

Research Article

Whether retrograde pyelography mandatory for percutaneous nephrolithotomy: a randomized clinical trial

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ABSTRACT

Background: Percutaneous nephrolithotomy (PCNL) technique was introduced a new era in the management of renal calculi, and day by day many changes occurred regarding the puncture points to an opaque stone as a guided landmark. We aim at comparing the outcome of many renal calculi with or without retrograde pyelography (RGP).

Methods: In a randomized clinical trial 110 cases with opaque renal calculi for PCNL with stone in the calyces, in the pelvis, both in the calyx and pelvis, simultaneously, included in 2 year study. They were randomized in 2 groups, non RGP (56) and RGP (54), called interventional and control group respectively.

Results: 2 groups are analyzed according to gender, age, duration of operation and hospital stay, past history of any surgical intervention on kidney and stone size. Outcome was evaluated with plain x-ray and USG abdomen. No differences in outcome were observed in between the two groups.

Conclusions: Present findings conclude that there is no difference in major clinical outcome between the 2 groups. So we can say RGP is not mandatory for selected patients while doing PCNL

Keywords: Percutaneous nephrolithotomy, Retrograde pyelography, Ureteric catheter, PCNL, RGP

INTRODUCTION

Percutaneous nephrolithotomy (PCNL) is the treatment of choice for kidney calculi greater than 2 centimeters in diameter and for cases of failed shock wave lithotripsy such as those with cystine calculi.¹

The routine approach for accessing the pyelocalyceal system is the placement of a ureteral catheter, injection of contrast media or air, and puncturing the calyceal system using fluoroscopy.^{2,3}

Other methods of the calyceal access are ultrasonography-guided method using intravenous contrast injection and computed tomography-guided (CT-guided) methods, especially if there is an abnormal

calyceal anatomy.^{2,4-9} PCNL introduced since long, but till that time there have been many changes occur in the entrance to pelvicalyceal system such as insertion of a needle as pointed to the opaque stone as a guide landmark or classical method of system enhancement with retrograde pyelography (RGP) or USG guided puncture. In clinical practice both methods are widely used but we didn't find any randomized clinical trial comparing them.^{1,5}

In the classic method, surgeon must perform as additional procedure to insert a ureteral catheter for better delineation of pelvicalyceal system. Thus, if the later is as efficient as the former in the elimination of stones, it is a good idea to perform PCNL without RGP. In this study we aim at comparing the clinical outcomes of renal

calculi management with and without retrograde pyelography.

METHODS

This is a randomized clinical trial in which 110 cases with opaque renal calculi in one calyx, renal pelvis or one calyx and renal pelvis simultaneously taken for PCNL in last 2 years. All patients had preoperative IVP to delineate pelvicalyceal system properly. They were randomized into 2 groups, one with RGP (56 patients) while other without RGP (54 patients).

Age, gender, past history of any surgical procedures on kidneys, side of the involved kidney, postoperative hemoglobin decline/ complications, postoperative fever, urinary leak, duration of PCNL (in minutes), radiation duration, length of hospital stay and outcome (stone-free), insignificant residuals, need for extracorporeal shock wave lithotripsy, need for additional PCNL and need for transureteral lithotripsy were recorded for each patient.

PCNL was performed classically in the RGP group, with the insertion of the ureteral catheter cystoscopically and the performance of a retrograde pyelography with contrast media and the assessment to the proper calyx while in the non RGP group, the pyelocalyceal system was approached with the insertion of a small needle toward the opaque stone, without any ureteral catheter insertion. In fact, after viewing the stone with fluoroscopy, the needle is inserted toward it. In case it is

proved to be successful for the system, entrance (i.e. urine aspiration) the contrast media (urographin) is injected to find out if the direction of the needle in the system is appropriate (a blood-less route like calyceal caps or fornices).

If so, dilatation is performed. Otherwise, a better direction is tried using the enhanced system toward the stone. On the other hand, if the first trial for the system entrance was not successful, the second puncture is performed under the guide of fluoroscopy targeting the stone. Enhancement of the system with intravenous pyelography is used only if multiple attempts for the system entrance were not successful. After dilatation, lithotripsy was performed with pneumo-lithoclast

Postoperative outcome was evaluated using plain X-ray performed on the morning after procedure. SPSS version 10 was used for statistical analysis. Kolmogorov-Smirnov test was used to test for normality of quantitative variables. Student t test and non-parametric (Mann-Whitney U) test were used for statistical analysis. $P \leq 0.05$ was considered as significant

RESULTS

The 2 groups were analyzed with similar distributions regarding gender, age. Demographic features and other characteristics of the two groups are demonstrated in Table 1. There was no significant difference between the 2 groups regarding stone location (calyce, pelvis, or calyce and pelvis simultaneously).

Table 1: Demographic characteristics of the 2 studied groups.

Characteristic	Group		p Value* Significant
	With retrograde pyelography	Without retrograde pyelography	
Gender (% male)	66.66 (36 patients)	60.71 (34 patients)	0.27
Age (mean±SD)	40.81 ± 14.78	42.90±14.14	0.56
Side of the involved kidney (% left)	83.33 (45 patients)	75 (42 patients)	0.027
Stone size (mean of 2 diameters)	3.2±0.7	2.9 ± 0.5	0.7
Urine leakage	6 Patients (11.1%)	2 Patients (3.5%)	0.3
Post PCNL fever	25% (14/56)	16.6% (9/54)	0.23

The findings of the major outcomes are presented below. The duration of surgery range from 23 minutes to 94 minutes and mean duration of surgery was 64.24±17.26 minutes in RGP group and 59.64±15.28 in the NON-RGP group ($p > 0.05$). The average duration of radiation exposure in the NON-RGP group was 2.34±1.27 and 2.56±1.1 minutes in the other ($p > 0.05$).

Hospital stay in the catheterized group was 1.8±1.48 and 2.40±1.06 days in the NON-RGP group ($p > 0.05$). Prevalence of post-PCNL fever in catheterized was 25%

(14/56) versus 16.6% (9/54) in the NON-RGP group ($p > 0.05$). Postoperative hemoglobin decrease was significantly higher in PCNL in the catheterized (2.29±1.25) when compared to the NON-RGP group (1.03±0.9) ($p < 0.001$).

No difference in outcome was observed between the 2 groups ($p = 0.136$). Around 96 percent of the patients in the catheterized group (n=54), were stone free on the day after operation, whereas in the NON-RGP group, 90.7% percent of the patients (n=49) were stone free on the day

after operation. Three patient in the NON-RGP group and 2 patients in the catheterized group needed ESWL. Additional PCNL was required in one patient in the NON-RGP group. Even after recoding outcome no difference was detected between the 2 groups ($p=0.2$).



Figure 1: Plain X-ray KUB showing stone in right renal pelvis.



Figure 2: Preparing for puncture without RGP.



Figure 3: Puncture without RGP.

DISCUSSION

Percutaneous access to the pyelocalyceal system is the first measure in most percutaneous treatments such as PCNL, endopyelotomy, and the upper urinary tract drainage in obstructive uropathies. This can be achieved by insertion of a ureteral catheter for instillation of contrast medium under the guidance of fluoroscopy, ultrasonography, or CT scan.^{3,11}

However, a blind access may be required in cases such as obstruction or stricture of the ureter, abnormal anatomy of the ureteral orifice, or when the required equipment for the standard approach is not available. Furthermore, the known complications of radiation exposure for the surgical team in long-term have emerged lowering the duration of exposure in endourological procedures.¹⁰

Till today, experience with PCNL without catheter has been limited to catheter insertion preoperatively and removing immediately afterwards just after.⁴ In this study, the ureteric catheters were not introduced earlier but directly go for puncture in prone position and the outcomes were compared with the classic PCNL.

In the classical approach to pyelocalyceal system, the system is opacified with retrograde pyelography with contrast media.⁵ Study shows that using a ureteric catheter may facilitate access to enhanced system (due to some pyelocalyceal distension) and can provide us with better directions in PCNL; though we did not find any kind of problem without it.⁷ In PCNL with catheter, a constant access to pelvis is provided and in case of any complications, successful management is more achievable but in well experienced hand one can go directly for the puncture.

Access to enhanced system may theoretically reduce blood loss (due to entrance via a hypovascular plane) and decrease the incidence of residual stones (due to most proper direction), but we did not find such benefits.¹² It seems that targeting the stone from a point medial to the posterior axillary line, saves this hypovascular plane.

Entrance to the system with antegrade pyelography has been widely used and fluoroscopic evaluation of the collecting system during antegrade pyelography is probably the best technique to use but in normal systems with simple stones, like what we had in present cases, performing retrograde pyelography does not sound necessary.¹⁵ In addition, the enhanced system may need less radiation exposure or reduce the total time of surgery; though no difference was observed in this regard.

Using balloon ureteral catheter insertion in PCNL has some benefits such as inhibiting migration of stone particles to the ureter.⁷ Due to financial implications, it is not a routine to use balloon ureteral catheter for PCNL in our center and simple ureteral catheter is used instead. Nevertheless, migrated ureteral stones are infrequently seen in our cases. In present study, the rate of migrated ureteral stones needing ureteroscopy was not different in the 2 studied groups. This finding is also justifiable, as simple ureteral catheter used in the control group does not provide any protection in this regard as discussed above.

The use of ureteral catheter may introduce bacteria from the lower urinary tract to the upper system and its

insertion requires another procedure (cystoscopy) to the patients. In addition to this potential complication, air embolism may rarely occur during retrograde pyelography.¹³

In this study, no increase in the rate of post-PCNL fever was observed in PCNL either with a catheter or without it. Moreover, PCNL without ureteral catheter can reduce postoperative discomfort due to less pain and less urine leakage as demonstrated in this study.

CONCLUSION

No differences in major clinical outcomes were observed between PCNL either with or without catheter (RGP). Considering other benefits of PCNL without stent insertion (e.g. no need to cystoscopy and lower amount of urine leakage as only one catheter is inserted in the urethra), it is a safe alternative procedure. Selection of patients for PCNL without catheter may be limited to those with opaque stones in pelvis or/and in one calyce. It is also a safe procedure for accessing to pyelocalyceal system in patients with difficulty for cystoscopy (due to positioning or urethral stricture).

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