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**Research Article**

# A COMPARATIVE STUDY ON MANAGEMENT OF PROXIMAL URETERIC CALCULUS BY URETEROLITHOTRIPSY VERSUS PUSH-PERCUTANEOUS NEPHROLITHOTOMY

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**A R T I C L E I N F O**

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**A B S T R A C T**

**Introduction:** Urinary stone disease, a significant problem in developing countries like India. The lifetime risk of development of urolithiasis in Asia 5-9%, lesser than western world. Although various non-invasive, minimally invasive endoscopy and open surgical methods available for stone disease, management of proximal ureteric calculus poses much challenge in its complete clearance. **Materials and methods:** We compared the outcome of ureterolithotripsy and push-percutaneous antegrade access in the management of proximal ureteric calculus >1.5cm. After getting the informed written consent, patient's demographic data, clinical presentation, radiological findings were noted in a pro forma and assigned based on inclusion criteria to groups. **Results:** The two groups were comparable in age, sex, stone burden and in stone attenuation values. The mean operating time and mean hemoglobin drop were less in Ureterolithotripsy group and it is significant. The stone clearance rate at 3rd week was higher in Push-Percutaneous nephrolithotomy group 17(85%) than Ureterolithotripsy group 9(45%) (P=0.00). **Discussion:** The stone clearance rate was higher in Push- Percutaneous nephrolithotomy group than Ureterolithotripsy group, which was lower but comparable to other studies. **Conclusion**: Push-percutaneous nephrolithotomy, a reasonable option in patients with proximal ureteric calculus of size more than 15mm.

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## INTRODUCTION

Urinary stone disease is a significant problem in developing countries like India. In this context, stone and calculus are one and the same hence interchangeably used. The lifetime risk of development of urolithiasis in Asia is 5-9% which is lesser than western world[a]. More common in males but the incidence, do increasing in females these days. Urolithiasis patient may go for complications like urosepsis, renal failure, malignancy even death. The spectrum of cause for urolithiasis is much wider, it is from lifestyle/climatic changes to congenital anomalies and genetic influence. The commonest stone type is calcium oxalate, phosphate and to a lesser degree uric acid, struvite, cystine etc. Various non-invasive, minimally invasive endoscopy and open surgery are available for stone disease. Depending upon its location, size and associated co-morbidities specific procedure is tailored for complete clearance[b]. Here we are going to study on a comparative management of proximal ureteric calculus, since there have been much challenges in its complete clearance.

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## MATERIALS AND METHODS

Patients who presented to department of Urology, Kilpauk Medical College hospital, Chennai, India and Govt. Royapettah hospital with proximal ureteric calculus of size 1.5 cm or more are subjected to study. After getting the informed written consent, patient's demographic data, clinical presentation, radiological findings are noted in a pro forma and assigned based on inclusion criteria to Groups - 1 and 2 on alternate basis. Inclusion criterions were Age: 25-55 years, both sexes, side (right or left), Proximal ureteric calculus more than 1.5 cm, Stone Hounsfield unit 400 and above. Whereas Age: <25, >55 years, Proximal ureteric calculus less than 1.5 cm, Immunocompromised patients, Diabetic Patient, Patient with severe cardiopulmonary co-morbidities, Patients with coagulopathies, Patients with urogenital congenital anomalies., Stone Hounsfield unit 400 and below were excluded from this study.

All patients who have preoperative urinary tract infections would be treated with appropriate antibiotics. Patients who present with urosepsis, raised renal parameter because of calculus obstruction would undergo percutaneous nephrostomy tube placement to drain the infected urine and optimized for definite treatment. In ureterolithotripsy (URSL)

Group-1, stones would be dealt in the ureter itself with 6-7.5 Fr semi-rigid ureteroscope. In the push-Percutaneous Nephrolithotomy (PCNL) Group-2, before puncturing the kidney, calculi were pushed back into kidney with the help of ureteric catheter and semi-rigid ureteroscope. Open ended 5 Fr ureteric catheter placed and secured with Foley's catheter for opacification of pelvicalyceal system followed by collecting system puncture under fluoroscopy guidance with 18G two-part needle, followed by serial dilatation, first with facial dilator then with guide rod placement, metal dilators, amplatz dilator and sheath in that order. Finally, percutaneous nephrolithotomy done with standard 28Fr nephroscope. Per-operatively the following parameters were considered: 1) Requirement of blood and blood components. 2) Duration of procedure (operating room time - OR time). The primary outcome measure: To compare the stone clearance rate. The secondary outcome measures: Post procedure ESWL rate and the infection rate. Data's were analyzed with standard software tools. Fisher's exact test (one Tailed 1T and two tailed 2T) was used to find the significance

## RESULTS

Forty patients (12 women and 28 men) were included in this study. Twenty patients in each group. The two groups were comparable in age, sex, stone burden and in stone attenuation values. There was no statistical difference in stone size between both groups. The mean stone size was 18.7 ± 2.65 mm and 19.40 ± 1.90 mm in groups 1 and 2, respectively p=0.344. Similarly, no difference with Hounsfield unit of calculus in both groups (Table I). The mean operating time and mean hemoglobin drop was significantly different among groups, less OR time and less hemoglobin drop with URSL group-1, P=0.00 (Table-2). The incidence of Post-operative infection in terms of positive urine culture similar with both groups (P=1.00). But stone clearance rate at 3rd week higher in group-2 17(85%) than with group-1 9(45%) (P=0.00). In the same way post-procedural ESWL requirement rate was lower in group-2 3(15%) vs 11(55%) than with group-1 (P=0.00) [Table II].

Complications include, post-operative blood transfusion (required for two patients) and transient post-operative fever in 5 patients in the PCNL group, managed with appropriate antibiotics. Two patients required more than one puncture. In URSL group, two patients had false passage and 2 patients had lithotripsy induced stone impaction thereby mucosal injury, 6 patient had mild fever post-operatively managed with DJ stenting and antibiotics respectively. We routinely keep DJ stent in all the cases. The mean hospital stay duration was 3.7, 5.2 days among URSL and Push PCNL respectively. The mean follow-up was 6 months.

| Table I | Demographic Parameters | URSL Group-1 | Push-Pcnl Group-2 | P value 1T | P value 2T |
|---|---|---|---|---|---|
| | No of patients | 20 | 20 | | |
| 1 | Mean age of patients/SD | 38.1 (8.66) | 36.95 (8.63) | 0.338 | 0.676 |
| 2 | Female /Male ratio | 5:15 | 7:13 | | |
| 3 | Mean stone size mm / SD | 18.7 (2.65) | 19.40 (1.90) | 0.172 | 0.344 |
| 4 | Mean Hounsfield unit / SD | 916.20 (213.16) | 916.35 (211.99) | 0.499 | 0.998 |

SD- Standard deviation, P-Probability, T- tailed

| Table II | Operative Parameters | URSL Group-1 | PUSH-PCNL Group-2 | P value 1T | P value 2T |
|---|---|---|---|---|---|
| 1 | Mean operating time / SD | 43.7 (12.7) | 83.70 (12.02) | 0.000 | 0.000 |
| 2 | Mean hemoglobin drop /SD | 0.27 (0.18) | 0.675 (0.25) | 0.000 | 0.000 |
| 3 | Mean hospital stay / SD | 3.7 (1.13) | 5.2 (0.41) | 0.000 | 0.000 |
| 4 | Urinary Infection rate | 6 (30 %) | 5 (25 %) | 0.500 | 1.000 |
| 5 | Stone clearance rate w3 | 9 (45 %) | 17 (85 %) | 0.009 | 0.018 |
| 6 | Residual calculus | 11 (55 %) | 3 (15 %) | 0.009 | 0.018 |
| 7 | Post procedure ESWL | 11(55 %) | 3 (15%) | 0.009 | 0.018 |

SD- Standard deviation, P-Probability, T- tailed

## DISCUSSION

Urinary stone disease is a significant problem in developing countries like India. The lifetime risk of development of urolithiasis in Asia is 5-9% which is lesser than western world [a]. More common in males but the incidence, do increasing in females these days. Urolithiasis patient may go for complications like urosepsis, renal failure, malignancy even death. The spectrum of cause for urolithiasis is much wider, it is from lifestyle/climatic changes to congenital anomalies and genetic influence. The commonest stone type is calcium oxalate, calcium phosphate and to a lesser degree uric acid, struvite, cystine etc. Various non-invasive, minimally invasive endoscopy and open surgery are available for stone disease. Depending upon its location, size and associated co-morbidities specific procedure is tailored for complete clearance[b]. According to AUA guidelines, for stone size > 10 mm ureterolithotripsy yields better result than ESWL. Percutaneous antegrade access is an acceptable first line when stone burden is more or impacted calculus [c,d,e]. In ureterolithotripsy chances of stone migration, incomplete clearance and the need for post procedure ESWL are higher due to significant proximal dilatation. Percutaneous Nephrolithotomy is becoming the procedure of choice in reasonably bigger stones in kidney as well as in proximal ureter.

Maheshwari *et.al* (1999f) reported in their study that, PCNL resulted in a 100% success rate in 23 patients with large upper ureteral stones greater than 1.5 cm although 2 patients (9%) needed a blood transfusion. Y. S. Juan *et al* (2008g) reported 95.4% stone-free rate in PCNL group at 4th week follow-up and 58% in the URSL group (p< 0.001). The mean OR time and postoperative hospital stay were significantly lower in the URSL group than in the PCNL group. A similar study compared the management of large proximal ureteric stone between percutaneous flexible ureteroscope and retrograde URS. Kamal moufid *et.al* (2013h) showed that, in Percutaneous-URS group 21 (95%) of 22 patients had complete calculus clearance through a single tract in one session of percutaneous surgery. The mean operative time was 66.5 ± 21.7 min (range 38-115 min). In the URS group, 20 (66.7%) 30 patients had complete stone clearance. The mean operative time was 52.13 ± 17.3 min.

The other minimally invasive option for management of large proximal ureteric calculus is Laparoscopic ureterolithotomy. Antonio Correa *et al* (2011j) compared and showed stone free rates between semi-rigid ureterolithotripsy 62.5% and laparoscopic ureterolithotomy 93.3%. Stone-free rates showed a statistically significant difference among the groups (p = 0.005).

| Table III | Study / Stone Free Rate | N | Stone Size | PCNL | URSL |
|---|---|---|---|---|---|
| 1 | Maheswari *et.al* (1999f) | 43 | >15mm | 100% | 55% |
| 2 | Y.S.JUAN *et.al* (2008g) | 54 | >15mm | 95.4% | 58% |
| 3 | Kamal moufid *et.al* (2013h) | 52 | >15mm | 95.4% | 66.7% |
| 4 | Jai pal *et.al* (2012i) | 101 | >15mm | 98.7% | |
| 5 | Antonio correa *et.al* (2011j) | 48 | >10mm | | 62.5% |
| 6 | Our study | 40 | >15mm | 85% | 45% |

In our study we compared the outcome of ureterolithotripsy and push-percutaneous antegrade access in the management of proximal ureteric calculus >1.5cm. The two groups were comparable in age, sex, stone burden and in stone attenuation values as already stated. The mean operating time and mean hemoglobin drop was less in URSL group and it is significant. The stone clearance rate was higher in Push PCNL group 17(85%) than URSL group 9(45%) (P=0.00) which is lower but comparable to other studies [Table III]. Hence Push PCNL is a reasonable option in management of proximal ureteric calculus more than 1.5cm.

## CONCLUSION

To conclude push-percutaneous nephrolithotomy is a reasonable option in patients with proximal ureteric calculus, size more than 15mm. Especially in a setup where there is no flexible ureteroscope and laser lithotripsy. Limitations in this study are small sample size, non-blinding and no randomization.

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