



## Surgery

## DIFFERENT SURGICAL TREATMENT MODALITIES FOR MANAGEMENT OF RENAL STONE : AN OBSERVATIONAL STUDY

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**ABSTRACT**

**Background:** The prevalence of renal calculi is affecting a large number of people in diverse age groups globally. The management of symptomatic kidney stones has progressed from traditional open surgical lithotomy to minimally invasive endourological interventions, resulting in reduce patients suffering, and improved quality of life of patients. **Methods:** A observational study involving a population of 75 renal stone patients was conducted in Department of Surgery, Raipur institute of medical sciences Raipur Chhattisgarh, India. The main objective of the study was to explored presentation and surgical management of renal stone. **Results:** In present study male to female ratio is approximately 2:1 (male 51 and female 24) and majority of the patients were from age group 41 to 50 years (29.3%). Among the 75 cases patients, *percutaneous nephrolithotomy (PCNL)* was done in 66 (88%) cases, *ureteroscopy (URS)* in 7 cases (9.3%) and *nephrectomy* in only 2 cases. Most of the patients had to stay in hospital for <10 days. The operating time is shorter (1 hr) in 72% of cases and 100% stone clearance rate was achieved in all the cases. **Conclusions:** Study concluded that majority patients opted *percutaneous nephrolithotomy (PCNL)* over traditional open surgery at Raipur institute of medical sciences Raipur, Chhattisgarh, which enabling urologists to increasingly enhance the efficiency of renal stone removal through percutaneous means.

**KEYWORDS :** kidney stones, renal calculi, surgery, pyelolithotomy, nephrolithotomy

**INTRODUCTION**

Kidney stones are common and potentially preventable causes of morbidity in the general population. Kidney stones are common across the world, with a prevalence of about 12% worldwide [1, 2]. In India, prevalence of kidney stones also reflects worldwide prevalence and stands at around 12% [3] and is comparatively more common in the Northern region of India, where it is about 15% [1,3]. Management of kidney stones surgically is a complex process due to the availability of multiple treatment options, sometimes necessitating the use of more than one method. The selection of the appropriate treatment depends on various factors, including the specific characteristics of the patient and the nature and size of stone, and is the primary determinant of treatment success. Notably, about 1% of emergency admissions are linked to renal colic and complications arising from kidney stones [1]. In 1976, Fernstrom and Johansson introduced the technique of creating a percutaneous tract specifically for the removal of renal stones. Subsequent studies have established PCNL as a commonly employed procedure for treating patients with large or complex calculi. Advances in surgical techniques and technology have facilitated the ongoing development of PCNL, enabling urologists to percutaneously remove stones with increasing efficiency. This approach is preferred over open surgery due to its advantages in terms of reduced morbidity, shorter recovery periods, and cost-effectiveness. Consequently, PCNL has largely replaced open surgical procedures for the removal of large or complex stones in most medical institutions [2, 3]. The characteristics of the stones, including their size, extent of calyceal involvement, and density, significantly influence surgical outcomes. Various research groups have made efforts to characterize kidney stones, and there is a need for the development of an integrated scoring system to assess and quantify the complexity of renal stones, aiding in optimal decision-making. This system also helps account for methodological differences among studies reporting outcomes of PCNL in renal stone disease [4 - 8]. The main objectives of the study were to explore the mode of presentation of renal stone and surgical methods for management of renal stones. PCNL offers several advantages over the traditional open surgical method, including reduced morbidity, shorter recovery periods, and cost-effectiveness. As a result, PCNL has become the preferred method for managing large or complex stones at the majority of healthcare institutions.

**MATERIALS AND METHODS:**

The studied cases for clinical study of kidney stone were selected from the cases admitted to surgical wards of Raipur institute of medical sciences Raipur Chhattisgarh, India from April 2022 to March 2023. The selection of cases was based on clinical symptoms and radiological findings. A routine blood and urine examination was conducted. For radiological findings a routine plain x-ray KUB region. Ultrasound abdomen, I.V.U. & CT scan in the patients were done.

Patients of renal calculi managed by non-operative medical line of treatment and patients having stone size < 1cm were excluded from the study. Statistical analyses were performed in order to determine the difference in the responses of the patients. The categorical demographic variables and clinical parameters were presented as percentage and frequency. The continuous demographic variables like age, serum calcium, serum phosphate, serum uric acid, blood urea etc. were presented as mean and standard deviation (SD). Independent samples t-test was performed to identify the statistical significance in the difference of the mean value of the various responses. All the statistical analyses were performed using SPSS version 24 software.

**RESULTS:**

**Table 1: Demographic Characteristics Of Studied Subjects**

| Variables   | No. of patients | %    |
|-------------|-----------------|------|
| Age (Years) |                 |      |
| <10         | 2               | 2.7  |
| 11 – 20     | 3               | 4.0  |
| 21 – 30     | 16              | 21.3 |
| 31 – 40     | 21              | 28.0 |
| 41 – 50     | 22              | 29.3 |
| 51 – 60     | 11              | 14.7 |
| SEX         |                 |      |
| Male        | 51              | 68   |
| Female      | 24              | 32   |
| Diet        |                 |      |
| Vegetarian  | 30              | 40.0 |
| Mixed       | 45              | 60.0 |

The present study included 75 patients diagnosed with renal calculi between the ages 8 to 66 years, with a mean age of 37.9(±12.2) years. The majority of patients were male (68%), while 32% patients were female. The male : female ratio was 2:1. Patients in the age group of 41-50 years were affected the most (29.3%), followed by the age group of 31-40 years (28%). In our study, the majority of the patients with kidney stones had a mixed diet (60%), while 40% of the patients had a vegetarian diet.

**Table 2: Pathological Characteristics Of Studied Subjects**

| Variables        | No. of patients | %    |
|------------------|-----------------|------|
| Duration of pain |                 |      |
| <30 days         | 6               | 8.0  |
| 1 – 6 months     | 46              | 61.3 |
| 7 – 12 months    | 8               | 10.7 |
| 1 – 5 years      | 12              | 16.0 |
| 6 – 10 years     | 3               | 4.0  |

| Site                                 |    |      |
|--------------------------------------|----|------|
| Right loin                           | 35 | 46.7 |
| Left loin                            | 30 | 40.0 |
| Both loin                            | 10 | 13.3 |
| <b>Symptoms</b>                      |    |      |
| Fever with chills & rigor            | 12 | 16.0 |
| Burning micturition                  | 46 | 61.3 |
| Nature of Pain                       |    |      |
| Dull aching                          | 49 | 65.3 |
| Colicky pain                         | 26 | 34.7 |
| <b>No. of episodes of haematuria</b> |    |      |
| 0                                    | 63 | 84.0 |
| 1 - 5                                | 9  | 12.0 |
| >5                                   | 3  | 4.0  |

We found that among 75 patients with renal calculi, 46 (61.3%) patients had a duration of pain between 1 to 6 months, only 3 (4%) patients had duration of pain between 6 to 10 years. The site of pain in all the patients with renal calculi presented with loin pain, predominantly right loin (46.7%). The character of pain in 26 (34.7%) patients was colicky in nature, and in the rest 49 (65.3%) patients it was dull aching.

Among 75 patients, 46 (61.3%) patients were complaining of burning micturition and only 12 (16%) patients were complaining of fever with chills and rigor. This suggests possible urinary tract infection. 9 (12%) patients had 1 to 5 no. of episodes of haematuria, while only 4% of the patients had above 5 no. of episodes of haematuria.

**Table No 3: Findings Of Urine Test**

| Parameters          | No. of patients | %    |
|---------------------|-----------------|------|
| Colour              |                 |      |
| Clear               | 43              | 57.3 |
| Light yellow        | 26              | 34.7 |
| Dark yellow         | 3               | 4.0  |
| Dark red            | 3               | 4.0  |
| Albumin (+)         | 29              | 38.7 |
| Sugar (+)           | 6               | 8.0  |
| pH                  |                 |      |
| Acidic              | 61              | 81.3 |
| Alkaline            | 14              | 18.7 |
| RBC (+)             | 30              | 40.0 |
| WBC (+)             | 31              | 41.3 |
| Pus Cells (+)       | 25              | 33.3 |
| Cystals – Oxalate   | 6               | 8.0  |
| Cystals – phosphate | 8               | 10.7 |

Table 3 depicted the findings of the urine test. Among 75 patients, 57.3% of the patients had clear urine, 34.7% cases had light yellow coloured urine, and only 4% cases had dark red urine. Albumin was found in trace amounts in 38.7% of cases. Glucose was present in 8% of patient's urine samples. In 81.3% of the cases urine becomes acidic. Also, RBC & WBC were detected in about 40% of cases each. Pus cells were identified in 75 cases (100%). Two types of crystals were identified, oxalate crystals in 6 cases and phosphate in 8 cases.

**Table No 4: Findings Of Blood Test**

| Parameters       | Range     | Mean ± SD    |
|------------------|-----------|--------------|
| Blood urea       | 6 – 37    | 22.08 ± 8.13 |
| Serum calcium    | 8.1 – 11  | 9.58 ± 0.90  |
| Serum phosphate  | 1.8 – 6.2 | 4.09 ± 1.20  |
| Serum uric acid  | 2.5 – 7.9 | 4.11 ± 1.08  |
| Serum creatinine | 0.2 – 1.4 | 0.81 ± 0.38  |

In the present study, blood urea levels range from 6 mg/dl to 37 mg/dl with a mean of 22.08 mg/dl. Serum calcium levels range from 8.1 to 11 mg/dl with mean value of 9.58 mg/dl. Serum phosphate levels range from 1.8 mg/dl to 6.2 mg/dl with a mean of 4.09 mg/dl. Serum uric acid levels range from 2.5 to 7.9 mg/dl with a mean of 4.11 mg/dl. Serum creatinine levels range from 0.2 mg/dl to 1.4 mg/dl with a mean of 0.81 mg/dl.

**Table No 5: Uroradiology Diagnosis**

| Diagnosis       | No. of patients | %     |
|-----------------|-----------------|-------|
| Ultrasound      | 75              | 100.0 |
| Plain X-ray KUB | 75              | 100.0 |

|         |    |       |
|---------|----|-------|
| IVU     | 75 | 100.0 |
| CT-scan | 8  | 10.7  |

In this study, out of 75 kidney stone patients, plain X–RAY KUB, USG whole abdomen and IVU was done in all the cases (100%). All cases were having functioning kidneys. CT scan was performed in only 8 (10.7%) patients.

**Table 6: Operative Procedures**

| Procedures         | No. of patients | %    |
|--------------------|-----------------|------|
| PCNL               | 66              | 88.0 |
| Nephrectomy        | 2               | 2.7  |
| Ureteroscopy       | 7               | 9.3  |
| Pyelolithotomy     | 0               | 0    |
| Ex. Pyelolithotomy | 0               | 0    |
| Nephrolithotomy    | 0               | 0    |
| Total              | 75              | 100  |

Table 6 depicted the different operative procedures opted to treat renal stone patients. Results showed that 66 (88%) patients undergo for PCNL, 7 patients for Ureteroscopy and 2 patients for Nephrectomy procedure. Pyelolithotomy, Ex. Pyelolithotomy and Nephrolithotomy are not done.

**Table 7: Findings Of Qualitative Analysis**

|                                                 | No. of patients | %     |
|-------------------------------------------------|-----------------|-------|
| Calcium phosphate                               | 8               | 10.7  |
| Calcium oxalate + Calcium phosphate             | 25              | 33.3  |
| Uric acid                                       | 9               | 12.0  |
| Calcium oxalate + Calcium phosphate + Uric acid | 13              | 17.3  |
| Triple phosphate                                | 14              | 18.7  |
| Calcium oxalate                                 | 6               | 8.0   |
| Total                                           | 75              | 100.0 |

After surgery stones were sent for qualitative analysis in all the 75 cases. On qualitative analysis, the most prevalent stone was Calcium oxalate + Calcium phosphate, which was found in 33.3% of the patients. Calcium phosphate stones were found in 8 cases, Calcium oxalate + Calcium phosphate + Uric acid in 13 cases, pure Calcium oxalate in 6 cases samples, and triple phosphate stone in 14 cases.

**Table 8: Operating Time, Post Operative Pain, Hospital Stays And Stone Clearance**

|                      | No. of patients | %    |
|----------------------|-----------------|------|
| Operating time       |                 |      |
| <1 hour              | 55              | 73.3 |
| >1 hour              | 20              | 26.7 |
| Post operative pain  |                 |      |
| Immediate            | 33              | 44.0 |
| Early                | 25              | 33.3 |
| Delayed              | 17              | 22.7 |
| Hospital stays       |                 |      |
| >10 days             | 19              | 25.3 |
| <10 days             | 56              | 74.7 |
| Stone clearance rate |                 |      |
| 100%                 | 75              | 75.0 |
| <100%                | 0               | 0    |

Table 8 depicted the frequency of operating time, post operative pain, hospital stays and stone clearance. 33 (44%) patients complained of immediate post-operative pain, early post-operative pain in 25 (33.3%) patients and delayed post-operative pain in 17 (22.7%) cases. Most of the patients (74.7%) stayed in hospital for <10 days. Stone free rate was found 100 % in all the 75 cases.

## DISCUSSION:

Renal stone formation has been recognized for thousands of years, but during the last few decades, the pattern, and incidence of disease have changed markedly. It has affected a greater population in the West. The lifetime risk of stone formation has been reported to be 5-10%.[9].

The present study included 75 patients diagnosed with renal calculi between the ages 8 to 66 years, with a mean age of 37.9 years, and most patients were male (68%). Male to female ratio in most of the previous studies were 2:1 like [10] Patients in the age group of 31 to 50 years were affected the most (57.3%). In our study, most of the patients with kidney stones had a mixed diet. Diet plays an important role in development of kidney stones. Vegetarians have a decreased risk of

developing kidney stones. Studies have shown that even among meat eaters those who have a high intake of fruits and vegetables are found to be at lower risk for renal stone disease. [6, 7, 11, 12].

We found that 61.3% patients had a duration of pain between 1 to 6 months, only 3 (4%) patients had duration of pain between 6 to 10 years. The site of pain in all the patients with renal calculi presented with loin pain, predominantly right loin. The character of pain in 34.7% patients was colicky in nature, and in the rest, it was dull aching. In our study, 61.3% patients were complaining of burning micturition and only 16% patients were complaining of fever with chills and rigor. This suggests possible urinary tract infection. We also observed, 12% patients had 1 to 5 no. of episodes of haematuria, while only 4% of the patients had above 5 no. of episodes of haematuria.

In the present study, the mean blood urea, serum calcium, serum phosphate, serum uric acid and serum creatinine were found 22.08 mg/dl, 9.58 mg/dl, 4.09 mg/dl, 4.11 mg/dl and 0.81 mg/dl respectively. In our study the different procedures opted to treat renal stone patients. Results showed that majority of the patients (88%) had PCNL, 9.3% patients had Ureteroscopy and only 2.7% patients had Nephrectomy procedure. Pyelolithotomy, ex. pyelolithotomy and nephrolithotomy were not done.

After surgery stones were sent for qualitative analysis in all the 75 cases. On qualitative analysis, the most prevalent stone was Calcium oxalate + Calcium phosphate, which was found in 33.3% of the patients. Calcium phosphate stones were found in 8 cases, Calcium oxalate + Calcium phosphate + Uric acid in 13 cases, pure Calcium oxalate in 6 cases samples, and triple phosphate stone in 14 cases. 33 (44%) patients complained of immediate post-operative pain, early post-operative pain in 33.3% patients and delayed post-operative pain in 22.7% cases. Most of the patients (74.7%) stayed in hospital for <10 days. Stone free rate was found 100% in all the cases.

## CONCLUSION:

Kidney stone disease affects individuals in the prime of their life. Present study concluded that majority patients opted percutaneous nephrolithotomy (PCNL) over traditional open surgery at Raipur institute of medical sciences Raipur, Chhattisgarh, which enabling urologists to increasingly enhance the efficiency of renal stone removal through percutaneous means. Men are more commonly affected than women. Right loinis the most common presenting symptom. In the present study complete clearance of stone was achieved in 100% patients without need of any ancillary procedure. PCNL is safe and successful method of treatment for renal stones. It is minimally invasive and easily reproducible.

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