Original Article

Percutaneous nephrolithotomy through superior calyceal approach - our experience

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Abstract

Introduction: Percutaneous Nephrolithotomy (PCNL) is considered the treatment of choice for large (> 2 cm size) renal stones at present. Aim of this study was to evaluate the results of PCNL as monotherapy in our centre which were done through superior calyceal approach.

Materials and Methods: Seventy five patients with three bilateral renal stone (total 78 renal units) that underwent PCNL through superior calyceal approach at Apollo Hospitals Dhaka from May 15, 2005 to December 15, 2007 were included in this retrospective study. Selected patients had renal stones more than 2 cm in size (average stone size 35 mm and surface area 750 mm^2). Ultrasonogram, intravenous urogram and in some selected cases CT scan were done to detect the location and size of the stone. Urologist performed percutaneous punctures through superior calyx in prone position under fluoroscopic guidance and general anaesthesia were employed in all cases. Post-operative stone clearance was documented on plain X-ray KUB and ultrasonogram KUB.

Results: PCNL was successfully (complete stone clearance and insignificant residue) carried out in 68 patients (69 renal units). Average stone clearance was 88.46%. No second look procedure were needed. Uro-sepsis was the main complication, occurred in 9 renal units (11.53 %) while urinary leakage/ fistula in 6.41%, significant bleeding in 6 renal units (7.69 %) and pleural breach with fluid in pleural cavity (hydrothorax) in 2 (2.6 %) cases. Mean blood transfusion was 1.2 units and mean hospital stay was 67 hours.

Conclusion: Monotherapy with PCNL is highly effective in the treatment of large volume renal calculi and staghorn calculi using superior calyceal supracostal and subcostal approach. As a minimally invasive procedure, it is quite safe in experienced hand.

Keywords: Percutaneous nephrolithotomy, Renal stone, Superior calyceal puncture, Staghorn calculi

Introduction

Percutaneous nephrolithotomy (PCNL) and extra-corporeal shock wave lithotripsy (ESWL) are considered the treatment of choice for upper urinary tract calculi at present[1]. Almost all renal stones can be managed with these two minimally invasive (PCNL) or non-invasive (ESWL) techniques either as monotherapy or in combination form[2]. Results of PCNL is better than ESWL for renal stones more than 2 cm size[3,4]. Presence of residual fragments along with post-treatment ancillary procedures (cystoscopy, stone manipulation and percutaneous nephrostomy) are more frequently needed with ESWL monotherapy for larger stones and inferior calyceal stones than PCNL[1]. At present, PCNL is done successfully even in pelvic ectopic kidney, horse shoe kidney, malrotated kidney, pediatric patients, morbid obese patients, calyceal diverticular calculi, upper calyceal calculi with infundibular stenosis, lower calyceal calculi (>10 mm) which cannot be cleared with ESWL[4-7].

PCNL is safe and less invasive than pyelolithotomy or nephrolithotomy and is now recommended for complete staghorn calculus as monotherapy or along with ESWL as sandwich therapy[8-10]. Safety and efficacy of supracostal approach for PCNL is already mentioned in some of the studies, although it is avoided by many urologists because of concerns of potential chest complications[7,14]. Purpose of this study is to evaluate the results of PCNL through superior calyceal approach at Apollo Hospitals Dhaka.

Materials & Methods

From May 15, 2005 to December 15, 2007, seventy eight renal units with 3 bilateral cases (75 patients) with mean age 39 ± 15 years (53 males and 22 females) were subjected to PCNL in our unit. Renal stones > 20 mm size, post-ESWL residual stones, partial staghorn, complete staghorn and stones in calyceal diverticula were selected for the purpose. Ultrasonogram, IVU (Figure 2) and CT scan were done to detect stone size and location along with all routine investigations and urine C/S. All punctures were performed in prone position after retrograde ureteric catheterization under general anaesthesia. Fluoroscopic guided punctures were made by urologist and thereafter tract dilatation done with metallic dilators upto 30 Fr followed by insertion of an amplatz sheath through which rigid nephroscope was passed. Stones were fragmented with pneumatic lithotripter (Swiss master lithoclast), removed with forceps and suction. Superior calyceal punctures were always performed along with additional punctures in some cases. Where multiple punctures needed, we tried to avoid unnecessary tract dilatation and complication. Rather we concentrated to manipulate the stone to a suitable position by pushing it with a needle under C-arm guidance. To retrieve small migrated fragments from difficult access calices, we used intraprocedural suction, calyceal irrigation, manipulation and flexible nephroscope. Antegrade stenting were done in all cases after PCNL (Figure 3). If the procedure was more

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than 30 minutes, 14 Fr. nephrostomy tube was placed. Nephrostomy tube was usually taken out on the first postoperative day after clamping for a few hours. Patients were discharged 48-72 hours after the procedure and D-J stent was removed 4-6 weeks later. Post-operative stone clearance was documented on X-ray KUB and ultrasonogram KUB. Stone analysis, urine C/S and metabolic work up were done in selected cases on follow up visits.

Figure 1: X-ray KUB showing radio-opaque shadow in right renal region.

Figure 2: Intravenous urogram showing staghorn calculus in right kidney

Results

In this study, 78 renal units (75 patients with 3 bilateral cases) were included. Average stone size was 35 mm (average surface area 750 mm^2) and 24 patients had multiple stones. PCNL was successfully carried out (complete stone clearance with insignificant residue) in 69 renal units (68 patients). Clearance was 88.46 % of renal units and 11.54 % renal units had residual stones more than 5 mm size. Clearance of stone was highly dependent on stone location rather than size. Stone clearance in renal pelvis was 100%, stone in pelvis and one calyx was 92.85%, stone in pelvis and two calyx was 73.33 % and stone in pelvis and all three calyx was 75 % (Table I). Among 9 residual stones, 3 passed spontaneously and 6 needed ESWL. Simultaneous endo-pyelotomy was done in 3 cases for associated PUJ obstruction. None of the patients required open exploration or pyelolithotomy.

Twenty two renal units required two or more punctures. Mean blood transfusion was 1.2 units and mean hospital stay was 67 hours. In our series, we did tubeless PCNL in 15 cases (19.23 %). All cases of complete staghorn calculus (Figure 1), superior calyceal puncture was made along with other accessory punctures.

Main complications were urosepsis in 9 renal units (11.53 %), urinary leakage / fistula from puncture site in 5 renal units (6.41 %), significant haemorrhage in 6 renal units (7.69 %) and wound infection in 2 renal units (2.56 %). All these complications were managed conservatively. Two renal units developed mild hydrothorax which were managed conservatively. Eighteen percent complaint of bothersome stent related symptoms, of which 77 % needed analgesics or anti-spasmodics. Stone analysis revealed calcium oxalate in 61 % cases, calcium phosphate 19 % cases, mixed (oxalate + phosphate) 12 % cases and uric acid in 8 % cases. There was no deterioration in renal function after either single or multiple tracts PCNL.

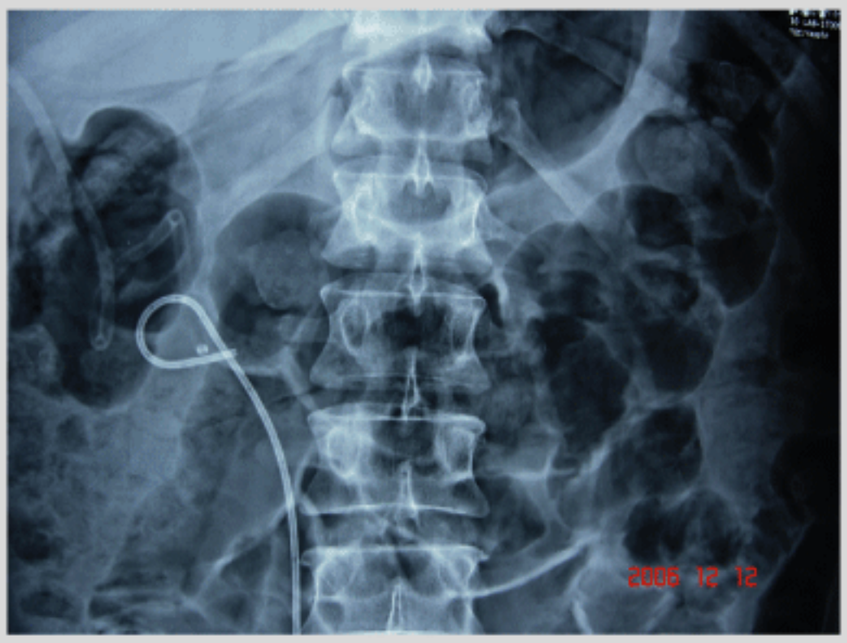

Figure 3: X-ray KUB showing complete clearance of stone with double J stent and nephrostomy tube in situ

Discussion

Maximum stone clearance with minimum morbidity should be the goal of stone management[11]. Though PCNL alone has a good success rate, for larger stone burden, ESWL may be used with PCNL (Sandwich therapy) for complete clearance in some cases[12]. PCNL is preferred to ESWL for larger stones, cystine stones and large inferior calyceal stones. PCNL is less invasive and even less expensive than anatrophic nephrolithotomy because of short hospital stay[12].

Stone location	Pelvis only	Pelvis and one calyx	Pelvis and two calices	Pelvis and three calices
No. of renal units	23	28	15	12
Average stone clearance	23 (100%)	26 (92.85%)	11 (73.33%)	9 (75%)

Table I: Location of stone and average stone clearance rate

In our series, 23 were renal pelvic stones with 100 % clearance rate, 28 pelvis and one calyceal stone with 92.85 % clearance, pelvis and two calices stones were 15 with 73.33 % clearance, pelvis and three calices 12 stones with 75 % clearance rate. Overall stone clearance was 88.46 % and 7.69 % renal units needed ESWL for complete stone clearance which can be compared to some of the studies in good centres[2,3,11,13,14]. In our series, urosepsis was 9 (11.53 %), urine leakage from the tract site 6.41 %, mild hydrothorax 2.6% and significant hemorrhage 7.69% which were managed conservatively. These complication rates are also compatible to other studes[3,14]. Follow up period was 1 to 19 months.

Multi-tract PCNL, supracostal puncture and tubeless PCNL were done safely and these are now well stablished[3,14, 15]. Average hospital stay of our patients was 67 hours which was also comparable[3,6]. In our series, three bilateral PCNL and one PCNL in a malrotated kidney were also done successfully.

Although multi-tract PCNL is safe, complication rate is higher than single tract procedure[15,16]. In our series, we tried to overcome multiple tract dilation even after second or third puncture; rather we successfully manipulated the stones (like push back the stone in the pelvis with puncture needle under fluoroscopy guidance) in a suitable position for extraction. Stones with extension into calyces were difficult to remove in some cases but with the help of various techniques like intraprocedural suction, calyceal irrigation and with flexible cystoscope residual stone incidence can be reduced significantly. Decreased reliance on ESWL after PCNL and liberal use of secondary PCNL (can be done with local infiltration) may be also a good option to ensure stone free status[3].

So, monotherapy with PCNL through superior calyceal approach is safe and highly effective for the treatment of large-volume renal calculi in a single hospital stay. Percutaneous nephrolithotomy has also significantly reduced the morbidity of open surgical procedures previously used for renal stones.

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