

## A Clinico-Radiological Study of Ureteric Calculi With Special Reference of Role of Urs in Such Cases.



### Medical Science

KEYWORDS :Ureteric calculus, X-Ray, USG, IVU, NCCT, URS,

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### ABSTRACT

**Background:** Urolithiasis is not uncommon and affects most of the patients in their prime age of life which cause a significant morbidity and loss of functioning. The severity of the condition can be judged from the fact that 10% of the patients harboring the stone in urinary tract, lose their kidney either by nephrectomy or as a result of subsequent damage to the kidney. **Objectives:** To study the distribution of patients, having ureteric calculus on the basis of age and sex, to study role of different imaging modalities in diagnosing ureteric calculus & to study role of URS in management of patient having ureteric calculus.

**Methods:** In this study the 100 consecutive patients attending department of surgery (outpatient department and emergency) of Subharti Medical College, Meerut presenting with suspected diagnosis of ureteric calculus was admitted & different imaging modalities (X-Ray KUB, USG, IVP, and NCCT) were done for the purpose of evaluation and confirmation of the diagnosis. The incidence of uretero-lithiasis at our institution and its epidemiological relationship to age and sex was studied during the present study. The results were evaluated to find out the diagnostic role of these modalities used to evaluate the ureteric calculi. These patients were then subjected to Ureterorenoscopy (URS) for further management.

**Result:** The majority of the patients were males with peak age group in the second and third decade accounting for 70% of the cases. Pain in abdomen or loin tenderness was the most common presenting symptom, seen in 100% cases. Non contrast CT was most accurate investigation for diagnosing ureteric calculus. URS was performed as surgical intervention in all cases.

**Conclusion:** Most of the patients with ureteric calculi present with pain in abdomen. With the availability of better facilities like NCCT and URS ureteric calculus is diagnosed with ease and the requirement for open surgery is decreasing and endourological procedures are becoming the means of surgical intervention. Complications are minimal with surgical expertise for endourological procedures.

### Introduction:

The earliest evidence dates to before 4800 B.C. and was bladder stone found among the pelvic bones of a predynastic Egyptian<sup>1</sup>. With Westernization of global culture, however, the site of stone formation has migrated from the lower to the upper urinary tract and the disease once limited to men is increasingly gender blind. Revolutionary advances in the minimally invasive and noninvasive management of urinary calculus disease over the past 2 decades have greatly facilitated the ease with which stones are removed<sup>2</sup>. The traditional diagnostic tools of abdomen, kidney-ureter-bladder (KUB) region radiograph and intravenous urography (IVU) remain the most useful methods of evaluation for urinary calculi. Ultrasound, a complementary modality to a KUB radiograph, is usually diagnostic<sup>3</sup>. However, in recent years, the recent innovation of non-contrast enhanced computerized tomography (NCCT) of abdomen by multi-detector computerized tomography has further revolutionized the diagnostic accuracy of urinary calculi. The treatment of ureteric stones has undergone a remarkable revolution in the last 15 years. Open uretero-lithot-

omy and stone basket manipulation used to be the mainstay of surgical management for calculus or urinary system. Today, the treatment options include stenting as definitive therapy, extracorporeal shockwave lithotripsy (ESWL), Percutaneous nephroureterolithotomy (PCNL), retrograde ureteroscopy, laparoscopic ureterolithotomy and occasionally open ureterolithotomy<sup>3</sup>.

### Material and Methods:

This study was conducted in Department of surgery at Subharti Medical College, Meerut over a period of two year & 100 consecutive cases was taken with following criteria, patients aging from 10 yr to 70 yr. with symptoms of ureteric calculus or with investigation reports indicating diagnosis of ureteric calculus. Informed consent from patient's attendant was taken for study. A detailed history was taken under the heading of present medical history and past history. Patients were fully examined under the heading of general physical examination, systemic examination and local examination. Patient underwent radiological investigation (X-Ray KUB, USG- abdomen, NCCT- KUB, IVU) for con-

firmation of diagnosis. NCCT was done in cases in which X-ray (KUB) is not able to pick up stone but patients presenting with symptoms of ureteric calculi. Ultimately these patients were subjected to URS (Ureterorenoscopy) for therapeutic purpose. Rigid ureteroscope was used. Unpaired T-Test at 95% & 99% confidence level was used to find out the significance of different imaging modalities in diagnosing Ureteric Calculus. A follow up of 3 months was done in these patients. A plain radiography of the kidneys, ureters and bladder (KUB) was performed 2 weeks after surgery to assess residual stone fragments. Success was defined as symptom free and no evidence of residual stones larger than 2 mm in diameter, since stone particles less than 2 mm usually would pass the ureter spontaneously. Follow up was done with USG-Abdomen, Urine routine & microscopy, culture & sensitivity on monthly basis till 3 months.

### Results:

In the present study, the age of patients ranged between 17 and 65 years. The maximum number of cases of ureteric calculus was found to be in the age group between 31 and 40 years, i.e., 39 cases. The average age of presentation is 35.15 years.

**Table -1 Age Distribution**

Age ranging (years)	No. of cases
11-21	5
21-30	31
31-40	39
41-50	12
51-60	12
>60	1
Total	100

**Table -2 Sex Distribution**

Sex	Number of cases
Male	67
Female	33
Total	100

In this study majority of patients were males (67) with male to female ratio of 2:1. All the patients presented with pain abdomen. 28% of the patients had radiation of pain from lumbar region to the groin, genital or to the thigh. 16% of the patients had hematuria. Burning micturition (24%) and vomiting & other non-specific gastro-intestinal symptoms (26%)

**Table -3 Location of Calculus**

Location	No. of cases
Lower Ureter	68
Middle Ureter	28
Upper Ureter	4
Total	100

The current study has an incidence of 68% of the stones in lower ureter 28% in mid ureter & only 4% was present in the lower ureter.

**Table -4 Imaging Modalities**

Investigation	X-Ray KUB	USG	NCCT- KUB	IVU
Detected	61 <sub>(100)</sub>	68 <sub>(100)</sub>	39 <sub>(39)</sub>	91 <sub>(100)</sub>
Not- Detected	39 <sub>(100)</sub>	32 <sub>(100)</sub>	0 <sub>(39)</sub>	9 <sub>(100)</sub>

In the present study X-ray KUB , USG-W/A, IVU was done in all patients while NCCT-KUB was done in 39 patients in which X-ray KUB was not able to detect ureteric stone. X-ray KUB detected ureteric stone in 61% of cases, USG-W/A detected stone in 68% cases, NCCT- KUB detected ureteric stone in 100% cases and IVU detected ureteric stone in 91% cases. All the patients were subjected to URS. DJ stenting was done in 65% cases whenever decided necessary in cases of ureteral edema secondary to an impacted calculus, ureteral injury, and upward migration of stone fragments, ureteric stricture or stenosis, abandoned cases or surgeon's preference.

**Table -5 Outcome of URS**

Outcome	Successful	Unsuccessful
No.	90	10

In 90% of the cases URS was able to achieve stone free retrieval. However in 10% of cases URS was unsuccessful & needed alternative method of retrieval. 16 cases developed minor complications, severe pain was seen in 6% cases, 4% developed gross hematuria, 2% cases developed fever & UTI was seen in 4% cases as complication. No major complication was encountered in present series. In this study duration of post operative stay ranged from 1 days to 7 days. Maximum patients were discharged on 2<sup>nd</sup> post operative day i.e. 55%, 25% cases were discharged on post op day 1, 10% on day 3<sup>rd</sup>, rest 10% had hospital stay of >3 days in post operative period.

**Table -6 Follow Up**

No.	Pre operatively	1 <sup>st</sup> month post operatively	2 <sup>nd</sup> month post operatively	3 <sup>rd</sup> month post-operatively
Hydronephrosis Present	60	5	0	0
Hydronephrosis absent	30	85	90	90

60 patients had hydronephrosis pre operatively. Only those 5 patients in whom severe hydronephrosis was present pre operatively still had mild hydronephrosis on 1<sup>st</sup> month scan, rest 85 patients didn't have any hydronephrosis. All 90 patients had normal kidney on 2<sup>nd</sup> & 3<sup>rd</sup> scan. All 90 patients underwent urine- routine, microscopy and culture & sensitivity was done after a month post- operatively showed no significant findings. Same also was observed in subsequent visits.

### Discussion:-

Urolithiasis is very common and affects most of the patients in their prime age of life which cause a significant morbidity and loss of functioning<sup>4</sup>. The severity of the condition can be judged from the fact that 10% of the patients harboring the stone in urinary tract, lose their kidney either by nephrectomy or as a result of subsequent damage to the kidney. The new generation small bore rigid and semi-rigid fiberoptic ureteroscopes have become integral to the modern management of ureteric calculi. Open ureterolithotomy is rare except in a select sub-group of patients i.e. those with complex calculus disease associated with anatomic abnormalities. Ureteroscopy has become as effective as open surgery with little attendant morbidity (Miller et al)<sup>5</sup> (Brant and Fulmar)<sup>6</sup> Early intervention and relief of an obstruction precludes the development of renal obstructive complications. Also with modern lifestyles and demands of the work place, the patients' prefer rapid diagnosis and early management of their problem.

The present study was carried out in the Post Graduate Department of Surgery, Subharti Medical College and Hospital Meerut

for a period of two year. Hundred (100) consecutive cases of ureteric calculi admitted in CSSH, Meerut were included in this study.

Marshall et al<sup>7</sup>, Johnson et al<sup>8</sup>, Hiatt et al<sup>9</sup> stated stone occurrence is relatively uncommon before age 20 but peaks in incidence in the fourth to sixth decades of life. In the present study, ureteric calculi show a peak incidence in the 2nd and 3rd decade accounting for 70% of the cases. The average age of presentation is 35.15 years with a range of 17 to 65 years. This is in agreement with the findings in existing literature.

In present study Ureteric Calculi occurred predominantly in males compared to females. As compared with other studies, Morse RM et al<sup>10</sup>, in their series showed that 64% males and 36% females were affected. In other studies by Dasgupta P et al<sup>11</sup> & Tondare et al<sup>12</sup> males affected were 67% & 73% and females 33% & 27% respectively

In present study we did X-RAY KUB in all 100 patients and it was able to pick ureteric calculus in 61 cases. Our study results coincide with study conducted by Mutgi et al<sup>13</sup>.

Statistical analysis was done to know the significance of X-ray KUB in detection of ureteric calculus. We applied unpaired t test to our data which showed a mean of 1.39 along with SD of 0.490. According to result of one sample t test to test the significance level at 95 % & 99 % significance level the p value was less than .05 & .01 respectively.

On the basis of p -value, as it is less than .05 & .01, we can reject Null Hypothesis & accept the alternative hypothesis, which means that plain X-ray KUB is significant in detection of ureteric calculus.

In present study we did USG-W/A in all 100 patients and it was able to pick ureteric calculus in 68 cases. Our study results are similar to that of study conducted by Faiq et al<sup>14</sup>

Statistical analysis was done to know the significance of USG-W/A in detection of ureteric calculus. We applied unpaired t test to our data which showed a mean of 1.32 along with SD of 0.469. According to result of one sample t test to test the significance level at 95 % & 99 % significance level the p value was less than .05 & .01 respectively.

On the basis of p -value, as it is less than .05 & .01, we can reject Null Hypothesis & accept the alternative hypothesis, which means that USG-W/A is significant in detection of ureteric calculus.

In present study we did IVU in all 100 patients and it was able to pick ureteric calculus in 91 cases. Our study results are similar to that of Miller et al<sup>15</sup>.

Statistical analysis was done to know the significance of IVU in detection of ureteric calculus. We applied unpaired t test to our data which showed a mean of 1.09 along with SD of 0.288. According to result of one sample t test to test the significance level at 95 % & 99 % significance level the p value was less than .05 & .01 respectively.

On the basis of p -value, as it is less than .05 & .01, we can reject Null Hypothesis & accept the alternative hypothesis, which means that IVU is significant in detection of ureteric calculus.

In present study we did NCCT in 39 patients in which X-RAY KUB was non-conclusive and it was able to pick ureteric calculus in all 39 cases with a sensitivity of 100%. Our study results are similar to that of study conducted by Faiq et al<sup>14</sup>.

Statistical analysis couldn't be done as there was no variation & NCCT detected calculus in all 39 patients.

In our study we saw no single investigation can be declared superior to others. X-RAY KUB and USG are good initial investigations but they miss good number of cases. IVU and NCCT are more sensitive but they have hazards of increased radiation.

So we conclude that combination of these tests should be used. X-RAY KUB and USG should be used as initial tests, IVU can be used for further information about function. Also IVU and NCCT can be used in those cases in which X-RAY KUB & USG are non-conclusive.

In our study all 100 cases underwent URS with successful stone free rate of 90%. In rest 10% of cases URS was unsuccessful either due to migration of stone in renal pelvis, URS couldn't reach up to the stone either due to stricture or stenosis in distal ureter or due to location of stone in upper ureter.

In our study in 4% cases position of calculus was so high up that lithotripter couldn't reach up to the calculus. In 2% cases there was migration of calculus in renal pelvis. In 2% cases we couldn't reach up to the calculus due to presence of stricture or stenosis in the distal ureter. In rest 2% cases there was partial or incomplete removal of calculus shown by X-RAY KUB in follow up.

In these cases we did DJ stenting and later patient was planned for stone retrieval by some other method like PCNL, Open Pyelolithotomy or Open Ureterolithotomy etc. Our study result is similar to the studies done by Bromwich et al<sup>16</sup>, Dhinakar<sup>17</sup> and Geavlete et al<sup>18</sup>.

#### Conclusion:-

- 1) Ureteric calculi showed a peak incidence in the 2nd and 3rd decade accounting for 70% of the cases.
- 2) Ureteric calculi were seen in as young as 17 years and as old as 65 years.
- 3) Male preponderance was noted with male to female ratio of 2:1.
- 4) Pain in loin was the main presenting symptom in 100% of the patients.
- 5) X-RAY KUB and USG, IVU and NCCT were used for evaluation and diagnosis.
- 6) X-RAY KUB and USG has a sensitivity of 61% & 68% respectively, which is fairly low and they miss to diagnose a good number of cases.
- 7) IVU is a very good investigation for diagnosing Ureteric calculi with sensitivity of 91% and it gives additional information about function also but due to increased dose of radiation, time consumption and hazards of contrast used in IVU.
- 8) NCCT has a sensitivity of 100% & is most accurate investigation in our study for diagnosing Ureteric calculus.
- 9) Highest incidence of ureteric calculi was found in the lower 1/3rd of ureter (68%).
- 10) URS was performed as surgical interventions in all cases with successful stone free rate of 90%.
- 11) No patients who underwent successful removal of stone had hydronephrosis in USG done on 2<sup>nd</sup> and 3<sup>rd</sup> month.

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