ORIGINAL ARTICLE

Outcome of Multiple Tract Percutaneous Nephrolithotomy for Renal Staghorn Calculi

UMAIR AFZAL[1], JAMSHED RAHIM[2], ALI SHANDAR DURRANI[3], *JMAIL RAHIM[4], ATTA-UR-REHMAN RANA[5], HAFIZ MUHAMMAD YOUSAF KHAN[6]*

[1,3]Senior Registrars, [2]Assitant Professor, [6]Postgraduate Resident, Department of Urology, Shaikh Zayed Hospital, Lahore

[4]Consultant Urologist, Mian Meer Hospital, Lahore

[5]Assistant Professor of Urology, Nishtar Medical College Multan

Correspondence to: Dr. Jamshed Rahim Cell 0300-9211153 E-mail: jamshed.rahim@gmail.com

ABSTRACT

Objective: To determine the frequency of stone clearance after multiple tract percutaneous nephrolithotomy for renal staghorn calculi

Study Design: Descriptive case series

Place and Duration of Study: Department of Urology, Shaikh Zayed Hospital, Lahore from 7th September 2016 to 7th March 2017.

Methodology: One hundred patients with renal staghorn calculi of >20 mm in size and between 16 to 65 years of age were included. Multiple tract PCNL was done after completion of all investigations. All patients were given prophylactic antibiotics. Stone clearance post-operatively was assessed by CT-KUB. The stone free rate at 4 week interval was the endpoint of this study.

Results: There were 65 (65%) males while 35 (35%) were females. Age range was from 16 to 65 years with mean age of 40.12±14.54 years. Mean size of the stone was 25.69±3.00 mm. Most of the patients 54(54%) had the size of stone >25 mm, while 46(46%) patients had the size of stone >25 mm. Overall success rate with multiple tract PCNL was 86% in patients with renal staghorn calculi.

Conclusion: The multiple tracts PCNL is gold standard technique for staghorn calcului with reasonable operative duration, low morbidity and good success rate.

Keywords: Multiple tract **p**ercutaneous nephrolithotomy (PCNL), Renal staghorn calculi, Stone clearance

INTRODUCTION

Renal calculi that are branched and involving a large portion of collecting system are termed as staghorn calculi. These calculi are generally infected stones.[1] Treatment options for staghorn calculi included open surgery, percutaneous nephrolithotomy (PCNL), extracorporeal shock wave lithotripsy (ESWL) and combination treatment. The main focus in the management of staghorn calculi is the complete clearances of stones which are not only reduces obstruction and prevent further stone growth but also eradicate causative organisms.[2] Percutaneous nephrolithotomy (PCNL), in such situations require more expertise and is challenging endourological procedures for the urologist.

Although excellent stone clearance rates are documented in different studies worldwide with acceptable surgical complication rates notably need for blood transfusion.[3] There has been continuing controversy regarding multiple tracts in a percutaneous nephrolithotomy session that may cause more complications specially severe bleeding after multiple tracts due to trauma to renal parenchyma, requiring frequent transfusions and even nephrectomy.[4]

But the impact of percutaneous nephrolithotomy, either with a single tract or multiple access tract is similar on temporary deterioration of renal function. So, in the management of staghorn calculi percutaneous nephrolithotomy with multiple accesses may be considered as effective and successful modality in terms of stone clearance with considerable complication rate.[5]

Aron et al[6] concluded that percutaneous nephrolithotomy (PCNL) for complete staghorn calculi is safe and effective in term of maximal stone clearance. Stone clearance in this study was 89%.

In another study percutaneous nephrolithotomy using multiple tracts showed to be safe and effective in the treatment of staghorn renal calculi with stone clearance rate 83% (p=0.026).[7]

Cho et al[8] documented that multiple tract percutaneous nephrolithotomy for well selected patients has similar effectiveness and safety as single access PCNL in patients having less complex and smaller stones and another procedure was needed more commonly in patients undergoing multi tract percutaneous nephrolithotomy (53.3% versus 24.1 p=0.003).

In another study stone clearance rate was 81.3%.[9] Chen J and colleagues[2] concluded that one session of multiple tract PCNL is safe and effective in the treatment of staghorn calculi. Stone clearance rate in this study was 94%.

MATERIALS AND METHODS

This descriptive case series conducted at Department of Urology, Shaikh Zayed Hospital, Lahore from 7th September 2016 to 7th March 2017 and comprised 100 patients. Patient's ranges between 16 to 65 years of age, both sexes and staghorn calculi size greater than 20 mm were included. Patients with uncontrolled bleeding disorders INR>1.5, ectopic pelvic kidney and urinary tract infection diagnosed on urine culture and sensitivity were excluded. Patients were admitted after evaluation on outdoor basis consisting of detailed medical history and examination, renal function tests (serum urea and creatinine), urine complete examination and urine culture, X ray KUB, ultrasonograhy and computed tomography

(KUB). Multiple tract PCNL was done after completion of all investigations. All patients were given prophylactic antibiotics. All procedures were performed under general anesthesia. Ureteric catheter 4 to 6-F was inserted into the target ureter under direct ureteroscopic vision The patients were placed in a lithotomy position. To create artificial hydronephrosis, saline was injected through ureteric catheter. To minimize lumber lordosis, prone position was done and pack was placed under the abdomen. The desired calyx was accessed by 18 gauge needle under fluoroscopic guidance. Upper renal calyx or posterior middle calyx was punctured, based on the location of stone and status of hydronephrosis. Accuracy of puncture was confirmed after outflow of the fluid was seen through the LP needle. Gradual dilation of the tract was done by using fascial dilators under fluoroscopic guidance and Amplatz sheath was placed. The stones were completely fragmented using Master Lithoclast. A 6 Fr double J stent was placed via percutaneous tract with the assistance of guide wire. Nephrostomy tube 14 to 20 Fr was placed in the collecting system. The stone free status assessed with fluoroscopic images and endoscopic visualization at the end of the procedure. Stone clearance at 4 week interval was assessed by CT KUB. The data was analysed using SPSS-20.

RESULTS

Sixty five (65%) were males, while 35(35%) were females. Age range in this study was from 16 to 65 years with mean age of 40.12±14.54 years. Majority of the patients 37(37%) were between 46 to 64 years of age. While 30(30%) and 33(33%) patients were between 15-30 and 31-45 years of age respectively. Mean size of the stone was 25.69±3.00 mm. Most of the patients 54(54%) had the size of stone >25 mm, while 46(46%) patients had the size of stone <25 mm. Overall success rate with multiple tract PCNL was 86% in patients with renal staghorn calculi (Tables 1-4).

Table 1: Frequency distribution of gender (n=100)

Gender	No.	%
Male	65	65.0
Female	35	35.0

Table 2: Frequency distribution of different stone sizes (n=100)

Stone size (mm)	No.	%
<26	46	46.0
>25	54	54.0

Table 3: Frequency distribution of age groups (n=100)

Age (years)	No.	%
15-30	30	30.0
31-45	33	33.0
46-65	37	37.0

Table-4: Frequency distribution of success (n=100)

Success	No.	%
Yes	86	86.0
No	14	14.0

DISCUSSION

The PCNL is the traditional gold treatment for renal stones. Currently marked developments in the PCNL procedures and fine instruments are regularly used to handle large stones and staghorns. Clayman et al[10] reported PCNL's safetyand viability for the treatment of staghorn calculi in 1983. The key objective of staghorn calculus therapy is full stone removal with reduced morbidity.[11-13] PCNL is currently the medication of choice for patients with complicated, broad and staghorn kidney calculus.[14]

By using multi tract PCNL, stone free rate for staghorn calculi is variable from 49%[15] to 89%.[16] Al-Kohlany et al[15] reported 80% stone free rate, while in our study it is 86%.

A study conducted by Soucy et al[16] who included branching calculi into one calyx (partial staghorn) in 2/3rd of his cases stone free rate was 88% that is higher than our result. Therefore, it is postulated that stone-free rate of PCNL using multiple tract is lower in complete staghron calculi as a compared to partial staaghorn calculi.

Urolithiasis is a major public health concern and is Pakistan's most serious urological disease. It not only causes chronic pain and physical discomfort, hematuria and inflammation but can also lead to the loss of one or both kidneys.[17] Of all types of renal stones, to deal with complete staghorn calculi is a difficult task for the urologists.[18] according to latest American Urological Association (AUA) guideline PCNL is recommended as gold standard procedure for staghorn calculi.[19]

It is most important for urologist while choosing PCNL for complete staghorn calculi that complete stone clearance should not raise patient morbidity as it is a challenging endourologic procedures for the urologist.[20]

For complete clearance of renal calculi by PCNL, proper access is required. Percutaneous renal surgery has changed dramatically with the advent of fine endourologic instruments that has lowered complications rate and increased success rate.[21]

Lingeman et al[22] suggested that with a rigid nephroscope, percutaneous access to the kidney with proper access could enable full stone removal. The optimal tract is the shortest and most direct connexion to all calculi.

Holman et al[23] and Jou et al[24] documented stone clearance rate 96% and 88.8% respectively that is higher than our study(86%). Ziaee et al[25] and Singla et al[26] also reported stone clearance rate of about 59.4% and 70.7% respectively after single session that is lower as a compared to our study.

The procedure was staged in 4/52 patients (7.6%) which is less than that documented by Monahar et al[27] (11.9 % second look PCNL) and higher than that reported by El-Nahas et al[28] (3.4% for the PCNL group).

Supracostal skin puncture is preferred as it provides benefit of an easy access to the renal pelvis for staghorn calculi. There is a risk of pleural injury in case of supracostal access.[29]

It is necessary to remove all causative species by relieving obstruction and avoiding further stone growth by fully extracting the stone.[30] This can be done using multi-tract PCNL[31], using versatile nephroscopy during the main or second look PCNL[32] or using lithotripsy (ESWL) to handle residual stones.

Kukreja et al[33] indicated that if there is a chance of intraoperative complications, e.g. bleeding, the PCNL treatment should be scheduled in patients with staghorn calculi. Multi-tract PCNL is known to be an alternative to

single-tract PCNL with compact nephroscopy or ureterorenoscopy in staghorn measurements with several large divisions..[34]

CONCLUSION

The multiple tracts PCNL is gold standard technique for staghorn calcului with reasonable operative duration, low morbidity and good success rate.

REFERENCES

1. Ganpule AP, Desai M. Management of the staghorn calculus: multiple tract versus single tract percutaneous nephrolithotomy. Curr Opin Urol 2008; 18(2):220-23.
2. Chen J, Zhou X, Chen Z, Liu L, Jiang L, Chen C. et al. Multiple tracts percutaneous nephrolithotomy assisted by LithoClast master in one session for staghorn calculi. Urology 2014; 42:165-69.
3. Soucay F, Ko R, Dovdevani M, Nott L, Denstedt JD, Razvi H. Percutaneous nephrolithotomy for staghorn calculi: a single center's experience over 15 years. J Endourol 2009; 10:1669-73.
4. Zhong W, Zeng G, Wu w, Chen W, Wu K. Minimally invasive percutaneous nephrolithotomy with multiple mini tracts in a single session in treating staghorn calculi. Urol Res 2011;13(2):117-22.
5. Akman T, Sari E, Binbay M, Yuruk E, Tepeler A, Kaba M. et al. Comparison of outcomes after percutaneous nephrolithotomy in staghorn calculi in those with single and multiple accesses. J Endourol 2010;24(6):955-60.
6. Aron M, Yadav R, Goel R, Hemal AK, Gupta NP. Percutaneous nephrolithotomy for complete staghorn calculi in preschool children. J Endourol 2005;19(8):968-72.
7. Maghsoudi R, Etemadian M, Shadpour P, Rafdar MH, Ghasemi H, Shati M. Number of tracts or stone size: which influences outcome of percutaneous nephrolithotomy forrenal staghorn stones. Urol Int 2012; 89(1):103-6.
8. Cho HJ, Lee JY, Kim SW, Hwang TK, Hong SH. Percutaneous nephrolithotomy for complex renal calculi:is multi-tract approach ok?. Can J Urol 2012; 19(4):6360-5.
9. Resorlu B, Kara C, Oguz U, Bavindir M, Unsal A. Percutaneous nephrolithotomy for complex caliceal and staghorn stones in patients with solitary kidney. Urol Res 2011; 39(3):171-6.
10. Clayman RV, Surya V, Miller RP, Casteneda Zunega WR, Amplatz PH, Lange PH. Percutaneous nephrolithotomy; an approach to branched and staghorn renal calculi. JAMA 1983;250:73–5.
11. Segura JW, Preminger GM, Assimos DG, Dretler SP, Kahn RI, Lingeman JE, et al. Nephrolithiasis Clinical Guidelines Panel summary report on the management of staghorn calculi. The American Urological Association Nephrolithiasis Clinical Guidelines Panel. J Urol 1994;151:1648–51.
12 Preminger GM, Assimos DG, Lingeman JE, Nakada SY, Pearle JS, Wolf Jr JS. AUA Nephrolithiasis Guideline Panel Chapter 1:AUA guideline on management of staghorn calculi: diagnosis and treatment recommendations. J Urol 2005;173:1991–2000.
13 Desai M, Jain P, Ganpule A, Sabnis R, Patel S, Shervastav P. Developments in technique and technology: the effect on the results of percutaneous nephrolithotomy for staghorn calculi. BJU Int 2009;104:542–8.
14. Morris DS, Wei JT, Taub DA, Dunn RL, Wolf Jr JS, Hollenbeck BK. Temporal trends in the use of percutaneous nephrolithotomy. J Urol 2006;175:1731–6.
15 Al-Kohlany KM, Shokeir AA, Mosbah A, Mohsen T, Shoma I, Eraky I, et al. Treatment of complete staghorn stones: a prospective randomized comparison of open surgery versus percutaneous nephrolithotomy. J Urol 2005;173:469–73.
16 Soucy F, Ko R, Duvdechai M, Nott L, Denstedt JD, Razvi H. Percutaneous nephrolithotomy for staghorn calculi. A single center experience of 15 years. J Endourol 2009;10:1–5.
17 Husain M, Rizvi SAH, Askari H, Sultan G, Lal M. Management of stone diseases: 17 years experience of stone clinic in a developing country. J Pak Med Assoc 2009;29(12):843-6.
18 Al-Kohlany KM, Shokeir AA, Mosbah A, Mohsin T, Shoma AM, Eraki I et al. Treatment of complete staghorn stones: A prospective randomized comparison of open surgery versus percutaneous nephrolithotomy. J Urol 2005;173(2):469-73.
19 Preminger GM, Assimos DG, Lingeman JE, Nakada SY, Pearle MS, Wolfe JS. AUA Nephrolithiasis Guideline Panel. Chapter 1: AUA guideline on management of staghorn calculi: Diagnosis and treatment recommendations. J Urol 2005;173: 1991–2000.
20 Saucy F, Duvdevani M, Nott L, Denstedt JD, Helmbold P, Caniatti M et al. Percutaneous Nephrolithotomy for Staghorn Calculi: A Single Center's Experience over 15 Years. J Endourol 2009;23(10): 1669-73.
21 Netto RN, Claro JF, Ferreira U: Is percutaneous monotherapy for staghorn calculous still indicated in the era of extracorporeal shock wave lithotripsy? J Endourol 1994,8:195-197.
22 Razvi H, Denstedt JD, Sosa RE, Vaughan ED Jr: Endoscopic lithotripsy devices. AUA update series 1995, 36(lesson 14):290-6.
23 Holman E, Khan AM, Pasztor I, Toth C: Simultaneous bilateral compared with unilateral percutaneous nephrolithotomy. BJU Int 2002, 89(4):334-8.
24 Jou YC, Cheng MC, Lin CT, Chen PC, Shen JH: Nephrostomy tube-free percutaneous nephrolithotomy for patients with large stones and staghorn stones. Urology 2006, 67(1):30-4.
25 Ziaee SA, Sichani MM, Kashi AH, Samzadeh M. Evaluation of the learning curve for percutaneous nephrolithotomy. Urol J 2010; 7(4):226-31.
26 Singla M, Srivastava A, Kapoor R, Gupta N, Ansari MS, Dubey D, Kumar A: Aggressive approach to staghorn calculi-safety and efficacy of multiple tracts percutaneous nephrolithotomy. Urology 2008, 71(6):1039-42.
27 Manohar T, Ganpule AP, Shrivastav P, Desai M. Percutaneous nephrolithotomy for complex caliceal calculi and staghorn stones in children less than 5 years of age. J Endourol 2006;20(8):547-51.
28 El-Nahas AR, Eraky I, Shokeir AA, Shoma AM, el-Assmy AM, el-Tabey NA et al. Factors affecting stone-free rate and complications of percutaneous nephrolithotomy for treatment of staghorn stone. J Urology 2012;79(6):1236- 41.
29 Munver R, Delvecchio FC, Newman GE, Preminger GM. Critical analysis of supracostal access for percutaneous renal surgery. J Urol 2001;166:1242–6.
30 El-Nahas AR, Eraky I, Shokeir AA, Shoma AM, El-Assmy AM, El-Tabey NA, et al. Long-term results of percutaneous nephrolithotomy for treatment of staghorn stones. BJU Int 2011;108:750–4.
31 Ganpule AP, Desai M. Management of the staghorn calculus: multiple-tract versus single-tract percutaneous nephrolithotomy. Curr Opin Urol 2008;18:220–3.
32 Beaghler MA, Poon MW, Dushinski JW, Lingeman JE. Expanding role of flexible nephroscopy in the upper urinary tract. J Endourol 1999;13:93–7.
33 Kukreja R, Desai M, Patel S, Bapat S, Desai M. Factors affectingblood loss during percutaneous nephrolithotomy: prospective study. J Endourol 2004;18:715-2.
34 Ganpule AP, Desai M. Management of the staghorn calculus: multiple-tract versus single-tract percutaneous nephrolithotomy. Curr Opin Urol 2008;18:220–3.