throughout the experimental observation period. Multi-access PNL does not cause a more severe decrease in renal function than single-access PNL; in other words, acute renal hemodynamic response to PNL appears independent of the number of access tracts.^[7] In another study, we showed that the impact of PNL using either single or multiple accesses on renal function is similar and of a temporary nature.^[8] In their study comparing renal parenchymal injury after standard and mini-PNL, Traxer et al.^[9] showed that the scar resulting from the creation of the access tract is too small to cause a significant decrease in overall renal function. When we look at the changes in the creatinine level during 3 PNL sessions, it appears that improvements in renal function as a result of decreased stone burden exceed the negative effects of scars resulting from multiple tracts.

In conclusion, treatment of staghorn kidney stones is still challenging despite improvements in treatment options, and these stones usually need multiple treatment sessions. Multi-session PNL is an important alternative with low complication rates, particularly in experienced centers.

Informed Consent: Written informed consent was obtained from patient who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - A.E., M.B.; Design - A.E., E.Y.; Supervision - E.Y., M.B., A.Y.M.; Data Collection and/or Processing - A.E., M.B.; Analysis and/or Interpretation - A.Y.M.; Literature Review - A.E., E.Y.; Writer - A.E., E.Y.; Critical Review - A.Y.M.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

Hasta Onamı: Yazılı hasta onamı bu çalışmaya katılan hastadan alınmıştır.

Hakem değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir - A.E., M.B.; Tasarım - A.E., E.Y.; Denetleme - E.Y., M.B., A.Y.M.; Veri toplanması ve/veya işlemesi - A.E., M.B.; Analiz ve/veya yorum - A.Y.M.; Literatür taraması - A.E., E.Y.; Yazıyı yazan - A.E., E.Y.; Eleştirel İnceleme - A.Y.M.

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

References

1. Muslumanoglu AY, Binbay M, Yuruk E, Akman T, Tepeler A, Esen T, et al. Updated epidemiologic study of urolithiasis in Turkey. I: Changing characteristics of urolithiasis. *Urol Res* 2011;39:309-14. [\[CrossRef\]](#)
2. Segura JW, Preminger GM, Assimos DG, Dretler SP, Kahn RI, Lingeman JE, et al. Nephrolithiasis Clinical Guidelines Pannel summary report on the management of staghorn calculi. The AUA Nephrolithiasis Clinical Guidelines Panel. *J Urol* 1994;151:1648-51.
3. Turk C, Knoll T, Petrik A, Sarica K, Skolarikos A, Straub M, et al. EAU guidelines on urolithiasis. 2014. p. 46-8.
4. Barnaba D, Grossi FS, Raguso M, Larocca M, Salustio G, Di Lena S, et al. Percutaneous treatment of staghorn stones: a retrospective case-control study with evaluation of single vs multiple access to the kidney. *Arch Ital Urol Androl* 2009;81:40-2.
5. Healy KA, Ogan K. Pathophysiology and management of infectious staghorn calculi. *Urol Clin North Am* 2007;34:363-74. [\[CrossRef\]](#)
6. Preminger GM, Assimos DG, Lingeman JE, Nakada SY, Pearle MS, Wolf JS Jr, et al. Chapter 1: AUA guidelines on management of staghorn calculi: diagnosis and treatment recommendations. *J Urol* 2005;173:1991-2000. [\[CrossRef\]](#)
7. Handa RK, Evan AP, Willis LR, Johnson CD, Connars BA, Gao S, et al. Renal functional effects of multiple-tract percutaneous access. *J Endourol* 2009;23:1951-6. [\[CrossRef\]](#)
8. Akman T, Sari E, Binbay M, Yuruk E, Tepeler A, Kaba M, et al. Comparison of outcomes after percutaneous nephrolithotomy of staghorn calculi in those with single and multiple accesses. *J Endourol* 2010;24:955-60. [\[CrossRef\]](#)
9. Traxer O, Smith TG, Pearle MS, Corwin TS, Saboorian H, Cadeddu JA. Renal parenchymal injury after standard and mini percutaneous nephrolithotomy. *J Urol* 2001;165:1693-5. [\[CrossRef\]](#)