

REAL TIME ULTRASONIC VERSUS FLUOROSCOPIC  
GUIDED PERCUTANEOUS NEPHROLITHOTRIPSY  
(Comparative Study)

**Thesis**

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## Summary and Conclusion

Since the initial description of purposeful establishment of a percutaneous tract for renal drainage and the subsequent extension of this technique for entry into the kidney for stone retrieval, the application of renal endourology has rapidly become a major therapeutic technique. As the experience gained with these approaches became coupled with technical advances in instrumentation to allow safe entry into the kidney, percutaneous nephrolithotomy has become a first-line mode of treatment for the removal of renal calculi.

The traditional fluoroscopic guided PCNL requires frequent radiographic monitoring throughout the procedure. Thus, relatively high radiation doses may be absorbed by the surgeon and medical staff, in addition to the patient. Effects of high doses of radiation include skin burning, cancer induction, infertility, radiation sickness and intrauterine fetal death. Also, contrast agents are routinely used in the procedure and although they are among the most commonly used and safest drugs, their administration may be associated with well-described hazards that may range from minor reactions up to anaphylactic shock.

We aimed in our study to carry out a new technique using ultrasound guidance to perform percutaneous nephrolithotomy without radiation and contrast agents.

In a prospective manner, 80 patients with renal pelvic stones with

or without calyceal stones were included in our study. 40 Patients underwent fluoroscopic guided PCNL while the other 40 underwent ultrasonic guided PCNL. Both groups were compared in all items including preoperative, intraoperative and postoperative data.

Inclusive criteria were nearly equal in both groups including the range of age, sex, body weight, laboratory investigations, stone criteria, kidney position, function and echogenicity. There was a significant difference between both groups regarding the number of fresh and recurrent cases, where recurrent cases were 30% in the fluoroscopic group while they were 10% in the ultrasonic group. Also, 90% of the patients in the fluoroscopic group showed mild to moderate pelvicalyceal dilatation while 77.5% showed moderate to severe dilatation in the ultrasonic group.

Preliminary fixation of ureteric catheter was routinely done in all patients in the fluoroscopic group (except in 1 patient where the Chiba needle was used as the ureteric orifice was not seen by cystoscope), in the ultrasonic group ureteric catheter was used only in 9 patients with mild dilatation of the pelvicalyceal system allowing injection of irrigating fluid resulting in ballooning of the system that made puncture easier.

We observed a highly significant statistical difference between both groups regarding the mean puncture time where it was 4.3 minutes in the fluoroscopic group while in the ultrasonic group it was 3.2 minutes. Mean time of tract dilatation was similar in both groups (9

minutes). Dilatation was done by Alken dilators in the fluoroscopic group while in the ultrasonic group it was done by screw dilators in 77.5% of the patients, balloon dilators in 5 % and by both in 17.5%•

We noted an average operating time of 98.5 minutes in the fluoroscopic group while in the ultrasonic group it was 89.6 minutes.

The mean duration of exposure to radiation in the fluoroscopic group was 11. 7 minutes / case.

We observed a significant statistical difference between both groups regarding the cost, where it was much lower in the ultrasonic group as ureteric catheter was fixed in only 22% of patients, only one guide wire per case, neither fluoroscopy nor contrast material were used. In the fluoroscopic group ureteric catheter, 2 guide wires /case, fluoroscopy and contrast material were routinely used.

We noted no significant statistical difference between both groups regarding the intraoperative complications. We had encountered bleeding with transfusion of 500 CC blood in one patient (2.5%) in each group. Pelvic perforation and extravasation occurred in 5 patients in the fluoroscopic group (12.5%) and 6 patients (15%) in the ultrasonic group. Stone migration to inaccessible calyces occurred in 2 patients (5%) in the fluoroscopic group and 6 patients (15%) in the ultrasonic group. Retroperitoneal migration of stone fragments occurred in one patient in the ultrasonic group due to the presence of a large pelvic perforation.

Colonic injury occurred in 2 cases (5%) in the fluoroscopic group that were discovered early postoperatively by faecal discharge. No cases of colonic injury were encountered in the ultrasonic group.

Failure of the procedure occurred in 2 cases (5%) in each group. In the fluoroscopic group, it was due to unsuccessful puncture and inability to enter the kidney. In the ultrasonic group, failure was due to kinking of the guide wire and its slippage into the perinephric fat during dilatation of the tract.

We observed no significant statistical difference between both groups regarding early postoperative drop in hemoglobin concentration, hematocrite value, total leucocytic count and platelet count.

Regarding the early postoperative complications, persistent urine leakage on closure of PCN occurred in 4 patients (10.5%) in the fluoroscopic group and 3 patients (8%) in the ultrasonic group. Leakage subsided conservatively except in one patient in the fluoroscopic group where double-J stent was fixed. We had encountered early postoperative fever in 4 patients (10.5%) in the fluoroscopic group and 5 patients (13%) in the ultrasonic group, which subsided within few days. Secondary hemorrhage occurred in 3 patients (7.9%) in the fluoroscopic group and one patient (2.6%) in the ultrasonic group.

There was no significant difference between preoperative and postoperative renal function after either fluoroscopic or ultrasonic PCNL.

Regarding the stone free status, it was nearly similar in both groups where it was 62.5% in the fluoroscopic group and 60% in the ultrasonic group.

### **In conclusion:**

Ultrasonic guided PCNL is a beneficial alternative to the traditional fluoroscopic guided PCNL especially in cases of failure or difficult preliminary fixation of ureteric catheter. It may be the operation of choice in pregnancy and pediatric patients where the use of fluoroscopy is extremely hazardous. It is of a great benefit in patients with iodine hypersensitivity. Also, it may be beneficial in Patients with radio-lucent stones that cannot be seen by fluoroscopy.

Puncture of the renal system using ultrasound guidance is easier rapid and more accurate with less incidence of failure and complications Also ultrasound is more accurate than fluoroscopy in detection of small stone fragments down to 3 mm in diameter that may improve the stone free status.

However, in the fluoroscopic guided PCNL, dilatation of the tract is much more easier as it is done completely under image and the surgeon can easily see the guide wire along the whole length of the track from the skin to the kidney. Thus, the operator can safely enter the kidney on the guide wire with less incidence of its kinking and slippage outside the kidney. In ultrasonic guided PCNL, the guide wire

cannot be easily seen along the track of dilatation by ultrasound scanning. So, the surgeon may find some difficulty to follow the access of the guide wire from the skin to the kidney during dilatation of the track. Therefore, the guide wire is more liable to be kinked and slipped from the kidney into the peri-nephric fat, which may lead to abortion of the whole procedure. The experience of the surgeon plays an important role to achieve successful tract dilatation by keeping the guide wire straight without Kinking and slippage.