



A COMPARATIVE STUDY OF STANDARD PCNL VS TUBELESS PCNL FOR ASSESSMENT OF PULMONARY COMPLICATIONS

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ABSTRACT

Background: Percutaneous nephrolithotomy (PCNL) is the preferred treatment of choice for renal calculi. PCNL has evolved with placing a nephrostomy tube after PCNL procedure as a drainage is still considered a standard procedure for renal stone disease. However, in the recent year literatures suggests that the use of tubeless or totally tubeless drainage following PCNL also presents excellent results. One postoperative complication that is of much concern is a pulmonary complication like hydrothorax, pneumothorax, hydro-pneumothorax. Postoperative pulmonary complications have a higher incidence than and an equal importance to postoperative CVS complications, these complications are associated with high morbidity after PCNL. **Method:** This study was a comparative prospective study of 90 consecutive adult patients randomise in two groups of 45 patients for tubeless and standard PCNL each who underwent elective PCNL under combined spinal and epidural anaesthesia. **Results:** In the study total 90 patients operated with standard PCNL and tubeless PCNL 45 patients in each group and evaluated. Mean age of the patients were 46.4 year in standard PCNL and 45.2 year in Tubeless PCNL. Mean Stone size was 2.7 cm standard PCNL and 2.6 cm in tubeless PCNL. Supracostal Puncture was more in standard group as compare to tubeless group. Standard PCNL taken more operative time than tubeless group. Standard group takes more hospital stay than tubeless group. Pulmonary complications like pleural injury, hydrothorax, hydropneumothorax, pneumonitis, atelectasis occur more in Tubeless PCNL group in 5 patients and 3 were managed by intercostal tube thoracostomy, on other side only one patient require tube thoracostomy in standard group other manage conservatively, all over pulmonary complications are very less as compare to other complications. **Conclusions:** In conclusion we found that the standard PCNL is associated with less pulmonary complications and in this pulmonary complications can be managed conservatively as compare to tubeless PCNL which is associated with more pulmonary complications but other complications are very less.

KEYWORDS : PCNL, CVS, Hydrothorax, Pneumothorax, Hydropneumothorax

INTRODUCTION:

Percutaneous nephrolithotomy (PCNL) is the preferred treatment of choice for renal calculi. PCNL has evolved with placing a nephrostomy tube after PCNL procedure as a drainage is still considered a standard procedure for renal stone disease. However, in the recent year literatures suggests that the use of tubeless or totally tubeless drainage following PCNL also presents excellent results. Remarkably since the 80s when it was first described. The concepts have changed in the context to miniaturization of instruments and advancements in energy and optics where even smaller stones are treated with PCNL with minimal morbidity and better stone clearance rates. The usual indications for PCNL are stones larger than 2cm, staghorn calculus, partial staghorn calculi. The contraindications for PCNL procedure include pregnancy, bleeding disorders, and uncontrolled urinary tract infections¹. In standard PCNL we place PCN tube and double J stent.

One postoperative complication that is of much concern is a pulmonary complication like hydrothorax, pneumothorax, hydro-pneumothorax. Postoperative pulmonary complications have a higher incidence than and an equal importance to postoperative CVS complications, these complications are associated with high morbidity after PCNL^[2-4]. Percutaneous nephrolithotomy has an increased risk

for postoperative pulmonary complications because the procedure is performed near the diaphragm and pleura. Risk of injury increases when approached through the upper pole of the kidney, or upper calyx puncture, the pleural cavity and lung could be injured. Moreover, the usage of a large volume of irrigation fluid could cause pulmonary congestion and edema^[5]. A good surgical technique, use of modern advanced equipment, experienced surgeon and good anaesthetic management is therefore required to reduce postoperative pulmonary complications of PCNL and improve perioperative outcomes, in particular, the assessment of risk factors for postoperative pulmonary complications to predict and prevent perioperative complications.

AIM And OBJECTIVES –

To evaluate the pulmonary and various complications in standard Vs tubeless PCNL.

METHOD - This prospective comparative study comprised of 90 male and female participants reporting to the urology department MLB medical college Jhansi U.P.(India), from May 2024 to May 2025 presented with history of renal stone disease yet to be treated.

Inclusion Criteria –

Both male and female patients with age between 18 to 60 year

,renal stone size more than 2 cm and upper ureteric stone size more than 1 cm and no previous surgery

Exclusion Criteria- Anomalous anatomy, previously treated patients ,history of cardiopulmonary disease ,abnormal coagulation profile.

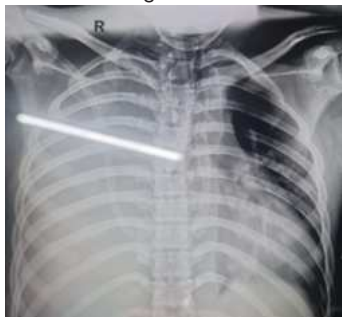
METHOD:

This study was a comparative prospective study of 90 consecutive adult patients randomise in two groups of 45 patients for tubeless and standard PCNL each who underwent elective PCNL under combined spinal and epidural anaesthesia in our hospital. The pre-, intra- and post-operative management was similar for all the patients in the study. On admission to the hospital, the patient proper history and examination done by urosurgeon and an anesthesiologist, who decided on the patient's American Society of Anaesthesiologist Class (ASA) . pre operative workup includes urine routine microscopy and culture sensitivity, kidney function test, hemogram,coagulation profile,serum electrolytes, CT urography, if KFT deranged then NCCT KUB or MR urography,X-Ray chest. On arrival at the operating room, the patient was monitored with non-invasive blood pressure, electrocardiogram and pulse-oximeter. After patients anaesthesia cystoscopy and ureteric catheterization done with 5 fr ureteric catheter after RGP in lithotomy position.In the procedure we use 5 fr ureteric catheter ,0.038 inch hydrophilic guide wire. A 16 fr foleys catheter placed for Urinary bladder drainage. Then the patient was turned to the prone position for the percutaneous nephrolithotomy. painting and drapping done, Under fluoroscopy, an 18 Fr needle was used to access the collecting system and a guide wire was inserted to the collection system. There after, the tract was dilated to 26 Fr using Amplatz plastic dilators , an access sheath was inserted, and a rigid nephroscope use for PCNL. Pneumatic lithotripter use for intra-corporeal stone fragmentation. In standard PCNL 22 fr nephrostomy tube and 5 fr double J stent were used and in tubeless PCNL only stent used After completion of the procedure, the patient was turned to the supine position, the patient was transferred to the post-anaesthesia care unit, where he/she stayed for 4 hours or more, and was treated with analgesics. Patients Keep monitored for further any complications ,Patients discharged on post operative second day and double J stent removal done after 21 days.

RESULTS:

in the study total 90 patients operated with standard PCNL and tubeless PCNL 45 patients in each group and evaluated .Mean age of the patients were 46.4 year in standard PCNL and 45.2 year in Tubeless PCNL.Mean Stone size was 2.7 cm standard PCNL and 2.6 cm in tubeless PCNL. Supracostal Puncture was more in standard group as compare to tubeless group.Standard PCNL taken more operative time than tubeless group.standard group takes more hospital stay than tubeless group.

Results are given in following tables.



Right side severe hydrothorax with tracheal shift in tubeless PCNL



Hydrothorax manage with ICD Tube 6hour after tube resolve hydrothorax



A case of standard PCNL With mild hydro-pneumothorax after conservative management with nephrostomy tube and double J stent

Table 1

Parameter	Standard PCNL with Nephrostomy tube	Tubeless PCNL
Mean age	46.4 year	45.2 year
Mean stone size	2.7cm	2.6 cm
Supracostal puncture	20(out of 45)	18(out of 45)
infracostal puncture	25(out of 45)	27(out of 45)
Duration of surgery	80.5 minutes	76.6 minutes
Hospital stay	60.7 hours	52.8 hours

Table-2

Complications	Standard PCNL with Nephrostomy tube	Tubeless PCNL
Pulmonary complications	3 (6.7%)	5(11.1%)
Fever and UTI	5(11.1%)	6(13.3%)
Secondary hemorrhage	2(4.4%)	4(8.9%)
Need of blood transfusion	4(8.9%)	6(13.3%)
Bowel injury	0	0
Adjacent viscera injury	0	0
Residual stone	5(11.1%)	4(8.9%)
Post op wound complication	3(6.7%)	1(2.2%)
Need of significant analgesia	7(15.5%)	4(8.9%)

DISCUSSION:

Pulmonary complications like pleural injury ,hydrothorax ,hydropneumothorax ,pneumonitis ,atelectasis occur more in Tubeless PCNL group in 5 patients and 3 were manage by intercostal tube thoracostomy ,on other side only one patient require tube thoracostomy in standard group other manage conservatively,all over pulmonary complications are very less as compare to other complications.

The more common perioperative complications of percutaneous nephron-lithotomy were extravasation, bleeding requiring a blood transfusion, and fever; major complications, such as septicemia and colonic or pleural injury that required intervention, were very rare^{6,7}. In our study we found that postoperative pulmonary complications occurred more frequently when anintercostal surgical approach was taken compared with a subcostal surgical approach. In a previous study, 15.3% of patients developed pulmonary complications afterpercutaneous puncture using an intercostal approach, where as only 1.4% developed pulmonary complications after percutaneous puncture using

a subcostal approach⁹. In the study in both groups subcostal study presented with more pulmonary complications as compare to infracostal puncture .The link between an intercostal approach and pulmonary complications may be anatomical.The upper pole of the kidney was located near to the posterior of the 11th to 12th rib or sometimes level with the 10th rib, and was separated from the pleural cavity by the diaphragm. Because the posterior portion of the diaphragm is attached to the inferior margin of the 12th rib, the diaphragm could be punctured if approached via the 11th to 12th intercostal space. The risk of complications is especially high when the puncture occurs above the 11th rib^{9,10}. Michel et al¹⁵ emphasized the importance of correct selection of patients in order to improve outcome, since co-morbidity increases the risk of complications. In this study complications occur in mainly upper pole puncture, gross hydronephrosis, prolonged procedure time, high stone burden, poor vision all these factors increase the pulmonary complications.

CONCLUSION:

In conclusion we found that the standard PCNL is associated with less pulmonary complications and in this pulmonary complications can be managed conservatively as compare to tubeless PCNL which is associated with more pulmonary complications but other complications are very less. Though we can reduce these complications by proper selection of patients, stone burden, anatomical delineation and anaesthesia.

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