PCNL MONOTHERAPY FOR RENAL CALCULI — AN INITIAL EXPERIENCE

Lt Col DEEPAK BATURA*

(Command Hospital Northern Command)

ABSTRACT

Twenty nine cases of renal stone underwent treatment by way of percutaneous nephrolithotomy during a 6 month period. Of these, 13 patients had recurrent or residual stones. Majority of these stones were between 1-2 cm in size. A field operating table was modified for this purpose. In 26 cases the calyceal system was accessed through either of the inferior calyces. Twenty five of these patients underwent stone clearance in a single stage, 2 underwent two-stage surgery while there were 2 failures.

MJAFI 1997; 53 : 119-121

KEYWORDS : Kidney calculi; Nephrostomy percutaneous.

Introduction

Since the first percutaneous nephrostomy performed by Goodwin in 1955 for the decompression of a hydronephrotic kidney [1], this procedure has evolved into an important modality for the management of renal stones. In 1976 Fernstrom and Johansson first described removal of kidney stones after percutaneous nephrostomy [2]. Later in the decade endourological procedures were further refined for the treatment of renal calculi. Hence open procedures are less commonly performed today [3]. Indeed, in many centres, the percutaneous approach is the method of choice for removal of almost all renal stones requiring surgical intervention [4].

Material and Methods

Between December 1994 and May 1995, 29 patients underwent percutaneous nephrolithotomy (PCNL). Patients with stone less than 3 cm diameter and with no underlying systemic disease were chosen. In the first 7 cases, only pelvic stones in dilated calyceal systems were chosen. Later calyceal stones and recurrent stones with non-dilated calyceal systems were included as well. Stones in solitary functioning kidneys were excluded.

Patient preparation: All patients considered for PCNL underwent renal ultrasound and intravenous urogram (IVU) to localize the site of the stone and

to assess contralateral renal function. Preoperative assessment included a hemogram, blood urea and serum creatinine estimations, urinalysis and urine cultures. Chest radiographs and blood sugar estimation were done where necessary. Those with positive urine cultures were treated with appropriate antibiotics 72 hours prior to surgery.

Operative technique: All patients were operated on a field operating table, the middle segment of which had been removed to impart radiolucency and to permit the use of an image intensifier. The first 5 patients were operated under general anaesthesia and the remaining under epidural anaesthesia. The decision to proceed with PCNL was reaffirmed after a retrograde pyelogram. A Fr 5 ureteric catheter was placed into the relevant renal unit and secured to a 16 Fr urethral Foley catheter. The retrograde pyelogram helped to elucidate the intrarenal anatomy, the exact relationship of the stone to the calyces and the configuration of the outflow tract. It also helped in excluding any intrarenal surprises. Thus it contributed toward reaffirming or reversing the decision regarding the advisability of PCNL.

The patient was then placed prone and, under image intensification and retrograde contrast opacification, the appropriate calyx was punctured to gain access to the stone-bearing region of the kidney. Biplanar imaging was not found neces-

*Classified Specialist (Surgery & Urology), INHS Asvini, Colaba, Mumbai - 400005

sary, a postero-anterior image being an adequate guide for directing the puncture. Successful puncture having been confirmed by observing a urine efflux through the puncture needle, a guide wire was introduced and the tract coaxially dilated under image intensification. Tract dilation was performed upto 30 Fr and an Amplatz sheath placed upto the stone. A safety guide wire was not used. The nephroscope was then introduced and the stone removed *in toto* or piecemeal. A 16 Fr Foley catheter was placed in the kidney as a nephrostomy.

Post-operative care: Patients were permitted oral fluids the same evening and normal diet the next day. The nephrostomy was removed after 3 days. All patients were given pre-operative gentamicin injections as a routine. They were discharged after 5 to 7 days after submitting urine samples for culture.

Results

Of the 29 patients operated 27 were males. The ages of the patients ranged between 21-44 years, the mean age being 33 years. Twelve patients had undergone open surgery on the same renal unit earlier while 1 had undergone PCNL earlier.

Twenty seven of these patients had solitary stones, while 2 patients had 2 stones in separate calyces. There was a preponderance of patients with inferior calyceal stones (Table 1). Except for 1 patient with a middle calyceal stone, none other with calyceal calculi had a dilated system. However, 7 of the 9 patients with pelvic stones had mild to moderate hydronephrosis.

TABLE 1
Size and location of stones in 29 patients undergoing PCNL

Site	Size in cms				Total
	< 1	1-2	2-3	> 3	
Pelvis	—	1	6	2	9
Inferior calyx	4	12	1	—	17
Middle calyx	1	1	—	—	2
Superior calyx	1	—	—	—	1
Total	6	14	7	2	29

Fourteen patients had stones between 1-2 cm in size as measured in the largest diameter on stand-

ard radiographs (Table 1).

Fifteen of the renal units were accessed through posterior inferior calyceal punctures while the anterior calyx was used in 11 cases. The calculi lying in the middle and superior calyces were accessed through direct calyceal punctures. For the superior calyceal stone an infracostal approach was successful and no recourse to the riskier supracostal puncture was required.

Duration of surgery ranged between 25 minutes to 2 hours 45 minutes. The average operating time was 1 hour. Twenty five of the patients underwent stone clearance in a single stage while 2 underwent two-stage surgery. The indications for staged surgery were brisk bleeding leading to curtailment of the procedure in 1 patient, and presence of residual fragments which were subsequently removed a week later by PCNL in the other case. In 2 patients the procedure was unsuccessful due to inaccurate punctures and consequent nonvisualization of the stone. These patients underwent stone removal by a dorsal lumbotomy on the field operating table, obviating the need to reposition the patient.

Twenty of the 27 stones were successfully removed *in toto* as 'pick up' stones, the other 7 being removed piecemeal. Three of these stones were fragmented by ultrasonic lithotripsy, the others, being friable, broke during removal.

The complications encountered are enumerated in Table 2. Fever was considered significant if it lasted more than 18 hours. The 2 cases of haemorrhage subsided spontaneously within 8 hours, though nephrostomy tube tamponade was employed in both cases. Three patients had residual fragments (none larger than 5 mm), while 3 patients had urinary infection which responded to conventional treatment.

TABLE 2
Complications encountered in 29 patients undergoing PCNL

Event	No. of patients
Fever	3
Hemorrhage	2
Secondary haematuria	1
Residual fragments	3
Urinary infection	3

Twenty of these patients were followed-up for periods ranging from 8 weeks to 15 months. The follow-up protocol included urinalysis, urine culture, urea and creatinine estimation, IVU (and renal scan in one case). One patient developed recurrence. Metabolic evaluation in this patient revealed hyperphosphataemia and hypercalciuria. He was advised dietary restrictions, thiazide diuretics and aluminium hydroxide gel. He did not have any anatomical or functional abnormality that could be considered a significant factor in increasing the risk of recurrence [5].

Discussion

The advent of extra-corporeal shock wave lithotripsy (ESWL) in the 1980's was expected to sound the death knell of PCNL. While originally used for pelvic stones in dilated systems, the scope of PCNL has progressively enlarged to include management of a variety of stones. These include renal pelvic calculi, calyceal calculi, staghorn calculi and large cystine stones. Stones that coexist with underlying ureteropelvic junction obstruction, calyceal diverticulum or infundibular stenosis are also considered suitable [6]. On the basis of analysis of Mayo Clinic data, PCNL has been recommended in those patients with outflow tract obstruction, or with large stone volumes, or where the patients body habitus was unsuitable for ESWL, or when other modalities failed and for those with cystine stones, pacemakers or calcified vessels [7].

In our country, where limited funds prevent access to ESWL for most patients, the indications for PCNL can be enlarged, perhaps justly so, to include other cases as well. Indeed, Reddy and Lange enthusiastically opined that this procedure, apart from being the preferred method for removing simple pelvic and lower calyceal stones, has also become the procedure of choice for calyceal and staghorn stones [8].

In the present series, a large majority of stones were solitary calyceal stones in non-dilated systems, and no undue difficulty was encountered provided the caveat of a well-placed puncture was adhered to. The 2 failures represent cases where an inaccurate puncture in a non-dilated system precluded intrarenal manipulation and hence successful removal. Recurrent stones have been easier to

operate upon, primarily because post-operative adhesions fix the kidney and make it less mobile. PCNL for recurrent stones is certainly less tedious, and less fraught with risks like intraoperative bleeding and infection, than redo open surgeries.

This being an initial experience, by and large solitary uncomplicated stones were selected with a resultant bias on the outcome. Nevertheless, a failure rate of 6.8 per cent was encountered, which is higher than the accepted figure of 1.5 per cent in similar series [9]. However if the outcome is viewed in light of the fact that every new procedure carries a learning curve of experience, and this is a small series, it may not be unduly sanguine to expect better results in the future.

No major complications were encountered and follow-up has revealed no long term deleterious effect upon the renal units operated - testimony to the inherent safety of the procedure if properly performed.

REFERENCES

1. Goodwin WB, Casey WC, Woolf W. Percutaneous trocar (needle) nephrostomy in hydronephrosis. *JAMA* 1955; 157: 891-904.
2. Fernstrom I, Johansson B. Percutaneous pyelolithotomy. A new extraction technique. *Scand J Urol Nephrol* 1976; 10: 257-61.
3. Motola AJ, Smith AD. Percutaneous Techniques. In: *High Tech Urology. Technologic innovations and their clinical applications*. Smith JA, editor Philadelphia: WB Saunders, 1992; 208-33.
4. Segura JW, Patterson DE, LeRoy AJ, et al. Percutaneous removal of kidney stones: Review of 1000 cases. *J Urol* 1985; 134: 1077-81.
5. Stream SB. Long term incidence and risk factors for recurrent stones following percutaneous nephrolithotomy or percutaneous nephrolithotomy/extracorporeal shock wave lithotripsy for infection-related calculi. *J Urol* 1995; 153: 584-7.
6. Motola JA, Smith AD. Therapeutic options for the management of upper tract calculi. *Urol Clin North Am* 1990; 17: 191-206.
7. Segura JW. Percutaneous Management. In: *Campbells Urology*. 6th ed. Philadelphia: WB Saunders, 1992; 2193-4.
8. Reddy P, Lange PH, Kulbat JC, et al. Percutaneous removal of calyceal and other inaccessible stones. *J Urol* 1984; 134: 443-7.
9. Branner GE, Bush WH, Correa RJ, Gibbons RP, Elder JS. Kidney stone removal: Percutaneous versus surgical lithotomy. *J Urol* 1985; 133: 6-12.