Management of large staghorn calculi – PCN Approach

Jakub Kempisty, Szczepan Pabiś, Janusz Ławiński

Jakub Kempisty, Department of Urology and Urology Oncology, KSW Nr. 1 Rzeszów (ORCID ID - 0000-0002-0744-7134)
Szczepan Pabiś, Department of Urology and Urology Oncology KSW Nr. 1 Rzeszów
Janusz Ławiński, Department of Urology and Urology Oncology KSW Nr. 1 Rzeszów University – Faculty of Medicine (ORCID ID – 0000-0002-0180-4380)

Contact details:
Jakub Kempisty
Kopisto 8A / 200
35-315 Rzeszow
Contact phone: +48 605-608-503
E-mail: jakub.kempisty@gmail.com
ORCID iD
https://orcid.org/0000-0002-0744-7134
Abstract
Urolithiasis is a common condition affecting more than 10% of well-developed country’s population. Formation of the stones may have several different causes. Stones can be classified by size, location, etiology, composition, and risk of recurrence. Evaluation of the stones should consist of imaging: X-Ray, CT, USG.
When dealing with staghorn calculi PCN approach should be the method of choice. This procedure is relatively safe and effective.
In this paper we would like to present a case report of large and very hard complete staghorn calculi which was managed by the PCNL.

Key words: Urolithiasis, Staghorn Calculi, PCN Approach

Urolithiasis is a common condition affecting more than 10% of well-developed country’s population. (1)
Formation of the stones may have four causes:

- Infection stones
- Non-infectious stones
- Genetic stones
- Drug stones.

Furthermore, stones can be classified by:

- Size
- Location
- Etiology
- Composition
- Risk of recurrence (2)

The diagnostic evaluation of the stones before any treatment should consist of contrast study. CT performed before PCNL results in better access and shorter operating times. (3,4). On the other hand all first time stone formers should be analyzed considering stone composition. This evaluation can prelude metabolic assessment and further treatment. (5)
Staghorn calculi are concerns that occupy collecting system and can be classified as complete or partial, depending on the level of occupancy. (6) Rassweiler et al. (16) as well as Di Silverio (17) classified Stones as follow:

- **Liminal** – when stones are filling the renal pelvis and one calix
- **Partial** – when are filling the renal pelvis and two calices
- **Total staghorn** – stones filling all collecting system
- **Enormous** – Stones filling all collecting system with hydrenephrosis

In approx. 50% of patients staghorn stones are infection stones, commonly named as struvite stones. Struvite stone, are composed of magnesium, ammonium, and phosphate. (7, 8).
Other conditions that affect unilateral staghorn stone formation are urinary tract obstruction, anatomical abnormalities, long term placement of indwelling catheter, and previous urinary diversion surgery (13).

Significant morbidity and potential mortality connected with staghorn, should prompt assessment and treatment of this condition.

Nowadays PCNL is the recommended treatment option for most patients with large-volume renal and staghorn calculi. (9) Rigid and flexible endoscopes are available. Most common access tracts are 24-30 F. (11)

Main contraindication for PCNL are:

- untreated UTI
- tumor in the presumptive access tract area
- potential malignant kidney tumor
- pregnancy

Whenever stone removal is planned, urinary tract infections should always be excluded by urine culture and treated if necessary. If urine culture is negative single dose prophylaxis seems to be sufficient (12).

PCNL is relatively safe procedure. Complication that affects most of the patients are fever, hemorrhage, thoracic complication and sepsis 0.5%. Major bleeding requiring transfusion, was reported in up to 30 % of patients who were undergoing PCNL due to staghorn stones. (14,15)

Case:

31 years old patient was admitted at the Emergency care department due to severe left lumbar pain. No fever nausea or vomiting was reported. Patient reported that the first symptoms started few months earlier. According to his knowledge he undergo urological procedure to remove stones from the left kidney approximately 12 years ago, patient didn’t have any kind of documentation, nor did he know about the type of the operation.

Blood test were as follow: Hgb 15,3, PLT 287, WBC 8,00 CRP <0,5, serum creatinine level 0,9

USG revealed complete staghorn calculi of the left kidney.

Patient was sent to Outpatient Clinic for further assessment.

CT was performed 10 days later, confirming first diagnosis. Staghorn calculi had 2000 Hu through whole dimension.
Patient was planned for the PCNL procedure. Patient was admitted to the Department of Urology, Clinical Regional Hospital No.1 in Rzeszów. Blood test including coagulation and urine culture was performed before the surgery.

PCNL procedure was performed in II stage approach. During the procedure ultrasonic, electrohydraulic lithotripters and Ho:Yag Laser were used. After II stages complete removal of the stone have been achieved. Stone analysis showed that the most of the stone was formed by the Calcium hydrogen phosphate.

Postoperatively no complications were reported. Patient left hospital at 3 day after surgery.
Discussion:
Renal stones are common urological problem and most of the urologists will face this disease during their practice. The most important thing in the treatment of this disease is the right selection of procedure considering location and size of the stones. After the procedure metabolic work-up should be implemented. PCNL seems to be the most effective procedure when dealing with staghorn calculi. Operation should be performed by experienced surgeon in special centers. After the procedure patients should be assessed considering bleeding, sepsis and residual stones. Due to high recurrence rate patient should be monitored after the treatment. Metabolic treatment and increased fluid intake should be inherent part during follow up.
References

(1) Trinchieri A, et al., Epidemiology, In: Stone Disease, edited by Segura J, Conort P, Khoury S, Paris, France, ICUD, Distributed by Editions 21, 2003.

(2) Hesse, A., et al. Study on the prevalence and incidence of urolithiasis in Germany comparing the years 1979 vs. 2000. Eur Urol, 2003. 44: 709.

(3) El-Wahab, O.A., et al. Multislice computed tomography vs. intravenous urography for planning supine percutaneous nephrolithotomy: A randomised clinical trial. Arab J Urol, 2014. 12: 162.

(4) Thiruchelvam, N., et al. Planning percutaneous nephrolithotomy using multidetector computed tomography urography, multiplanar reconstruction and three-dimensional reformatting. BJU Int, 2005. 95: 1280.

(5) Pearle, M.S., et al., Medical management of urolithiasis. 2nd International consultation on Stone Disease, Denstedt J., Khoury S. eds. 2008.

(6) Healy KA, Ogan K. Pathophysiology and management of infectious staghorn calculi. Urol Clin North Am 2007;34:363–374.

(7) Resnick MI, Boyce WH. Bilateral staghorn calculipatient evaluation and management. J Urol. 1980;123: 338–341.

(8) Heimbach D, Jacobs D, Muller SC, et al. Chemolitholysis and lithotripsy of infectious urinary stones – an in vitro study. Urol Int. 2002;69:212–218.

(9) Preminger GM, Assimos DG, Lingeman JE, Nakada SY, Pearle MS, Wolfe JS Jr; AUA Nephrolithiasis Guideline Panel. Chapter 1: AUA guideline on management of staghorn calculi: Diagnosis and treatment recommendations. J Urol 2005;173:1991–2000.

(10) EAU Guidelines. Edn. presented at the EAU Annual Congress Barcelona 2019. ISBN 978-94-92671-04-2.

(11) Ruhayel, Y., et al. Tract Sizes in Miniaturized Percutaneous Nephrolithotomy: A Systematic Review from the European Association of Urology Urolithiasis Guidelines Panel. Eur Urol, 2017. 72: 220.

(12) Mariappan, P., et al. Stone and pelvic urine culture and sensitivity are better than bladder urine as predictors of urosepsis following percutaneous nephrolithotomy: a prospective clinical study. J Urol, 2005. 173: 1610.

(13) Gettman MT, Segura JW. Struvite stones: diagnosis and current treatment concepts. JEndourol. 1999;13: 653–658.

(14) Seitz, C., et al. Incidence, prevention, and management of complications following percutaneous nephrolitholapaxy. Eur Urol, 2012. 61: 146.

(15) Koga S, Arakaki Y, Matsuoka M, Ohyama C. Staghorn calculi—long-term results of management. Br J Urol 1991; 68:122–124.

(16) Rassweiler JJ, Renner C, Eisenberger F. The management of complex renal stones. BJU Int. 2000;86:919–28.

(17) Di Silverio F, Gallucci M, Alpi G. Staghorn calculi of the kidney: Classification and therapy. Br J Urol. 1990;65:449–52