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Our Experience With Tubeless Pcnl

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I. Introduction and Objective

Removing kidney stones via percutaneous access is a less invasive and more effective procedure than traditional open stone surgery. The advantages of percutaneous nephrolithotomy (PCNL) over open urinary stone surgery include lower morbidity and mortality rates, faster recovery, easier secondary procedures, and greater cost effectiveness.[1] However in recent years there has been a modification in which drainage is provided by DJ stent instead pf nephrostomy tube Called as "Tubeless PCNL". . Wickham reported the first tubeless PCNL in 1984 but it did not gain acceptance until 1987 with the studies by Bellman[2]
The objective of our study is to compare the safety and effectiveness of tubeless PCNL

II. Materials and Methods

Between January 2021 and March 2022, 100 consecutive PCNLs were operated in our hospital. The inclusion criteria were Stones > 2 cm, multiple stones/large stone burden, extracorporeal shock wave lithotripsy or ureteroscopy failure for patients with upper urinary tract stones. Patients were asked about previous history of UTI, Renal failure , any previous surgery (urological) , haematuria or fever.

Medical History regarding DM, HTN or IHD .

Routine Preop Investigations Consisted of CBC, Serum creatinine, Serum electrolytes,Urine Routine and Culture, USG Abdo pelvis, X Ray IVP or CT Kub plain Depending on the patient . The specific parameters that were measured or assessed were size of stone(longest diameter on preoperative KUB CT scan or ultrasonography), location , number and density of the stone.

All surgeries were performed by the same experienced urology team using standard operative procedures.

Before puncture, a 6FR Uretric catheter was inserted cystoscopically in the supine lithotomy position to allow for retrograde contrast and saline infusion and prevent downward migration of stone fragments during Stone fragmentation . Initial puncture was taken with 18G 2 part I.P. needle, after placing a 0.035 x 150cm guidewire, The access tract was dilated with alken telescopic metal dilators to 24 FR.A 22fr nephroscope along with EMS Swiss lithotclast was used alone to disintegrate the stones. After the stones had been disintegration and extracted, a 6 or 5 F double-J catheter was inserted in an antegrade fashion for post operative urine drainage. The percutaneous wound was then closed with suture.

Intraop measurements were Type of anaesthesia , Puncture, No and Size Of tracts , Stone clearance, blood transfusion ,hypotension, duration of surgery , subcostal/Supra costal puncture.

Patient age, stone size, operative time, postoperative stay, urinary tract infection, , and other complications were recorded and analysed by retrospective chart review. The operative time was calculated from the beginning of cystoscopy to the end of wound closure. Stone free was defined as complete removal of all stones as evaluated by a postoperative X-Ray KUB or USG performed immediately after the procedure. A body temperature above 99F after the operation was defined as postoperative fever. Urosepsis was defined as patients with systemic inflammatory response syndrome with suspected infection.

III. Results

The study involved 100 consecutive cases of percutaneous nephrolithotomy (PCNL), with patients aged between 10 and 70 years. Of these cases, 58 were male and 42 were female. The stone characteristics included 66 kidney stones, 19 concomitant kidney and ureteral stones, and 15 staghorn stones. All patients underwent the procedure under general anaesthesia. The initial puncture was predominantly taken in the lower calyx (89 cases), followed by the middle calyx (5 cases) and upper calyx (8 cases), and 3 patients required multiple tracts (2 of 24 FR each). The average stone size was 2.4 ± 1.6 cm. The success rate was defined as patients who were stone-free or who had clinically insignificant residual fragments (CIRF), with a cut-off point of 4 mm used to define the size of CIRF. The stone-free rate was 89% for renal stones, 96% for renal and ureteric stones, and 70% for staghorn

stones. In the follow-up period, one patient required ureteroscopy (URSL) as the fragment had migrated to the ureter, and seven patients required extracorporeal shock wave lithotripsy (ESWL), while two required a second look PCNL. Four patients with renal calculi (4%), seven with renal and ureteric stones (7%), and 12 with staghorn calculi developed postoperative fever. All patients with urinary tract infections recovered well after proper antibiotic treatment based on culture and sensitivity reports. No correlation was found between the number of tracts, tract size, or intraoperative time and postoperative fever in the study. The average postoperative hospital stay was 2.3 days. All patients had preoperative haemoglobin levels >10 g/dL, and the average haemoglobin drop was 0.8 ± 0.9. Two patients required postoperative blood transfusion. Pulmonary complications in the form of hydrothorax were reported in 4.67% of cases, while there were no reported cases of colonic injuries. The average operating time was 45 minutes.

Table 1

Characteristics of 100 cases of tubeless PCNL

Age (y)	50.4 ± 10.6
Gender	
Male	58
Female	42
Stone characteristics	
Renal stones	66
Renal and ureteral stones	19
Staghorn stones (Complete + Partial)	15
Mean stone size (cm)	
Renal stones	2.4 ± 1.6
Renal and ureteral stones	2.4 ± 0.8
Staghorn stones (Complete + Partial)	4.5 ± 1.2

Table 2

Initial Puncture	
lower calyx	**89**
middle calyx	**5**
upper calyx	**6**
Single Tract	**87**
Multiple Tracts	**13**
Average operative time (min)	**45 mins**
Stone-free rate (%)	
Renal stones	**89%**
Renal and Uretral stones	**96%**
Staghorn stones (Complete + Partial)	**70%**
Average postoperative hospital stay (days)	**2.3**
Postoperative fever rate (%)	
Renal stones	**4**
Renal and ureteral stones	**7**
Staghorn stones (Complete + Partial)	**12**
Sepsis rate (%)	**1**
Blood transfusion	**2**
Pulmonary complications	
Hydrothorax	**4**
Auxiliary Procedures	
ESWL	**7**
URSL	**1**
Re-PCNL	**2**

IV. Discussion

The use of a nephrostomy tube after PCNL has traditionally been considered standard practice. However, the introduction of tubeless PCNL has sparked a debate among clinicians regarding the benefits and risks of each approach. Several studies have compared the outcomes of tubeless and standard PCNL, and the results have been mixed.

The study by Yang Xun et al[3] showed that tubeless PCNL may be a safe and effective procedure for selected patients, with shorter hospital stays, lower postoperative pain scores, reduced analgesia requirements, and quicker return to normal activity. These findings are in line with the study by Jiawu Wang et al [4], which also reported decreased analgesia usage and hospital stay in uncomplicated cases.

On the other hand, Pande Made Wisnu Tirtayasa[5] found that tubeless or totally tubeless PCNL is significantly superior to standard PCNL in terms of various outcomes such as hospital stay, return to normal daily activities, postoperative pain, analgesia requirements, and total treatment costs. Therefore, it may be considered as a safe alternative in uncomplicated cases.

Overall, the available evidence suggests that tubeless PCNL can be a viable option for selected patients, particularly in uncomplicated cases. However, it is important to note that not all patients are suitable candidates for the tubeless approach, and the decision should be made on a case-by-case basis after careful evaluation of the patient's clinical profile and comorbidities. Further studies are needed to determine the long-term outcomes and safety of tubeless PCNL

V. Conclusion

Our study adds to the growing body of evidence that suggests that tubeless PCNL may be a viable alternative to traditional PCNL with nephrostomy tube placement in selected cases. By avoiding the placement of a nephrostomy tube, patients may experience reduced postoperative pain and discomfort, lower analgesia requirements, and shorter hospital stays. These benefits may translate to improved patient satisfaction and reduced healthcare costs.

It is important to note that our study has limitations, including its retrospective design and small sample size. Further studies with larger sample sizes and randomized controlled designs are needed to confirm the safety and efficacy of tubeless PCNL and to identify the patient population that will benefit the most from this approach.

In conclusion, our study suggests that tubeless PCNL may be a safe and effective alternative to traditional PCNL with nephrostomy tube placement in selected cases. Further studies are needed to confirm these findings and to guide clinical decision-making regarding the use of tubeless PCNL in routine practice.

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