ORIGINAL ARTICLE

PERCUTANEOUS NEPHROLTHOTOMY (PCNL)

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Background: SIMS/Services Hospital Urology department presented its initial experience of Percutaneous Nephrolithotomy (PCNL) with promising results.
Aim: To assess the efficacy and safety of PCNL in the management of Renal stones.
Methods: Prospective study of 40 patients who underwent PCNL. Procedure performed in General Anasthesia. Placement of ureteric catheter in Lithotomy position to visualize the collecting system. Ureteric catheter and Foley catheter retained in a sterilized bag. Patient shifted to prone position with C-Arm at 0°. Nephrostomy needle placed over desired calyx and tract dilated with metallic dilators. Stone crushed with swiss lithoclast and fragments removed with stone graspers. Foley catheter placed at the end of procedure percutaneously. X-Ray KUB done post operatively and both Foley and ureter removed subsequently.
Results: In total 40 patient 27 (67.5%) male and 13 (32.5%) female the success rate with PCNL as monotherapy was 72.5%. It was 82.5% when combined with ESWL.
Conclusion: Percutaneous Nephrolithotomy (PCNL) is effective monotherapy for renal stones and gives excellent results when combined with ESWL
Key Words: Percutaneous Nephrolithotomy (PCNL), extracorporeal shock lithotripsy, (ESWL), C-Arm fluoroscope.

Introduction

Today in urology incisional surgery is being replaced by endoscopic surgery. Disease access is being achieved using rigid and flexible endoscopes passed along natural pathways or through key hole incisions such as nephrostomy.[1]

In 1955 Goodwin described percutaneous puncture of the intra renal collecting system without the assistance of radiographic guidance as a means of supra vesical urinary diversion. Percutaneous Nephrolithotomy is a particularly effective procedure that is used to treat patients with large or otherwise complex stones. Since that time percutaneous renal surgery has evolved into technique that is routinely used for a wide variety of clinical applications [2]

Mini percutaneous Nephrolithotomy tubeless PCNL and PCNL in supine position are also practiced routinely to treat renal stones[3,4]

PCNL is becoming a routine procedure to treat large renal stones, stone refractory to ESWL, stone in children and stones with renal anomalies.[5,6] We presented the finding of our initial experience of renal endoscopic surgery (PCNL) at SIMS/Services Hospital, Lahore.

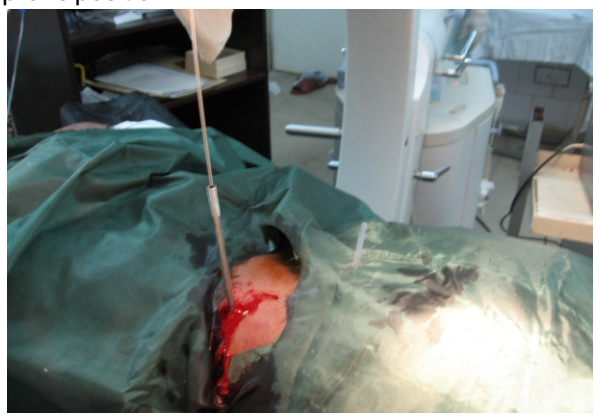
Patients and Methods

Prospective study of 40 patients with renal stones who underwent (PCNL) from Jan 2006 to Feb 2007. Preoperative assessment of all patients were done. Patients with bleeding diathesis, uncontrolled hypertension, renal failure, raised LFTs, cardiac failure, uncontrolled diabetes and complex renal stones with stone mass occupying almost all of the renal collecting system were excluded from our study. The endoscopic procedure with the possibility of conversion to open pyelolithotomy was informed to the patient. First of all we placed ureteric catheter under C-Arm fluoroscope to opacify the collecting system for on going dilatation. Ureteric and Foley catheter were retained in a sterilized bag **(Fig 1).**

Fig-1: Placement of ureteric catheter in lithotomy position

Patient then shifted to prone position with C-Arm at 0° **(Fig 2).**

Fig-2: Tract dilatation with metallic dilators in prone position



The collecting system opacified and slightly dilated by retrograde dye (urograffin instillation). The ideal approach to the stone was achieved by transpapillry puncture with straight access to the renal pelvis. Hub on tip nephrostomy needle was positioned over the desired calyx. As the needle was skin advanced the C-Arm rotated to 25°. The needle was clearly seen and its entry into the desired calyx was monitored. After a give away feeling of needle in the calyx the entry was confirm by the flow of urine and contrast through the needle. A 0.032 inch floppy J-tip guide wire was passed. The skin puncture was incised with a sharp knife to facilitate the incoming metal dilators. The tract was dilated was metal dilators upto 30 F° and amplatz sheath was finally placed.

The system was visualized with nephroscope and stones broken with pneumatic lithoclast with 1.5mm probe used for stone fragmentation (Fig 3,4 & 5).

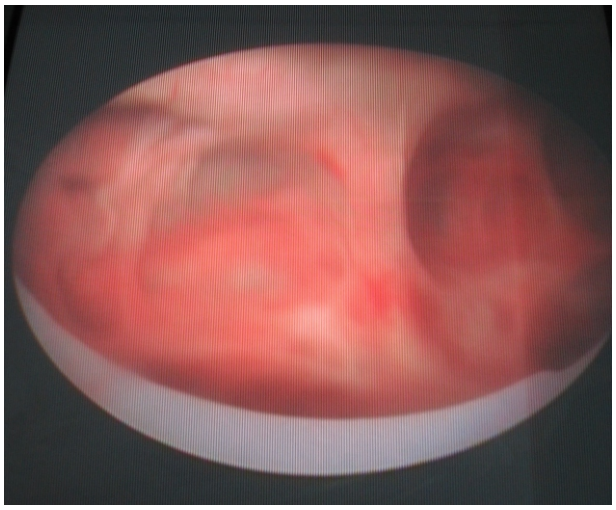
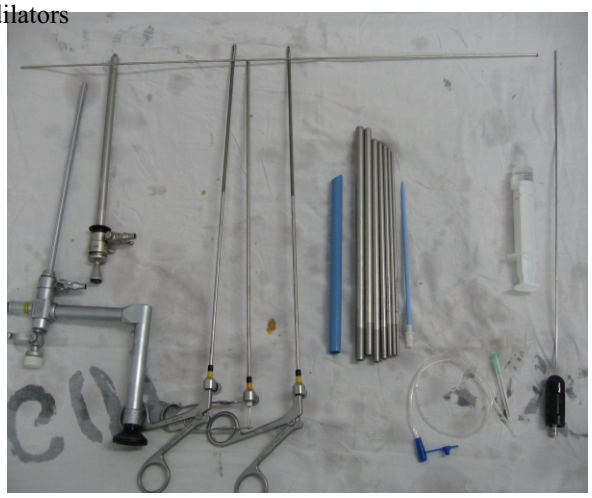


Fig. 4: Endoscopic view of calyceal stones

Fig-5: Stones fragments broken with Lithoclast

Fig-6: Grasping Forceps, Nephroscope and Metal dilators



After clearance of the system Foley catheter 18 F was placed in the collecting system percutaneously. In case where there were residual fragments and incomplete removal of stones D-J stent, was placed. X-Ray KUB (plain) was performed on first post operative day to see any residual stone fragments which may or may not need ancilliary procedure (ESWL) and the decision of removal of ureteric and Foley catheter.(Fig7,8,9 &10)

Fig-7: Partial Staghorn calculus in Left renal area

Fig-8: Stone clearance and placement of ureteric catheter post operatively

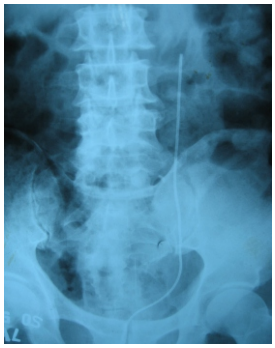


Fig. 4: Stone in Left renal area

Fig-10: Stone clearance after PCNL

Results

A total No of 40 patients age range 21-55 years with 27 (67.5%) males and 13 (32.5%) female were included in the study. **Fig. 11**

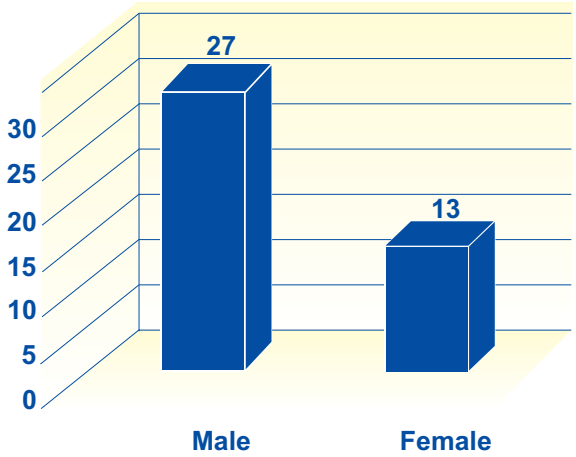


Fig-11: Male and female Distribution

In 23 (57.5%) patients the stone size was < 3 cm and in 17 (42.5%) patients the stone size was ≥ 3 cm with mean size 3.2 cm and range 2.6 to 4.0 cm.

According to the site of stone 16 (40%) were in left kidney and 24 (60%) were in right kidney. Average duration of operation was 95 min with < 2hrs in 24 (60%) patients and ≥ 2hrs in 16 (40%) of patients. In 7(17.5%) patients mild to moderate hemorrhage was noted while in 3 (7.5 %) patients severe hemorrhage was noted during surgery. In these patients the procedure was abandoned and open pyelolithotomy was performed. In 4 (10%) of patients we failed to make tract so in these case open pyelolithotomy was performed. In 23 (57.5 %) patients with lower polar stones 20 (86.95%) patients were successful and 3 (13.04 %) patients were unsuccessful. In 3 (7.5%) upper polar stones 1 (33.33%) was successful and 2 (66.66 %) were unsuccessful. In 14 (35 %) patients

with pelvic stones 12 (85.71 %) were successful and 2 (14.28%) were unsuccessful.
In 23 (57.5%) patients with stone size < 3 cm 21 (91.30 %) patients, were successful and 2 (8.69 %) were unsuccessful. In 17 (42.5%) patients with stone size ≥ 3 cm 12 (70.58 %) patients were successful and 5 (29.41 %) were unsuccessful. Overall in 40 patients 33 (82.5%) patients were successful 7 (17.5%) patients were unsuccessful. Stone free rate with PCNL as monotherapy was (72.5%) and (82.5%) when combined with ESWL.

Discussion

In the era of shock wave lithotripsy PCNL remains the treatment of choice for large renal stones or even proximal ureteral stones. Refinements in surgical techniques and radiological assistance have decreased the complication rate of this frequently challenging procedure (7).
PCNL is recommended by the guidelines of the European Association of urology for following indications (8).

- Large stone burden > 2 cm or 1.5 cm for lower calyceal stones
- Staghorn calculi
- Stones that are difficult to disintegrate by ESWL (Ca oxalate monohydrate, brushite, cystine)
- Stone refractory to ESWL/ or ureteroscopy
- Urinary tract obstruction that need simultaneous correction (e.g PUJ obstruction)
- Malformations with reduced probability of fragments passage after ESWL (horse shoe kidney or dystopic kidney)

Progress in PCNL first done by Fernstorm and Johannsonin 1976 has revolutionized the treatment of renal stones with the reduction in morbidity and early recovery. Recent advancement in C-Arm fluoroscopy, flexible instruments, new stone breaking devices has allowed access to all parts of the kidney and had made the endourological procedure more safer (9)
The crucial step in PCNL is establishing the percutaneous tract after careful identification of the anatomy and stone configuration. During the whole procedure imaging should be done whenever necessary (10). Difficult cases with former percutaneous operations, distorted collecting system and renal malformations need extra care. The beginner should avoid PCNL in situations where only a little space is available.(11)
In the initial stages of our study we were unable to established tract in (4%) patients. Loss of tract is most often due to wrong access and not following the geometry of the system. Such castastrophes can be avoided by following the anatomy and by using frequent fluoroscopy (12).
When the vision is poor due to bleeding during the procedure, it is advisable to terminate the procedure and to postpone stone removal. Renal perforation, multiple puncture leads to vascular injury causing significant blood loss (13, 14). In our study 3 (7.5%) patient with large stone ≥ 3 cm had severe hemorrhage. The endoscopic procedure was abandoned and open pyelolithotomy was performed.
Success in PCNL depends upon successful tract dilatation, stone burden with or without dendritic extension in different calyces and expertise. Staghorn calculus with a very little space in respective calyx often cause difficulties in stone clearance. Still there is documented superiority in the effectiveness of PCNL compared to ESWL monotherapy. Majid 2005 (9) showed stone clearance rate after PCNL as monotherapy in single sitting as 71% and overall stone clearance rate 97% when combined with auxiliary procedure ESWL.

Conclusion

PCNL (Percutaneous Nephrolithotomy) is most effective monotherapy for renal stones when there is proper selection of patient with adequate understanding of renal anatomy. It gives excellent results when combine with ESWL. The result of PCNL are likely to improve with experience. In expert hands it is effective in term of short hospital stay, good cosmetic results and with higher stone clearance rate.

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