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Management of large staghorn calculi – PCN Approach

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Abstract

Urolithiasis is common condition affecting more than 10 % of well-developed country's population. Formation of the stones may have few 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 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 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)

Chemical name	Mineral name	Chemical formula
Calcium oxalate monohydrate	Whewellite	CaC ₂ O ₄ .H ₂ O
Calcium oxalate dihydrate	Wheddelite	CaC ₂ O ₄ .2H ₂ O
Basic calcium phosphate	Apatite	Ca ₁₀ (PO ₄) ₆ .(OH) ₂
Calcium hydroxyl phosphate	Carbonite apatite	Ca ₅ (PO ₃) ₃ (OH)
b-tricalcium phosphate	Whitlockite	Ca ₃ (PO ₄) ₂
Carbonate apatite phosphate	Dahlite	Ca ₅ (PO ₄) ₃ OH
Calcium hydrogen phosphate	Brushite	CaHPO ₄ .2H ₂ O
Calcium carbonate	Aragonite	CaCO ₃
Octacalcium phosphate		Ca ₈ H ₂ (PO ₄) ₆ .5H ₂ O
Uric acid	Uricite	C ₅ H ₄ N ₄ O ₃
Uric acid dehydrate	Uricite	C ₅ H ₄ O ₃ -2H ₂ O
Ammonium urate		NH ₄ C ₅ H ₃ N ₄ O ₃
Sodium acid urate monohydrate		NaC ₅ H ₃ N ₄ O ₃ .H ₂ O
Magnesium ammonium phosphate	Struvite	MgNH ₄ PO ₄ .6H ₂ O
Magnesium acid phosphate trihydrate	Newberyite	MgHPO ₄ .3H ₂ O
Magnesium ammonium phosphate monohydrate	Dittmarite	MgNH ₄ (PO ₄).H ₂ O
Cystine		[SCH ₂ CH(NH ₂)COOH] ₂
Xanthine		
2,8-Dihydroxyadenine		
Proteins		
Cholesterol		
Calcite		
Potassium urate		
Trimagnesium phosphate		
Melamine		
Matrix		
Drug stones	<ul style="list-style-type: none"> • Active compounds crystallising in urine • Substances impairing urine composition (Section 4.11) 	
Foreign body calculi		

[Fig 1(10)]

Staghorn calculi are concernments 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 hydronephrosis

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.

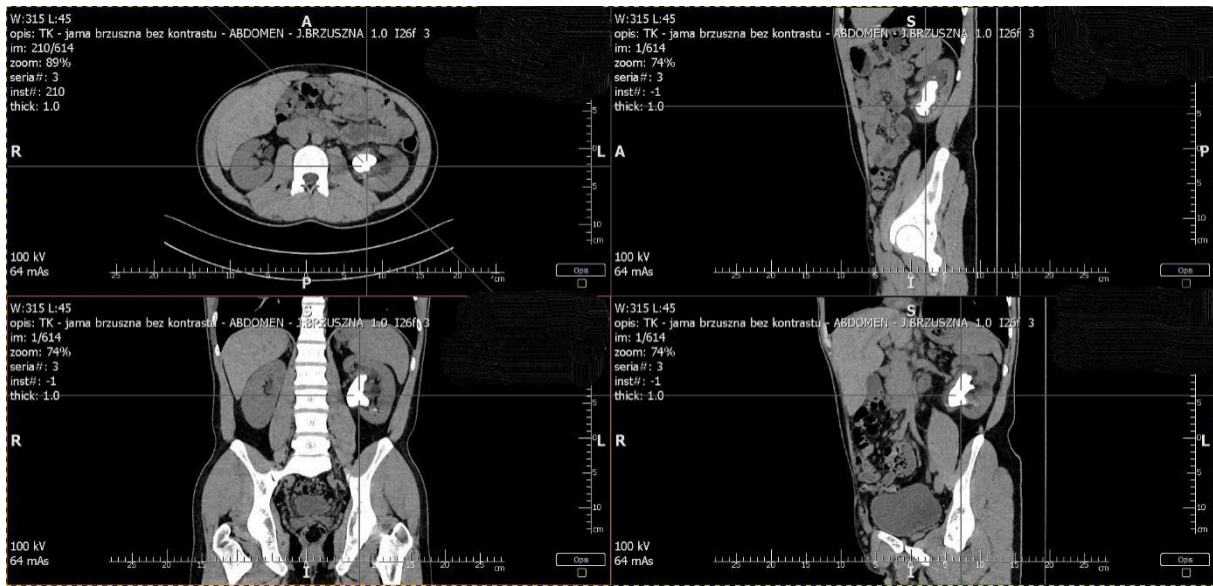
Blood test were as follow: Hgb 15,3, PLT 287, WBC 8,00 CRP <0,5, serum creatinine level 0,9

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



[Fig. 2]

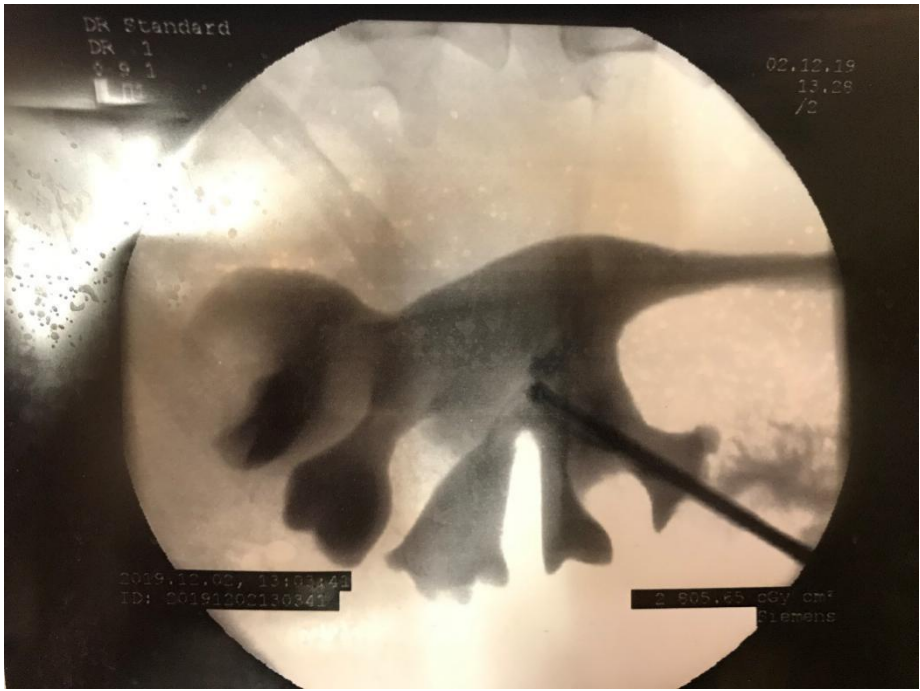
Patient was planned for the PCNL procedure. Patient was admitted to the Department of Urology, Clinical Regional Hospital No.1 in Rzeszów. Blood test including coagulation and urine culture was performed before the surgery.

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.

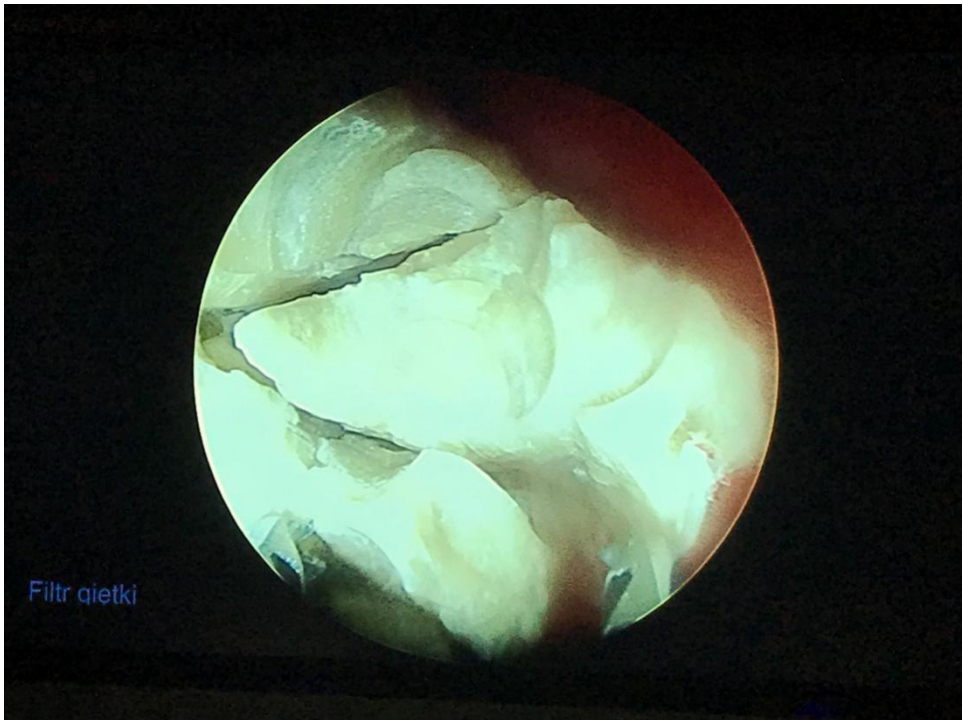
Postoperatively no complications were reported. Patient left hospital at 3 day after surgery.



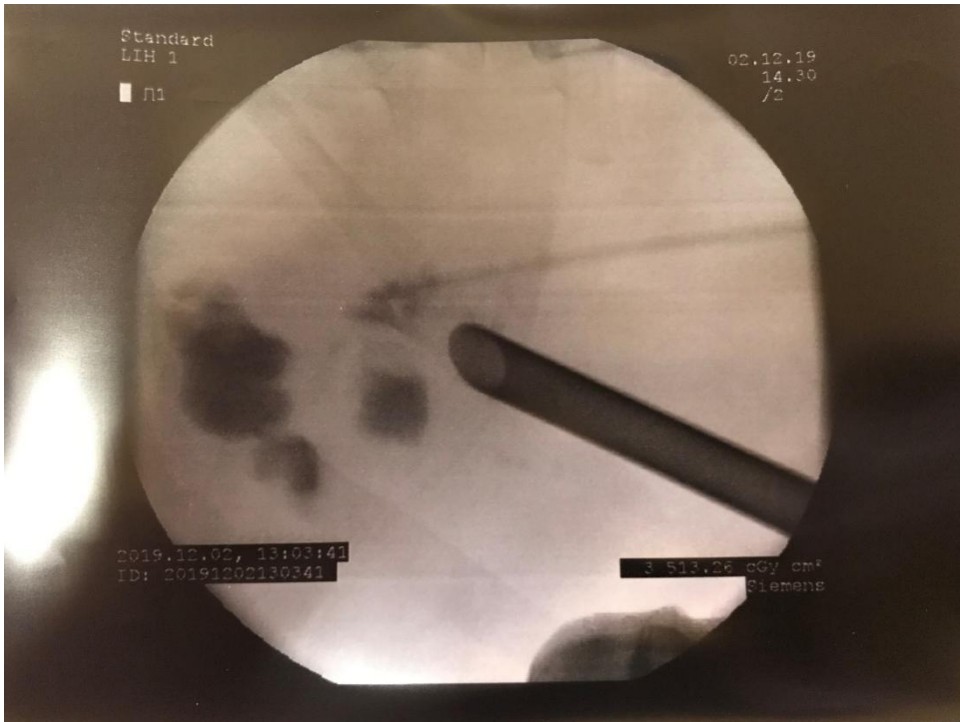
[Fig 3]



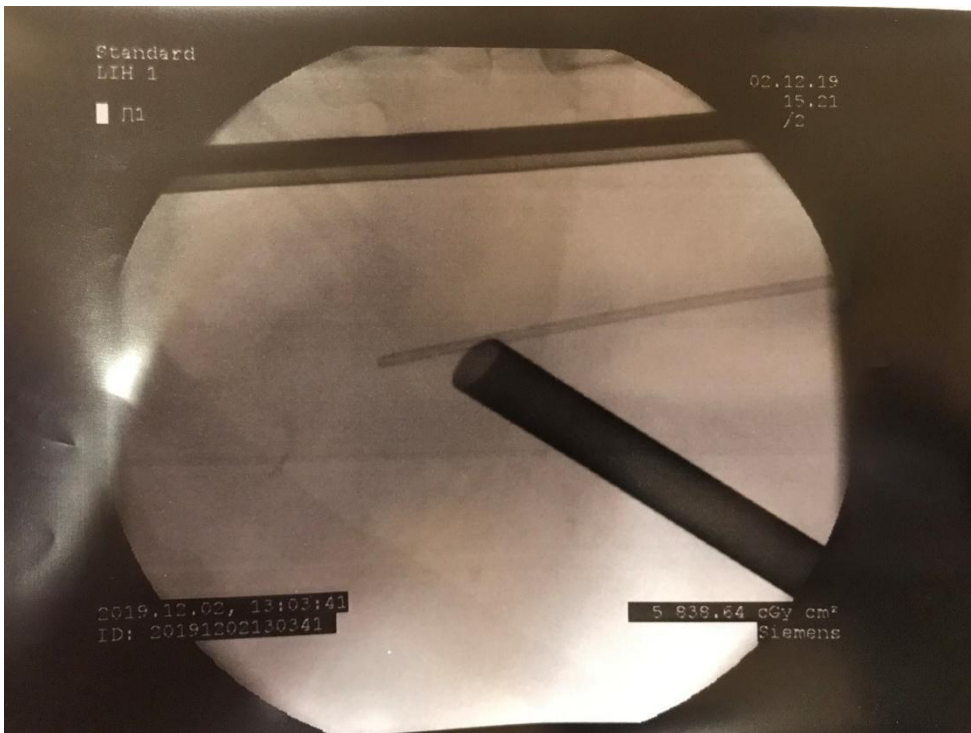
[Fig 4]



[Fig 5]



[Fig 6]



[Fig 7]

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 calculi: patient 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. *J Endourol*. 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