https://doi.org/10.22502/jlmc.v1i1.11

Original Research Article

Initial Experience of Percutaneous Nephrolithotomy at Lumbini Medical College

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ABSTRACT:

Introduction: Renal stone disease is a challenging problem in urologic practice especially in our locality because of large stone burden and recurrence. Since ,the early 1980s when percutaneous nephrolithotomy (PCNL) was established for management of renal stones, open surgical procedures have virtually been replaced. PCNL is a safe, effective and minimally invasive approach compared to open surgery for patients with large single, multiple or staghorn stones. The aim of this prospective study was to evaluate and to review our experience with PCNL in management of renal and upper ureteric stones. **Methods**: Prospective study carried out at Lumbini Medical College and Teaching Hospital during 1stJanuary 2011 to 31st October 2011. Sixty patients were evaluated and subjected to PCNL. After clinical investigations like ultrasonography (USG) and intravenous urography (IVU), once patients were found to have renal or upper ureteric stones they were informed and explained about PCNL, its likely complications, probable hospital stay, the cost of treatment and data were recorded along with the operative time, estimated blood loss, stone burden, stone-free rate, length of hospitalization and complications .Patients were followed up after three months to rule out recurrence of stones by plain abdominal x-ray of kidney, ureter and bladder and USG. **Results**: Out of 60 patients 35 were male and 25 were female (M: F=1.4:1) with mean age of 37 years and were subjected to PCNL monotherapy. With the average stone size of 3.26cm, the mean operative time was 78 minutes. Complete stone removal achieved by PCNL alone in 60 cases, with insignificant residual small stones we achieved 97% stone clearance rate. The mean hospital stay was 3.7 days. No Serious complications were encountered, 9 (15%) patients required blood transfusion and 3 (5%) patients developed transient post-operative pyrexia. **Conclusion**: PCNL is the first line treatment option for management of large renal stones which as monotherapy has advantages in removal of renal and upper ureteric stones and achieving excellent results with minimal morbidity.

Keywords: experience • percutaneous nephrolithotomy (PCNL) • renal stones • upper ureteric calculi

INTRODUCTION:

Renal stones continue to occupy a challenging and important place in everyday urological practice especially in our locality because of large stone burden and recurrence. Even after the introduction of Electro-shock wave lithotripsy (ESWL), Percutaneous nephrolithotomy (PCNL) is still the method of choice in patients with large single, multiple or stag horn stones, frequently as monotherapy.[1] PCNL began to be a routine procedure in developed countries since 1980s and has become a standard, well established procedure for the treatment of renal stones.[2,3] Efforts have been made to decrease the procedure morbidity by improving the techniques and the equipment's used in PCNL procedure.[4]

METHODS:

Sixty patients underwent PCNL for treatment of renal and upper ureteric stones at Lumbini Medical College from January 1st to October 31st 2011. Patient's pre-operative assessment included

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How to cite this article:
Sapkota P, Tambay YB, Thapa S, Shakya R. Initial experience of percutaneous nephrolithotomy at Lumbini Medical College. Journal of Lumbini Medical College. 2013;1(1):35-8. doi:10.22502/jlmc.v1i1.11.

medical history, physical examination, urine analysis, urine culture, serum haematocrit, platelet count, coagulation profile, kidney function test, USG, plain abdominal X-ray of kidney ureter and bladder (KUB) and IVU. Each case had a documented negative urine culture or treated with antibiotic according to the culture and sensitivity. The procedure was performed under general anesthesia with prophylactic intravenous antibiotic, patients in dorsal lithotomy position a retrograde catheter was inserted into the proper site using 21F cystoscope, fixed to a 16F Foley catheter and connected to a syringe containing contrast media. The patient was turned to prone position, a retrograde pyelogram was performed in all cases to visualize and distend the collecting system in addition to identify the site, size and number of stones.

RESULTS:

In our study 60 patients were treated with PCNL monotherapy for single, multiple and stag horn renal stones. The average stone diameter was 3.26 cm (range1.5-5.2cm), Table 1. The mean age of these patients were 37 years (range 20- 64 years). Right side disease was seen in 33 patients (55%) and left side disease in 27 patients (45%). Of these patients 35 were males and 25 females with male to female ratio of (1.4:1).

In our study most common location of the stones were 22 (36.67%) renal pelvis, 13 (21.67%) pelvic ureteric junction (PUJ), 11 (18.4%) lower calyx, 10 (16.67%) upper ureteric, 3 (5.0%) upper calyx, and 1 (1.67%) middle calyx respectively. 26 patients (43.34%) were grossly hydronephrotic, 15 patients (25.0%) moderately, 11 patients (18.34%) mild and eight patients (13.34%) without hydronephrosis. Stones were approached through upper, middle, lower calyx and multiple sites as well in some patients with stag horn calculi Table 2 and 3.

Average operating time was 78 minutes for 60 PCNL cases, out of which mean operating time for single stones was 52 minutes (range 45-60 minutes), multiple stones was 70 minutes (range 60-90 minutes) and for staghorn 110 minutes (range 90-120 minutes). Patients with large renal stones needed blood transfusions (Table 4).

Table 1. *Distribution of type of stone and its range*

Stones types	Stone range in centimeter	No. of patients	Mean
Single	1.5 - 3.2	33 (55.0%)	2.7
Multiple	1.5 - 2.7	20 (33.0%)	2.5
Staghorn	3.9 - 5.2	7 (11.67%)	4.6

Though all cases showed 100% clearance rate under fluoroscopy intraoperative, four (6.67%) patients had clinically insignificant residual stone fragments as confirmed by post-operative USG. At three months follow up, all four patients were found to have passed the residual stone and no recurrence was seen.

DISCUSSION:

Renal stones were usually described as more frequent in men.[5] Which seems to be true in our study showing 35 male (58%) slightly more than 25 female (42%). The increasing incidence of nephrolithiasis in women might be due to lifestyle associated risk factors, such as obesity. In developing countries the male-to-female ratio range from 1.15:1 in Iran and 1.6:1 in Thailand to 2.5:1 in Iraq and 5:1 in Saudi Arabia.[6-9] The male to female rate reported by Risal et al. is 2:1.[10] Marshall et al have reported that it is 2 times more in males than females.[11] Similarly,Singh et al., have also reported occurrence of renal stones is higher in males than in females.[12] Our findings male-to female ratio 1.4:1, are in close proximity to the reports of developing countries. In a study conducted by Risal et al. demonstrated that there were decreases in stone prevalence among older age groups. Strikingly, the prevalence was very high in the 20 years age group.[13] Similarly the interesting features of our study are the high occurrence of renal stones in the age group of 10-19 years. The major and most difficult step in PCNL procedure is the ability to create a suitable access to the renal collecting system, with better stone clearance rate and minimal risk of vascular injury and other complications.[14] In our series stones were approached through upper, middle, lower calyx and as well as multiple site in some patients with staghorn calculi.

Traditionally, PCNL has been performed in the prone position like the approach in our cases as it considered by many urologist to be the safest approach to kidney which enable the surgeon or the radiologist to puncture the kidney through brodel's a vascular renal plane without causing significant parenchymal bleeding or visceral injury.[15] However, other investigators described supine position approach with different techniques including the use of flexible ureterorenoscope, with comparable

Table 2: Patients distribution depending on location and hydronephrosis

Locations	Hydronephrosis				Total
	Without	Mild	Moderate	Gross	
Pelvis	1	1	4	16	22 (36.67%)
Upper calyx	2	1	0	0	3 (5.0%)
Middle calyx	1	0	0	0	1 (1.67%)
Lower calyx	4	3	4	0	11 (18.34%)
Puj	0	3	4	6	13 (21.67%)
Upper ureteric	0	3	3	4	10 (16.67%)
Total	8 (13.34%)	11 (18.34%)	15 (25.0%)	26 (43.34%)	60

Table 3. Patients distribution depending on stone location and types of access

Stones locations	Access to stones through			TOTAL
	Upper	Middle	Lower	
Pelvis	0	10	12	22
Upper calyx	2	1	0	3
Middle calyx	0	1	0	1
Lower calyx	0	0	11	11
Puj	0	11	2	13
Upper ureteric	0	9	1	10
Total	2 (3.33%)	32 (53.33%)	26 (43.34%)	60

Table 4. Duration of operation for different types of stones

Type of stones	Operative time	No. of patients	Mean
Single	45 - 60 min	33	52
Multiple	60 - 90 min	20	70
Staghorn	90 - 120 min	7	110

success and complication rates.[16]

About prophylactic antibiotics, all our patients received a full course antibiotics in case of proved growth in urine culture, and during induction of anesthesia as most of the protocols, however, Mariappan et al in their study showed that one week oral ciprofloxacin in case of large renal stone more that 20mm or in case of hydronephrosis significantly reduced the risk of urosepsis after PCNL procedures.[17] Fluoroscopy was done to monitor the access to the collecting system in all our steps of dilatation . Nephrostomy catheter was inserted by size 20F chest tube drainage catheter at the end of our procedure, the aim is to tamponade venous bleeding, to prevent urine extravasations or allow healing of minimal pelvicalyceal system injury and allow an access for a second look PCNL through the same tract in case of significant residual stones.[18] Bellman et al describe the advantages of placement of nephrostomy tube after PCNL and demonstrated that the haemostatic process was easy, it provide an access if second look procedure is required and prevent urinary extravasation.[19] Tubeless PCNL was found by Falahatkaret al on 42 renal units for staghorn stones, they found that the procedure is safe and effective even with less complications.[20] The major concern in PCNL surgery involves serious post-operative complications such as blood loss, adjacent organ injuries and life threatening infection.[21,22] Lee et al. reported the complications of PCNL in 582 patients, they report major complications in 6.8% and minor complications in more than 50% with 11.2% requiring blood transfusion.[23] In study by Osman et al, the complication rate was 50.8% with the most common complication being transient pyrexia in 27.6%, however we report 8% transient post-operative pyrexia and this is explained by the restriction to the selection of patients with pre-operative documentation of absence of infection or one week antibiotic treatment according to sensitivity in case of presence of urinary tract organism.[24] The incidence of blood transfusion in our study was 9% and none of our patients had serious life threatening bleeding that requiring open surgery or angioembolization. Regarding the stone clearance rate, Falahatkar et al. in their series, they achieved 87.5% stone clearance rate, Soucy et al. report 91% stone clearance rate at three months follow up for partial or complete staghorn stones using single or multiple tracts.[25] Our study revealed 97% stone clearance rate and 3% with clinically insignificant fragments following PCNL monotherapy compares favorably with the results ofothers.[26-28] PCNL is a safe and effective method of stone removal in patients with calculi in horseshoe kidneys.[29] In our

study a case of horse shoe kidney was also included where the stone was removed with posteriorly placed upper or middle pole puncture and successful stone removal was achieved.

CONCLUSION:

PCNL as the primary treatment and monotherapy for renal calculi offers the twin advantage of minimally invasive therapy and complete stone clearance. In addition, the hypothesized decrease in renal and body wall trauma may result in less pain, reduced severity or risk of complications, and shorter hospital stays including smaller total procedural cost compared with the other techniques. The success of PCNL depends on meticulous technique and experience. As experience is gained in percutaneous stone surgery there is continuous improvement in the success rate and a decrease in operating time, complication rate and hospital stay after treatment. A general observation of clinicians suggests that the prevalence of urolithiasis is fairly high in Nepal; these increases are seen across sex, race, and age. However, no systematic study has been undertaken here to explore the etiopathogenesis of disease in this region. Hence, looking to the burden of stone a prospective detail study is warranted.

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