



TUBELESS PCNL VS CLASSICAL PCNL FOR RENAL STONE DISEASE -A COMPARATIVE STUDY

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ABSTRACT

PCNL is a standard procedure for larger renal stones and upper ureteric stones. There are several variants of PCNL like classical PCNL, tubeless PCNL, total Tubeless PCNL etc. In our study we studied a group of patients as prospective analysis where PCNL are performed in 128 patients and in all patients we put the double J stent with both ends open. We selected the patients from May 2022 to October 2022 operated in our institution. Inclusion criteria - All age patients with normal baseline investigations, location of stone in kidney and stone size greater than 2 cm, upper ureteric stone, while exclusion criteria included any anatomical abnormalities such as horseshoe kidney/malrotated kidney, kyphoscoliosis, patients having positive urine cultures and coagulation disorders. Mean stone burden was 3.52cm. After operation of the patient we put only Double J stent and no PCN tube used. Mean age group was 21 to 40 years, mean operative time was 50.74 minutes, average dose required for analgesia of NSAIDs was 5.5 mean dose. Only 10% patients required opioid analgesics for pain control. Mean hospital stay time was 45.5 hours. 11.1% patient complains fever which managed conservatively. 2 managed in ICU with culture based antibiotics. Mean Hb fall was 1.1 gm/l, only 3 patients need BT post operatively and 3 with secondary haemorrhage which managed conservatively on emergency basis. No mortality reported in our study. In whole study we found that tubeless PCNL reduce the hospital stay, morbidity, complication and over all cost of the surgery.

KEYWORDS : PCNL, DJ stent, Nephrostomy

INTRODUCTION

The important milestones in the history of percutaneous renal surgery include Goodwin's description of percutaneous nephrostomy in 1955^[1] and Fernstrom and Johanson's first publication of percutaneous nephrolithotomy (PCNL) in 1976^[2]. Wickham in 1979 described the staged approach^[3] starting with percutaneous nephrostomy under local anaesthesia, followed by the dilatation of the tract serially over the next few days, with subsequent stone removal under general anaesthesia using a rigid 30° cystoscope. Alken used this technique as a salvage procedure to remove remaining stones after open surgery, through an operatively established nephrostomy tract^[4].

Mini Percutaneous Nephrolithotomy

Chan et al. described 'mini-PCNL' with a 13F nephroscope followed by the placement of an 8F nephrostomy tube with a 7F double pigtail ureteric stent^[5]. Maheshwari et al^[6] reported lower analgesic requirement with a 9F pigtail nephrostomy tube as compared to a 28F nephrostomy tube. The smaller tube also provided a significantly shorter duration of nephrostomy tract leakage after tube removal. Several other studies have supported the use of small bore nephrostomy tube in terms of reducing morbidity after PCNL^[7,8,9].

Tubeless Percutaneous Nephrolithotomy

Previously it was thought that nephrostomy tubes provide hemostasis along the tract, avoid urinary extravasation, and maintain adequate drainage of the kidney. However, based on the concept that the purpose of the tube is only to maintain adequate drainage of the kidney, a 'tubeless' approach has been developed by placing a ureteral stent or catheter to provide drainage after PCNL in lieu of a nephrostomy tube. Authors stated that with this approach, patients could leave the hospital within 24 h and the procedure was safe and efficient with a shorter hospital stay. However, subsequently Winfield et al^[10] reported two patients with complications of premature nephrostomy tube removal after the extraction of

simple upper-tract calculi, who experienced serious haemorrhage and marked urinary extravasation necessitating transfusion, internal stenting, and prolonged hospitalization. They recommended that nephrostomy tube drainage should be provided during the first 24 to 48 h after percutaneous stone extraction, which subsequently became the standard practice for PCNL worldwide.

In 1997, Bellman and associates^[11] challenged there is a requirement for the routine placement of a nephrostomy tube after percutaneous renal surgery. Their 'tubeless' procedure involved the placement of an internal ureteral stent without any nephrostomy tubes. The study group consisted of 50 patients, who were compared with a control group of 50 patients undergoing percutaneous renal surgery with the standard nephrostomy tube. The hospitalization time, analgesia requirements, time to return to normal activities, and cost were significantly less with this new technique.

Totally Tubeless Percutaneous Nephrolithotomy

Totally tubeless approach was first reported by Wickham and co-workers^[12]. In a randomized study of 60 patients, Aghamir et al^[13] assessed the outcome and safety of the totally tubeless PCNL in renal anomalies (horseshoe kidney, rotational anomalies of pelvi-calyceal system, and ectopic kidney). The differences between tubeless and standard PCNL groups in terms of operation time, transfusion rates, complications, retreatment, and overall stone-free rate were not statistically significant. The hospitalization period, analgesia requirements, and return to normal activities were significantly less in the totally tubeless group.

MATERIALS AND METHODS:-

It is a prospective analysis where PCNL are performed in 128 patients and in all patients we put the double J stent with both ends open. We selected the patients from May 2022 to October 2022. Consent was taken from the patients and one blood relative before undergoing PCNL. Inclusion criteria - All age

patients with normal baseline investigations, location of stone in kidney and stone size greater than 2 cm, upper uretric stone, while exclusion criteria included any anatomical abnormalities such as horseshoe kidney/malrotated kidney, kyphoscoliosis, patients having positive urine cultures and coagulation disorders. For the decision of doing tubeless PCNL we made it sure that there was no disruption of the pelvicalyceal system (seen as leakage of contrast on fluoroscopic images), no development of profuse bleeding during the procedure making the surgery difficult, complete removal of the renal stone would be achieved or if residual fragments were left, they would be insignificant fragments apparently less than 4 mm size.

Preoperative intravenous pyelograms (IVP X-ray), ultrasonography of kidneys and urinary bladder and computed tomograms of the patients were reviewed in the outpatient clinics. Once the decision to perform percutaneous nephrolithotomy (PCNL) was finalized, a complete blood count (CBC), cut off of platelets count was 1 lakh, serum urea, creatinine, electrolytes and BT/CT, PT/INR were obtained one day before surgery. Blood cross- matching and grouping were also done before surgery to arrange one unit of blood in case of need during intra or postoperative period. Those patients who had positive urine cultures were treated accordingly before surgery.

PCNL technique

Under spinal anaesthesia, cystoscopy with 21 Fr 30 degree cystoscopy done and a ureteric catheter was passed up to the kidney and fluoroscopic guidance was utilized to visualize the anatomy of the pelvicalyceal system after the non ionic contrast material 1:2 dilution was infused. A 14 Fr Foley's catheter was passed per urethra and afterwards patient was turned to prone position. Pelvicalyceal system was punctured under fluoroscopic guidance with 30 and 0 degree orientation after air pyelogram, using 18 G PCN puncture needle. A straight tip 0.035 inch guidewire was passed through spinal needle into pelvicalyceal system. The tract was dilated by using serial Amplatz dilators (10/12/cobra wire/14/16/20/28) over the guidewire for PCNL by standard technique. Pneumatic lithoclast was utilized to fragment the stones and an attempt to achieve complete clearance was made. Stone fragments were removed by using stone graspers. Operative time was calculated from the onset of cystoscopic examination to last stitch of the skin wound closure, after removal of nephroscope. Manual compression of wound was used for hemostasis. The ureteric stent was removed after 6 weeks.

Follow-up

Ultrasound scan was performed at postoperative 2 weeks to detect any possible perinephric collection. Patients were considered to be stone- free if there was no stone left after surgery, or when non obstructive, asymptomatic and clinically insignificant residual fragments (CIRFs) of size less than 4 mm were observed on postoperative imaging of the urinary tract. X-ray KUB and ultrasound were used for follow up imaging. Computed tomography was not used for follow-up.

DISCUSSION :-

In our study, we included all age patients and divided into four groups <20 yr, 21-40 yr, 41-60 yr, and >60yr. Most common age group is 21-40 yr which is 46.9% ,60 out of 128 patients .Least common age group is <20 yr which is 5.4% ,7 out of 128 and 3 patients are less than 12 yr of age .Female patients with stone disease were less as compared to male, 39.8% and male 61.2%(51/77) because of less water consumption as compared to hard work and dry climate .Mean operative time of PCNL was 50.74 min. 12.5%(16) patients taken less than 40 min time duration ,10.1%(13) patients taken more than one hour. Most common analgesic used in study was 75 mg diclofenac injection, average dose of injection was 5.5 dose. On day of operation 8hourly and after that SOS basis. <10 % patients require opioid analgesic in form of tramadol

injection. Average dose of antibiotics was 4.2 dose in 9.4%(12) patients have fever complain for which we use paracetamol either in oral or parental formulation.

Age group of the patients	<20 Yr	21-40Yr	41-60 Yr	>60 Yr
No. of the patients	7	60	37	24
Ratio of age out of 128 patients	5.47%	46.89%	28.9%	18.75%

Size of the stone assess preoperatively by the ultrasonography KUB ,mean stone burden in the study was 3.52 cm size. Most common group was size less than 2 cm.

Size range	<2cm	2-3 cm	3-4cm	>4 cm
No. Of patient	52	29	36	11
Ratio of the patient	40.6%	22.6%	28.2	8.6%

Range of time duration of PCNL	<40 min	40-50 min	50-60 min	1hr
No. Of the patients	16	46	53	13
Ratio of patients	12.5%	35.9%	41.4	10.15%

Patient required analgesia	91	25	10	2
Percentage of patient	71.%	19.5%	8%	1.5%
No. of the dosage	4	5	6	7

In this study for analgesia we use injection diclofenac 75mg in parental form. 91 patients required 4 dosage ,25 patients required 5 dosage ,10 patients required 6 dosage and 2 patients required 7 dosage in form of injections. 12 patients complains severe pain and these patients manage with injection Tramadol. After discharge we advise diclofenac and paracetamol combination on sos basis.

12 (11.1%) patients complain of the fever, which resolve after 2-3 days with empirical antibiotics and antipyretics. 2 patients complain of fever not subside and manage with urine culture based antibiotics out of which one manage in the ICU.

In post operative period we monitor blood loss with colour change of urine, which generally become clear within 24 hours of the surgery, haemoglobin and vitals monitoring. Average fall in haemoglobin was 1.1 mg/dl. 3 (2.3%) patients need blood transfusion in early post op period. 3 patients presented with secondary hemorrhage after 7 days which manage with catheterisation antibiotics and iv fluids, no patients need blood transfusion.

2(1.5%) patients needs chest drainage due to hydrothorax, we use 24 F drain for chest drainage which was removed after 2 days when column stopped moving . Suture removed after 7 days in all patients ,2 patients presented with wound infection of suture site which was heal by cleaning and dressing. No colon injury ,spinal anaesthesia related complication or mortality noted in our study.

Stent removal done after 6 week, there was no indication found to remove early stent. 2 patients presented with encrustation of the stent, to prevent encrustation of stent we advise citrus fruits to the patients, we reported the irritative bladder symptoms of stent in 9 patients which was manage by anticholinergic drugs.

Average fall in haemoglobin in our study was 0.9 gm/dl which was asses before discharge. After stent removal we evaluate the patient for any remaining stone by Ultrasonography KUB. Stone clearance rate was 97.5, fragments size <4 mm not counted significantly.

Complaints	No. Of the patients	Percentage of the patients
Fever	12	11.1%
Patients need ICU management	1	.8%
Patients need blood	3	2.3%

transfusion		
Patients need chest drainage	2	1.5%
Suture line infection	2	1.5%
Stent encrustation	2	1.5%
Mortality	0	0%
Colonic injury	0	0%
Spinal anaesthesia related complication	0	0%
Irritative bladder symptoms	9	7%

Referen ce study	NO.	Mean stone bur den	Post oper ative drain age	Addit ional hemo stasis	Analge sia	Avera ge Hb fall (g/dl)	Stone free rates(%)	Lengt h of stay
Agrawa l et al ⁽¹⁴⁾	101	3.8c m2	JJs	Nil	81.7m g MP	.36g %	100	21.8hr
Desai et al ⁽¹⁵⁾	10	250 mm2	JJs	Nil	8.5mg D	4.4 g%	-	3.4 days
Feng et al ⁽¹⁶⁾	8	4.4c m2	JJs	Nil	5.25m g M	-	85.7	1.9
Singh et al ⁽¹⁷⁾	30	750 mm	JJs	Diath ermy	6 mg MD		100	2.1 Days

JJs Double –J Stent;MP –Meperidine;M- Morphinesulphate;D- diclofenac sodium

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Reference Studies And Their Outcome Of Tubeless Pcnl

After analysing these studies mean stone burden was 3.8 cm in Agrawal et al, and 4.4cm in Feng et al, in our study mean stone burden was 3.52 cm which is nearly comparable .Stone free rate in 100% in Feng etal and Agrawal et al, in our study stone free rate is 97.5% which are comparable .like all these studies we used double J Stent ,no hemostatic agent used in our study . Average fall in haemoglobin was 0.9 gm/dl which is better than Desai et al 4.4%/dl. Average dose requirement of analgesia 5.5 dosage in the form of diclofenac 75mg inj. Average hospital stay in our study was 45.5 hour.

CONCLUSION:-

Tubeless PCNL can be used with a favourable outcome in patients with the stone disease with a wide range of stone size either small or large staghorn calculus. After surgery with the tubeless PCNL there is good stone clearance rate,less morbidity in the form of decreased postoperative pain,less requirement of analgesic agent ,decrease hospital stay time ,less requirement of blood transfusion ,better wound healing of scar and cosmetically better result than the PCNL with PCN tube, less UTI and early return to work .All these benefits aid in the decrease all over cost of Tubeless PCNL.

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