Percutaneous renal surgery for urolithiasis

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Summary

Sixty eight consecutive cases of percutaneous renal surgery, percutaneous nephrolithotripsy (PCNL), were performed on 64 patients (male – 41, female – 23) at the Subang Jaya Medical Centre from April 1988 to July 1989. All the cases were done as a one stage procedure. Fifty eight stones were large renal or staghorn and ten were ureteric. Thirty cases (41%) were stone free after PCNL alone. Thirty eight cases had residual fragments needing extracorporeal shockwave lithotripsy (ESWL). Mean operating time was 109.6 ± 36.0 minutes. Mean hospital stay was 4.5 ± 1.8 days. At three months follow-up, 86% of the cases were stone free. The remaining had residual sand (less than 3mm). Minor complications occurred in six patients. None required major surgical intervention post PCNL.

Key words: PCNL, ESWL, Ureteroscopy, lithotripter, endourology.

Introduction

Fernstrom and Johanson[1] first described percutaneous nephrolithotripsy (PCNL) in 1976 but it was not until 1981 that the technique became an established method of stone removal. Even after the introduction of extracorporeal shockwave lithotripsy (ESWL) in Germany (1982) and the United States (1984), PCNL continued to be needed in the treatment of complicated or large urinary calculi.[2–10] Today, the importance of PCNL in the urological armamentarium has been well documented.[2–10]

ESWL is effective for renal stones up to 25mm size and for small or unobstructed ureteric stones.[9–15] Larger stones or staghorn stones are best treated by PCNL.[3–10] ESWL is only used as an adjunct to clear any residual fragments post PCNL. Very hard or tightly impacted upper urinary stones, including ureteric stones, that fail to fragment with ESWL would also require PCNL. Percutaneous endourological techniques are also vital to treat any post ESWL urosepsis secondary to ureteric obstruction. Percutaneous endourological services which are associated with low morbidity are undoubtedly very essential to all lithotripsy centres.

Patients and methods

From March 1988 to July 1989, 68 consecutive PCNL procedures were performed in 64 patients. This study was to determine the role of percutaneous surgery in the current management of urinary calculi.

PCNL was offered as first line therapy for renal stones larger than 35mm diameter, staghorn calculi (full or partial) and large obstructed upper ureteric calculi. It was also performed for patients who had failed ESWL and patients who had post ESWL steinstrasse obstructions.

Of the 68 cases, 16 cases were full staghorn, 25 partial staghorn, nine large renal pelvic calculi, ten large impacted upper ureteric calculi and eight were combinations of renal and ureteric calculi. Two of these cases were due to failed ESWL, viz an impacted calculus at the pelvic ureteric junction and a diverticular calculus. Five cases of partial and full staghorn calculi had had ESWL attempted in other lithotripter centres.

All cases were done as one stage procedure i.e. percutaneous tract dilatation and removal of the stone were done in one sitting. The kidneys were punctured through the upper calyx in 16 cases, middle calyx in ten cases and lower calyces in 39 cases; and in three kidneys both upper and lower calyces were punctured simultaneously to clear the stone.

In order to gain good access to the kidney, 17 cases needed the tracts to be sited above the 12 rib (supracostal access). Both metal and fascial dilators were used in dilating the tracts.

Puncturing of the kidney was done with a portable C-arm image intensifier. A pelvic ureteric junction occlusion balloon catheter was routinely used to inject contrast to visualise the calyceal system during the puncture. A safety guide wire was routinely placed before the percutaneous tract was fully dilated. An Amplatz sheath was placed with the last dilator (either F28 or F30) to facilitate removal of the stone in 60 out of the 68 cases. The kidney stones were fragmented using ultrasonic lithotripsy and pieces of stone fragments were removed by grasper. A malecot pigtail stent or a J-stent together with a malecot stent were placed as a nephrostomy drainage on completion of the procedure.

Check X-ray or nephrostogram was done after 24 to 48 hours and the nephrostomy tube removed usually on the second or third postoperative day. If necessary, ESWL (shockwave) was given to pulverise any significant residual fragment before removal of the nephrostomy tube.

The Chi-square test was used to compare the results of the different groups of patients. Operating time and hospital stay were expressed as mean ± standard deviation.

Results

Thirty of the 68 cases (41%) were stone free after PCNL alone. The remaining 38 (59%) had residual fragments which were not accessible through the percutaneous tract and needed ESWL treatments.

The total operating time for the percutaneous procedure ranged from 50 to 270 minutes (109.6 ± 36.0 minutes). The number of days of hospitalisation ranged from 1–8 days (4.5 ± 1.8 days).

Sixty two out of the 64 patients returned for follow-up and check X-ray. Of these 66 cases (62 patients), 57 (84%) were found to be stone free and nine (13%) had residual fragments less than 3mm size. The outcome for patients undergoing PCNL alone was significantly better ($P < 0.01$) than patients who require combined PCNL and ESWL (Table 1).

Table 1
Percutaneous renal surgery and outcome of 66 cases with complicated stones

Procedures	Number of cases		Total
	Stone Free	Patients with residual stone	
PCNL	30	0	30
PCNL & ESWL	27	9	36
Total	57	9	66

However, the outcome was not significantly different ($p > 0.05$) in patients with stone less than 25mm compared with stones of 25mm or greater (Table 2).

The most common complication (post PCNL) was fever (50 patients). However, none developed any significant sepsis even though only peri-operative prophylactic antibiotics were given. A full course of antibiotics was only given if the urine culture was positive pre-operatively.

Three patients required blood transfusion. One patient each developed pneumothorax, haemothorax and pleural effusion. All three required chest tube insertion. Two patients developed secondary haemorrhage necessitating bladder clot evacuation. One patient had a tiny persistent urinary fistula but refused further intervention. None of the complications required any major surgical intervention.

Table 2
Percutaneous renal surgery and outcome as influenced by stone size

Stone sizes	Number of cases		
	Stone Free	Patients with residual stone	Total
< 25mm	18	0	18
> 25mm	39	9	48
Total	57	9	66

Discussion

From March 1988 to July 1989, we treated 635 consecutive upper urinary calculi. 68 cases (11%) of these urinary calculi required percutaneous removal PCNL alone or combination with ESWL. The indications for percutaneous nephrolithotripsy (PCNL) were large stone volume, failed ESWL and large impacted upper ureteric calculi that could not be pushed up into the renal pelvis to ensure success with ESWL.

The three months stone free rate was significantly better when PCNL was used alone compared to when the stones were treated by combination of PCNL and ESWL. This was to be expected as ESWL treatment in most series have about 10% of the cases with post ESWL residual sand.[10–15] However, the stone free result was not significantly different at three months follow-up whether the stone was less or greater than 25mm, when PCNL alone or combination of PCNL and ESWL were used. This indicate PCNL alone can also achieve similar stone free rates even in large or full staghorn calculi.

The success rate with staghorn or large pelvic stones (more than 25mm) using ESWL monotherapy has been poor in most series.[2–10] Of 635 urinary calculi in our series, 49% were difficult stones (stones larger than 25mm size and large impacted or ureteric calculi). However, we were still able to achieve a success rate of 98% with ESWL.[16] This high success rate with the lithotripter would not have been possible without the services of endourology which include PCNL. None of the patients subjected to ESWL who developed serious complications or failed ESWL needed open surgery.[16]

In conclusion, PCNL is a safe procedure with low morbidity, short hospitalisation and convalescence.[1,2–9,17–19] It is the treatment of choice for large renal or impacted upper ureteric calculi.[3–10,19] ESWL is only an adjunct to clear any residual stones post PCNL. PCNL is also necessary to salvage any failed ESWL due to very hard or tightly impacted renal pelvic calculi. The percutaneous technique is also necessary to treat any emergency due to ureteric obstruction post ESWL. A PCNL service is indeed very essential to all lithotripter centres.[9,10,16,19]

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