



## Outcome of Calyceal Access with or Without Retrograde Pyelography in Percutaneous Nephrolithotomy

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### Abstract

**Background:** Percutaneous nephrolithotomy (PCNL) has gradually evolved to be one of the main endourologic treatment options for managing renal stone. For successful entry into pelvicalyceal system can be obtained by fluoroscopy, ultrasonography and sometimes computed tomography (CT-guided) after RGP, but many are done without RGP. In this study, our objective was to compare the clinical outcomes of renal calculi management by PCNL with and without retrograde pyelography.

**Method:** This quasi experimental study conducted on 60 cases with opaque renal calculi in lower, middle and upper calyx and lower calyx with renal pelvis. They were grouped into 2 groups purposely, one with RGP (30 patients) while other without RGP (30 patients).

**Result:** We found no statistically significant difference between RGP and non RGP group in terms of duration of surgery ( $71.68 \pm 12.95$  minutes vs  $78.84 \pm 15.56$  minutes), duration of radiation exposure ( $3.55 \pm 1.34$  min vs  $3.74 \pm 0.52$  minutes) & hospital stay ( $3.0 \pm 0.8$  vs  $2.6 \pm 1.0$  days). Around 93.33 percent of the patients in the RGP group ( $n=28$ ) were stone free, whereas in the Non-RGP group, 90% percent of the patients ( $n=27$ ) were stone free.

**Conclusion:** We can avoid RGP during PCNL in selected cases for pelvicalyceal access in the sight of no significant differences in duration of surgery, duration of radiation exposure, Hospital stay & complications in PCNL either with or without RGP.

### Background & Objective

Percutaneous nephrolithotomy (PCNL) has gradually evolved to be one of the main endourologic treatment options for managing renal stone. Best way to visualize and accessing the pelvicalyceal system for PCNL is retrograde pyelography by using contrast medium or air under the guidance of fluoroscopy. Sometimes ultrasonography or CT scan are also used for visualization. But the fluoroscopy and CT scan have great radiation hazard which is a dreaded complication to the urologist. So, all urologists want to reduce the radiation exposure time during the procedure. To reduce radiation exposure many techniques are introduced regarding pelvicalyceal system entry such as insertion of the needle pointed to an opaque stone as a guided landmark without retrograde pyelography (RGP). The guided method may be

fluoroscopy, ultrasonography and sometimes computed tomography (CT-guided). Though most of the procedures are performed by gaining access to calyceal system after RGP, but many are done without RGP. Efficacy to eliminate stone from kidney in later procedure is not less than the former. In this study, our objective was to compare the clinical outcomes of renal calculi management by PCNL with and without retrograde pyelography.

### Materials & Methods

This was a Quasi experimental study in which 60 cases were included with opaque renal calculi. Stone in lower, middle and upper calyx and lower calyx with renal pelvis were taken as sample for last one year. Preoperative radiological evaluation was done by IVU or CT scan to delineate pelvicalyceal system for planning

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purpose. They were grouped into 2 groups purposely, one with RGP-group A (30 patients) while other without RGP-group B (30 patients).

PCNL was performed classically in the RGP group, with opacification of pelvicalyceal system with contrast media via cystoscopically inserted ureteric catheter and the assessment to the proper calyx. In non RGP group puncture was done by inserting puncture cannula toward the opaque stone or by imagine the calyceal system (assumption from IVU or CT scan). It was proved to be successful if urine was coming through the needle or by aspirating the urine by syringe. Ureteric catheter was inserted in both groups. Stone free status was evaluated using plain X-ray KUB 4 weeks after procedure.

Age, gender, 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 additional procedures (ESWL, PCNL or ureteroscopic lithotripsy) were recorded for each patient. Statistical analyses were done by using SPSS version 10. Statistical analyses were done and level of significance was measured by using Chi-square test ( $\chi^2$ ) and Student's t-test.  $P \leq 0.05$  was considered as significant.

### Results

After analysis of 2 groups we found similar distributions regarding age, gender. We found no statistically significant difference between groups regarding stone location (calyx, pelvis, or calyx and pelvis simultaneously).

The duration of surgery range from 48 minutes to 99 minutes and mean duration of surgery was  $71.68 \pm 12.95$  minutes in RGP group and  $78.84 \pm 15.56$  in the Non-RGP group ( $p > 0.05$ ).

The findings of the major outcomes are presented below.

Characteristic	Group		P value
	With RGP (Group A)	Without RGP (Group B)	
Gender (% male)	63.33% (19 patients)	70.00% (21 patients)	
Age	$35.34 \pm 10.78$	$39.45 \pm 11.14$	0.06 <sup>NS</sup>
Side of the involved kidney (% left)	66.67% (20 patients)	60% (18 patients)	
Stone size	$2.9 \pm 0.5$	$2.7 \pm 0.5$	0.06 <sup>NS</sup>
Stone free rate	93.33% (28/30)	90.00% (27/30)	0.60 <sup>NS</sup>
Post PCNL fever	23.33% (7/30)	33.33% (10/30)	0.40 <sup>NS</sup>
Urinary leakage	13.33% (4/30)	10.00% (3/30)	0.70 <sup>NS</sup>
Postoperative hemoglobin drop	$1.31 \pm 0.76$	$1.05 \pm 0.37$	0.14 <sup>NS</sup>
Duration of surgery	$71.68 \pm 12.95$	$78.84 \pm 15.56$	0.08 <sup>NS</sup>
Duration of radiation exposure	$3.74 \pm 0.52$	$3.55 \pm 1.34$	0.47 <sup>NS</sup>
Hospital stay	$3.0 \pm 0.8$	$2.6 \pm 1.0$	0.06 <sup>NS</sup>

NS: Not Significant

The average duration of radiation exposure in the Non-RGP group was  $3.55 \pm 1.34$  min and  $3.74 \pm 0.52$  minutes in the other ( $p > 0.05$ ). Hospital stay in RGP group was  $3.0 \pm 0.8$  and  $2.6 \pm 1.0$  days in the Non-RGP group ( $p > 0.05$ ). Prevalence of post-PCNL fever in RGP group was 23.33% (7/30) versus 33.33% (10/30) in the Non-RGP group ( $p > 0.05$ ).

Postoperative hemoglobin decrease in the RGP group was  $1.31 \pm 0.76$  gm/dl and  $1.05 \pm 0.37$  gm/dl in the Non-RGP group ( $p > 0.05$ ). No difference in outcome was observed between the 2 groups ( $p = 0.6$ ). Around 93.33 percent of the patients in the RGP group ( $n = 28$ ), were stone free on the day after operation, whereas in the Non-RGP group, 90% percent of the patients ( $n = 27$ ) were stone free on the day after operation. Two patients in the Non-RGP group and 2 patients in the RGP group needed ESWL. Additional PCNL was required in one patient in the Non-RGP group.

### Discussion

There is a theoretical believe that access to calyceal system by enhancing system causes less blood loss by localization of the hypovascular plane. But Biswas et al 2016 did not found any extra benefit. Instead they recommended that targeting the stone from a point medial to the posterior axillary line can achieve this hypovascular plane.

During PCNL a ureteric catheter in situ provide extra benefit if any complication arise and successful management could be ensured. But experienced urologist can access directly.

Retrograde pyelography is done to enhance the collecting system. At that time fluroscopy or CT is used which emit radiation and surgeons are exposed to radiation which causes serious health hazard.

Radiation exposure is slightly less if puncture is done by directly pointing the stone. In our study only where fluoroscopy was used radiation exposure time was  $3.55 \pm 1.34$  min in Non RGP group and  $3.74 \pm 0.52$  minutes in RGP group. Biswas et al. 2016 found that the average duration of radiation exposure in the NON-RGP group was  $2.34 \pm 1.27$  and  $2.56 \pm 1.1$  minutes in the other ( $p > 0.05$ ). Biswas et al. 2016 and Tabibi et al 2007 published that the average duration of radiation exposure in the non-RGP (where contrast was not given) group was  $2.58 \pm 1.47$  and  $2.66 \pm 1.2$  minutes in the other ( $p > 0.05$ ) (Tabibi et al 2007).

Usually some time is required for cystoscopic ureteric stenting. So, total operation time is increased in this situation. In our study we put a ureteric catheter in both group to prevent any complications. Some study were conducted where ureteric catheter was not given in one group. In our study mean duration of surgery was  $71.68 \pm 12.95$  minutes in RGP group and  $78.84 \pm 15.56$  minutes in Non-RGP group. Biswas et al. 2016 found that the duration of surgery range from 23 minutes to 94 minutes and mean duration of surgery was  $64.24 \pm 17.26$  minutes in RGP group and  $59.64 \pm 15.28$  in the Non-RGP group ( $p > 0.05$ ). Tabibi et al 2007 showed that mean duration of surgery was  $73.2 \pm 26.37$  minutes in catheterized group and  $62.86 \pm 17.66$  in the non-catheterized group ( $p > 0.05$ ).

In our study we didn't find any difference in the duration of hospital stay and duration of hospital stay in RGP group was  $3.0 \pm 0.8$  days and Non-RGP group was  $2.6 \pm 1.0$  days. Biswas et al. 2016 mentioned that hospital stay in the catheterized group was  $1.8 \pm 1.48$  and  $2.40 \pm 1.06$  days in the NON-RGP group ( $p > 0.05$ ) (Biswas et al. 2016). Tabibi et al 2007 showed that hospital stay in the catheterized group was  $2.7 \pm 1.08$  and  $2.93 \pm 2.16$  days in the non-catheterized group ( $p > 0.05$ ) (Tabibi et al 2007)

Post operative pyrexia is common after PCNL whether it is standard PCNL or Tubeless PCNL and PCNL with RGP or without RGP. Main reason is the bacterial endotoxin which is released after stone fragmentation. During our study we also combated such situation in some cases. We found 7 cases with fever after PCNL in RGP group and 10 cases in Non RGP group. In the study of Biswas et al. 2016, prevalence of post-PCNL fever in catheterized was 25% (14/56) versus 16.6% (9/54) in the NON-RGP group ( $p > 0.05$ ) (Biswas et al. 2016) and Tabibi et al 2007 found prevalence of post-PCNL fever in catheterized was 23.2% versus 18.5% in the non-catheterized group ( $p > 0.05$ ) (Tabibi et al 2007). We think that incident of post operative fever is less in Non-RGP group is due to absence of contrast installation. Because contrast is usually given by some pressure which may causes intravasation of toxin in the circulation.

Per-operative blood loss is a common phenomena in PCNL like other operations. But sometimes severe bleeding

may occur as a complication. Postoperative hemoglobin decreases in the study of Biswas et al. 2016 where it was significantly higher in the catheterized ( $2.29 \pm 1.25$ ) when compared to the NON-RGP group ( $1.03 \pm 0.9$ ) (Biswas et al. 2016). In the study of Tabibi et al 2007 postoperative hemoglobin decrease was significantly higher in PCNL in the catheterized ( $2.29 \pm 1.25$ ) when compared to the non-catheterized group ( $1.03 \pm 0.9$ ) ( $p < 0.001$ ) (Tabibi et al. 2007). But In our study haemoglobin decreases was  $1.31 \pm 0.76$  gm/dl in RGP group and  $1.05 \pm 0.37$  gm/dl in Non-RGP group and it was not significant.

Main aim of PCNL is to make the kidney complete stone free. In the study of Biswas et al. 2016 no difference was observed between the 2 groups ( $p = 0.136$ ) and percentage of stone free rate was around 96% and 90.7% in RGP group and in NON-RGP group, respectively. Three patient in the NON-RGP group and 2 patients in the catheterized group needed ESWL and one patient needed Re-PCNL in the NON-RGP group (Biswas et al. 2016). Tabibi et al 2007 observed no difference in outcome because percentage were 93% and 78.6% in the catheterized group and non-catheterized group, respectively (Tabibi et al. 2007). In our study percentage of stone clearance was 93.33% in RGP group and 90% in Non-RGP group and difference was not significant. In our study, no distinction was made between the data entries of stone burden and location with clearance rate in two groups. These factors may be responsible for non-stone free cases in either group.

### Conclusion

We found no significant differences in duration of surgery, duration of radiation exposure, hospital stay & complications in PCNL either with or without RGP. So our impression is we can avoid RGP during PCNL in selected cases (according to inclusion criteria).

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