Feasibility and Efficacy of Percutaneous Nephrolithotomy, Initial Experience

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ABSTRACT:

BACKGROUND:

Renal stone disease is common in Iraqi population and percutaneous nephrolithoyomy present a minimal access for large stone a substitute for traditional open surgery

OBJECTIVE:

We are presenting our first experience in percutaneous nephrolithotomy (PCNL) in terms of renal access, stone free and to evaluate the other aspects such as the need of auxiliary procedures in a center without prior experience in this field.

MATERIALS AND METHODS:

We evaluate all the PCNL performed in period of two year. A series of perioperative and post-operative details were recorded. All PCNL were performed in prone position.

RESULTS:

The first 55 PCNL cases were included in the study. Out of 55 patients, 16 were women and 39 men. Their mean age was 35.5 years (range 11-65) and means stone diameter were 23.5 mm ± 8.9. A successful renal access achieved in 87.3 % (48) cases with stone fragmentation. Procedures were performed over two year Dec.2013-Dec. 2015. Of fifty five patients 4 cases with single functioning kidney, and eleven cases with PCNL on same side of previous scar of pyelolithotomy. Stone free rate was 82%. Co morbidities included 8 hypertensive, 3 diabetics, one systemic lupus erythematosus and two with elevated blood urea.

Morbidity and complications following PCNL are dominated by access failure in 12.7 % (n= 7); intraoperative bleeding in 3.6 % (n=2), urinary leakage in one patient, ureteric colic in 5.4 % (n=3) hydrothorax 1.8 % (n=1). None of these patients experienced post-operative bleeding, No mortality

CONCLUSION:

PCNL can be learned by urologists who do not have the support of an experienced colleague without endangering patient safety.

KEY WORDS: PCNL, renal stone, urolithiasis.

INTRODUCTION:

Percutaneous nephrolithotomy (PCNL) is a standard of treatment for renal stones and the technique is associated with a steep learning curve [1]. Precise needle puncture of the kidney is a challenging and essential step for successfully PCNL [2, 3]

Access for PCNL is often performed by specialists in centre with experienced personnel. In our region, however, there is no availability of such personnel. We reviewed our initial experience in PCNL in terms of renal access and the complication rates when performed at a teaching hospital to demonstrate that access for PCNL may be safely performed by urologists who do not have the support of an experienced colleague without endangering patient safety.

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PATIENTS AND METHODS:

Percutaneous access surgery of the kidney was introduced in AL- yarmouk hospital in 2013. Fifty five patients with renal stones planned for PCNL were underwent urinalysis, coagulation profile and Blood urea, serum creatinin measurement in addition to IVU and /or CT scan. All cases were performed using under table C-arm fluoroscopy.

Treatment success was defined as either completely stone free or presence of residual stone less than 4 mm in diameter. Postoperative imaging was performed 1 week after PCNL using KUB and /or ultrasonography depending on clinical circumstances. Figures 1, 2, 3 X ray films of the first PCNL. Patients' demographic and clinical data are summarized in table1.

Table 1: Patients' demographic and clinical characteristics.

Variable		
Age, mean yr. (range)	35.5	11-65
Mean stone size mm ± SD	23.5 mm ± 8.9	
Male gender (n) %	36	65
Left side (n) %	30	54
Ipsilateral open renal surgery (n) %	11	20
Stone location (n) %		
Pelvic stone	22	40
Calyceal	6	11
Pelvi-calyceal stone	27	49

Operative procedure

PCNL procedure is performed under general anaesthesia, with the patient in the prone position, a ureteral catheter 6 French (Fr.). is fixed in the lithotomy position before the patient is turned to prone position. The desired calyx was puncture by diamond tip 18 gauge needle under fluoroscopy guidance (C –arm OEC 9800) subsequent introduction of a .035 -inch guidewire into the collecting system for further manipulations [4-6]. All steps of PCNL including dilatation were performed under fluoroscopy guidance.

The two methods of percutaneous renal access are" triangulation" and "eye of the needle "(Bull's eye) techniques. Both were used in our study.

The tract was dilated by using sequential Teflon telescopic dilators. After Amplatz sheath insertion, 30 Fr. Nephroscope was introduced, stones were broken by using a LithoClast litholtriptor (Electro-Medical Systems, Switzerland) and fragments were extracted by stone forceps.

After completion of stone removal, a nephrostomy tube was used (Foley catheter 16 fr.) fixed by silk sutures and clamped for one hour.

RESULTS:

In total fifty five consecutive PCNL cases were performed by single surgeon in center with no previous experience in this field.

A successful renal access achieved in 87.3 % (48) cases with stone fragmentation. Thirty three of 48 individuals (69 %) were stone free while 14 patients with significant remnant stone 10-15 mm were successfully managed with shock wave lithotripsy in six individuals that increase stone free to 81%, while 8 individuals didn't attend for follow up. Operative data are summarized in table 2. Of fifty five patients 4 cases with single functioning kidney, 11 cases with PCNL on same side of previous scar of pyelolithotomy and five cases of pediatric renal stone. Co morbidities included 8 hypertensive, 5 diabetics, two with elevated blood urea and one with systemic lupus erythematosus on steroid.

Morbidity and complications following PCNL are dominated by access failure in 12.7 % (n= 7); intraoperative bleeding in 3.6 % (n=2), urinary leakage in one patient ureteric colic in 5.4 % (n=3) hydrothorax 1.8 % (n=1) and fragment migrated to distal ureter treated by ureteroscopy and pneumatic lithotripsy in one patient. None of these patients experienced post-operative bleeding. No mortality.

Table 2: Operative data of study group.

Variables	No.	%
Successful access	48	87.3
Unsuccessful access	7	12.7
Convert to open surgery	5	
JJ in situ & SWL	2	
Stone		
Opaque	52	94.5
Lucent	3	5.4
PCS		
Dilated	47	85
Non- dilated	8	15
JJ	18	32

Fig. 1: Pre Op : KUB film Left multiple renal stones

Fig.2 : IVU : left dilated PCS

Fig.3: Post Op. KUB film left JJ stent with mid calyx residual stone

DISCUSSION:

Over the past 30 years, percutaneous nepholithotomy (PCNL) has largely replaced open renal surgery for the management of large upper tract calculi in many parts of the world. Since Dec. 2013 PCNL has largely replaced open surgery in our practice.

PCNL is currently the most complicated stone surgery technique to teach. The steep learning curve is mainly related to renal access. [3,4 7]. Many authors suggest several modalities for PCNL learning that simulate human collecting system before going to the operating room like virtual trainers, to the *ex vivo* animal organ models through to non-biologic models. Each of these has its drawbacks. The virtual training models are expensive, the animal models do not reproduce the human renal anatomy accurately and require fresh animal organs, and the current plastic models are often expensive, single use, and do not accurately reproduce the collecting system.[7, 8]

We believe PCNL can be learned effectively by good cognitive knowledge in the absence of validated virtual simulators.

With our initial experience in this field we enrolled the 1st fifty five patients of PCNL. Of fifty five patients 48 (87.3%) got successful renal access and stone fragmentation, while unsuccessful access in 7 cases five of them were female, we had faced a problem of excessive mobile kidney and lost track particularly in female cases.

In our study group thirty three of ٤٨ individuals (٦٩ %) were stone free while 14 patients had significant residual stone (10-15 mm) were successfully managed with shock wave

lithotripsy in six individuals that increase stone free to 8١%. 27 patients had pelvicalyceal stone. Residual fragments are frequent after PCNL, most studies showed that stone free rate after PCNL ranges from 40% to 90 % depending on size, number, and nature of stone. The incidence of residual stones after PCNL ranges from 10% to 60% [9, 10]

Renal access was established by our self we only used fluoroscopy guidance. A reported American survey revealed that only 11% of urologist performing PCNL routinely obtained access by themselves [11]

Urologist are increasingly obtaining access themselves because eliminates reliance on a second "surgeon" and increase flexibility with respect to procedure timing and the location of the access tract. [12]

In our study 7 cases with unsuccessful renal access five of them were females, we have noticed that renal access was more difficult in females as the kidneys were more mobile, while 11 patients with previous renal scar on same site of PCNL in all of them renal access were successful.

A major cause of access failure or loss during the renal access is excessive renal displacement which happen more frequently in female patients and in those with no previous history of open stone surgery on the ipsilateral kidney [13, 14]

CONCLUSION:

PCNL is feasible and effective as initial experience in center with no prior work in this field and PCNL can be learned by urologists who do not have the support of an experienced colleague without endangering patient safety.

REFERENCES:

1. Skolarikos A., Alivizatos G., de la Rosette J.J. Percutaneous nephrolithotomy and its legacy. Eur Urol. 2005;47:22–28. [PubMed]
2. Pedro L, Rodrigues, Nuno F. Rodrigues, Jaime Fonseca, Estevao Lima and Joao L. Vilacakidney targeting and puncturing during percuatneous nephrolithotomy : recent advances and future perspectives. Journal of Endourology . 2013;27:826-34.
3. Spann A, Poteet J, Hyatt D, Chiles L, Desouza R, Venable D.Safe and effective obtainment of access for percutaneous nephrolithotomy by urologists: the Louisiana State University experience . J Endourol 2. 2011;25:1421-25.
4. Farrell TA, Hicks ME. A review of radiologically guided percutaneous nephrostomies in 303 patients. J Vasc Interv Radiol 1997;8:769–74.
5. Andrew J. LeRoy, MD Percutaneous Access, Tract Dilation, and Maintenance of the Nephrostomy Tract. SMITH'S textbook of endourology edited by Arthur D. Smith et al. 2nd edition 2006.
6. Steinberg PL, Semins MJ, Wason SEL, Matlaga BR, Pais VM. Fluoroscopy-guided percutaneous renal access. J Endourol. 2009;23:1627-31.
7. De la Rosette JJ., Laguna MP., Rassweiler JJ., Conort P. Training in percutaneous nephrolithotomy- a critical review. Eur Urol 2008;54:994–1001 [PubMed]
8. Schout BM., Hendrikx AJ., Scherpbier AJ., Bemelmans BL. Update on training models in endourology: A qualitative systematic review of the literature between January 1980 and April 2008. Eur Urol 2008;54:1247–61 [PubMed]
9. Abdelhafez MF residual stones after percutaneous nephrolithotomy . Med Surg Urol 2013 2:115
10. Park J, Hong B, Park Hk effectiveness of noncontrast computed tomography in evaluation of residual stones after percutaneous nephrolithotomy. J Endourol 2007 21: 684-87.
11. Watterson JD, Soon S, Jana K. Access related complica- tions during percutaneous nephrolithotomy: urology versus radiology at a single academic institution. J Urol 2006; 176:142–5 Crossref.
12. Stern J, Zeltser IS, Pearle MS. Percutaneous renal access simulators. J Endourol 2007; 21:270–3.Crossref
13. Farhan M, Nazim SM, Salam B, Ather MH Prospective evaluation of outcome of percutaneous nephrolithotomy using the 'STONE' nephrolithometry score: A single-centre experience. Arab J Urol. 2015;13:264-69.
14. Aminsharifi A, Haghpanah R, Haghpanah S Predictors of excessive renal displacement during access in percutaneous nephrolithotomy: a randomized clinical trial. Urolithiasis, 2014;42:61-65.