

CLINICAL STUDY OF DIFFERENT MODALITIES OF MANAGEMENT OF URETEROLITHIASIS

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Abstract:

Background: Various radiological procedures, X-ray KUB and Ultrasonography to Evaluate urinary system for Management in ureterolithiasis -requires scrutiny in the term of indications, success and failure to give benefit to patient. Their relevance and validity requires to be assessed in present era. **Methods:** The study is carried out on patients admitted in municipal general hospitals of Ahmedabad .100 patients were observed and data were collected in the prescribed Performa consisting details of patient's history, clinical diagnosis based on inspection and palpation, pathological findings, radiological findings, operative findings, post-operative outcome. **Results:** Observation and analysis of the data of present series was interesting and important aspects were compared with standard series. Bacteriuria/UTI was found to be the most common complication in patients operated for ureterolithiasis. **Conclusion:** In recent era, radiological procedures to Evaluate urinary system and minimally invasive URS –Ureteroscopic removal of stone remains as mainstay in management of patients of Ureterolithiasis. This minimal invasive procedure-URS yields significantly greater stone free rates for majority of the stone stratifications and associated with minimum risk of morbidity and mortality.

Keywords: Ureter, Stone

Introduction:

Urolithiasis is one of the oldest diseases in humans and has been documented in ancient Greek. Urinary stones have been found in the remains of Egyptian mummies dating as far as seven thousand years and the symptoms were described by Hippocrates who suggested that drinking of soiled river water causes the excretion of sand in urine. Those times the occurrence of calculi was confined to urinary bladder and renal stones were undiagnosed. Roman physician Galen stated that factors like diet, climate, hereditary, race and some abnormalities cause the stone formation¹.

The incidence of the stone disease has risen significantly over the last several decades because of modern lifestyles and dietary modifications. This puts a financial liability over the health care delivery system. The reported lifetime risk of having a kidney stone is around 5-21%. Moreover, the recurrence rates are even more troublesome, reaching 10% at one year, 35% at five years and 50% at ten years. Since the affliction mainly involves adults with a peak incidence in 3-5th decade, the

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loss of work years and deleterious effects on productivity are considerable. Historically males were affected more than females but this disparity is dwindling according to the more recent reports with a sex ratio of 1.6:1 as compared to 3:1 in 1975.

Historically the treatment of urinary calculi consisted of open surgical procedures, which were associated with significant morbidity. This was compounded by the recurrent nature of the disease, which necessitated multiple operations. Management of the urinary calculi has been revolutionized by the technical innovations over the past 2-3 decades. Endourological techniques have become the mainstay of treatment for ureteric calculi and transformed the outcome for patients. These techniques have not only expanded the indications of stone removal, but also have enabled superior stone free rates with minimal morbidity².

The joint European Urology Association/ American Urology Association Nephrolithiasis Guideline Panel (herein after the panel) performed a systematic review of the English language literature published since 1997 and a comprehensively analyzed outcomes data from the identified studies. Based on their findings, the Panel concluded that when removal becomes necessary, Extracorporeal shockwave lithotripsy (ESWL) and Ureterscopy (URS) remain the two primary treatment modalities for the management of symptomatic ureteric calculi. Other treatments were reviewed, including medical expulsive therapy (MET) to facilitate spontaneous stone passage, Percutaneous Antegrade Ureterscopy, and Laparoscopic and Open surgical Ureterolithotomy³.

Purpose of study: In recent era , Radiological procedures to Evaluate urinary system and minimally invasive URS & non-invasive ESWL remains as mainstay in management of patients of Ureterolithiasis . Minimal invasive procedure-URS yields significantly greater stone free rates for majority of the stone stratifications and associated with minimum risk of morbidity and mortality.

Aims:

The Aims and objectives of the study are: (1) To study the Etio-Patho-physiology of ureteric stone formation.(2) To study the treatment of ureterolithiasis. (3) To study and assess effectiveness and outcome of different modalities of management of ureterolithiasis.(4) To study Post-Operative complications- morbidity . Study and conclusions are important in the sense of assessing various aspects in context of present time.

Materials and Method:

100 Patients of having ureteral stones, after taking written informed consent, admitted in one of the municipal general hospitals of Ahmedabad city, India, were studied during period of two years, ie. From June 2017 to November 2019.

All the patients were fulfilling following **inclusion criteria:**

- All patients between the ages of 11 to 70 years presenting and diagnosed of Ureterolithiasis at Department of General surgery and Urosurgery at the hospital.
- Only the patients with isolated Ureteric calculi above 5mm were included in the study.

Exclusion Criteria:

- Patient with urinary calculi located elsewhere in urinary tract.
- Patient not willing for study.
- Multiple pathologies in the urinary tract.

Supersaturation of solutes lead to formation of calculus by combining two ions with one another into a solid substance termed Nucleus. Calcium and oxalate ions can get oriented themselves on surfaces of another crystal, like uric acid, and such nuclei can promote calcium oxalate stones. Imbalance in ratio of urolithiasis promoters (calcium, oxalate, uric acid and inorganic phosphate) and inhibitors (citrate and magnesium) and alterations in urothelial surface partly explains why only a small fraction of people suffer from calcium oxalate stones though urinary calcium oxalate supersaturation is almost universal⁴ .

Hereditary and personal history of renal stone and geographic conditions also influences stone formation⁵. Urine analysis, X-ray images, intravenous urogram and ultrasound were only used till now for diagnosis but now recently introduced non- contrast computerized tomography is the first-line investigational tool⁶.

All routine investigations such as complete blood count, renal function tests, X-ray KUB (Kidney Ureter Bladder), USG KUB, CT -KUB Plain, urine for routine and microscopic examination were done. All the patients underwent CT KUB for renal function and study of anatomy of urinary tract.

Preoperative prophylactic antibiotic⁷ - injection ceftriaxone (dose according to weight) was given 45 minutes before surgery. All the patients received - standard care for preoperative anaesthesia riskassessment⁸. Necessary systemic antibiotics, haemodynamic and nutritional support.

Results:

The analysis of 100 cases of ureteral stones treated in surgical department and urosurgical department at the hospital from June 2017 to November 2019.

Table 1: Age group – Sex correlation of patients

Age group in Years	Males	Females	No.of patients
11-20 years	2	0	02 (2%)
21-30 years	25	15	40 (40%)
31-40 years	16	9	25 (25%)
41-50 years	9	7	16 (16%)
51-60 years	7	5	12 (12%)
61-70 years	3	2	05 (5%)
Total	62	38	100

The most common age-group of patients in our study was 21-30 years' age (40%) followed by 31-40 years(25%).

Out of 100 patients, 62 were males and 38 were females. In present study incidence of male patients is more than female patients.

In our study most of patient with ureteric stone had complaints of pain in abdomen (96%) followed by burning micturition (60%) and followed by vomiting (30%). Ureteric stone passage of small stone / its movement produces colic pain associated with vomiting/ nausea.

Most of the patients in our study are from the rural areas and belonging to low socio-economic status and they only had access to bore water (55%).and Municipal water (40%) – consumption seen in patients living in city area.

Table 2: Investigations

	X-ray KUB	Ultrasound	CT KUB Plain
Showing stone	75 %	90 %	100 %
Not Showing stone	25 %	10 %	0 %

In our study, 75% ureteric stones were visible on plain X-ray KUB and 90% ureteric stones were visible on USG and 100% ureteric stones were visible on plain CT KUB. Stones of size < 7 mm and uric acid stones are usually not visible on x-ray. Ultrasound is operator dependent so its sensitivity may vary making plain CT KUB as the most sensitive investigation.

Our hospital being tertiary care hospital, patients are either referred form other hospital or approached directly. Most of the patents were managed Surgically(78 patients), while those presenting with smaller size stones were managed Non-surgically (22 patients).

Table 3: Surgical Management

Site	ESWL(%)	URS(%)	Laparoscopic ureterolithotomy	Total(%)
Upper ureter	10(35.7%)	16(57.1%)	2(7.2%)	28
Mid ureter	4(33.3%)	8(66.7%)	-	12
Lower ureter	15(39.4%)	23(60.6%)	-	38
Total(%)	29(37.2%)	47(60.2%)	2(2.6%)	78

In our study both URS and ESWL are accepted as first line modalities of management of ureteric calculus. Only 2 patients underwent laparoscopic ureterolithotomy and none underwent antegrade URS and Open ureterolithotomy. Open surgery is rarely done now a days and only when there is simultaneous open surgery for another purpose because of the high morbidity associated with the procedure.

Table 4: Complications

Complications	Of ESWL(%)	Of URS(%)	Total
Bacteriuria- UTI	8 (27.5%)	1 (2.12%)	9
Failed access	-	2 (4.25%)	2
Fever	-	2 (4.25%)	2
Cardiac arrythmias	2 (6.89%)	-	2
Steinstrasse	1 (3.44%)	-	1
Stent migration	-	1 (2.12%)	1

Only two laparoscopic ureterolithotomy were done as primary procedure for upper ureteric calculus and both of the patients did not have any post op complications. Hence they are not included in the discussion because of low sample size which would lead to bias. There were 2 patients treated by antegrade URS as the second procedure -as there was failed access during

URS being done as the primary procedure. Open ureterolithotomy is nearly an obsolete procedure because of the associated morbidity with the procedure.

Discussion

Ureteric stones are a preventable cause of morbidity, accounting for, both for hospitalization and procedures to remove the symptomatic stones, as well as the time lost from work.

Table 5 : Comparison of Age Distribution

Age Group	Present Study	Bedardeen et al ⁹	Gupta M et al ¹⁰	Madhusudan A et al ¹¹
<20 years	2%	-	-	24.1%
21-40 years	65%	73%	50%	55.5%
41-60 years	28%	18%	37.5%	20.7%
>60 years	5%	9%	12.5%	-

Most of the patients in our study belong to the age group of 21-40 years which is the most productive population and this is comparable to the studies by Bedardeen et al⁹, Gupta M et al¹⁰ and Madhusudan A et al¹¹. This age group is the working population and stays away from home for longer hours and has low water intake and thus higher probability of urinary stone formation.

In our study, out of 100 patients, 62 were male and 38 were female. The incidence in female patients is less than the male patients which is comparable to the studies by Bedardeen et al⁹ and Gupta M et al¹⁰.

Male predominance may be attributed to those patients who were staying away from home and had low water intake. Due to low water intake, dilution of uric acid does not occur, so the pH of the kidney drop sand becomes more acidic, which leads to formation to stone. This finding and the lower incidence of stone disease in women compared with men have been attributed to the protective effect of estrogen against stone formation in premenopausal women, owing to enhanced renal calcium absorption and reduced bone resorption. There is also lower urinary saturation of calcium oxalate and brushite in women compared with men. Hyperparathyroidism is more common in males as compared to females.

The most common presenting clinical feature in patient with ureteric calculus is abdominal pain, pain is present in the flank region and may radiate down to the groin or the inner side of the thigh. It was found in 96% of the patients and this is comparable to the results of the study conducted by Gupta M et al¹⁰. The second most common symptom was burning micturition, seen in 60% of the patients, due to the obstruction of the urine due to the stone and the resultant stasis of the urine leading to the bacterial growth in urine. Vomiting is also a symptom commonly seen in patients with ureteric calculus.

Type of Water intake: Most of the patients in our study belong to the rural areas and therefore they tend to consume Bore water as there is low supply of municipal water. Bore water is hard and contains high amount of calcium and magnesium as compared to the municipal water and most of the patients in the study drink bore water leading to high calcium content in urine and ureteric stone formation. This result is comparable to the study conducted by Madhusudan A et al¹¹.

Sensitivity of Investigations: The sensitivity of X ray KUB is low at 75% in the present study and is comparable with the study by Levine et al¹² in which it is 45%. But it is still the first preferred investigation for a patient of ureteric calculus in a developing country like India followed by USG. Sensitivity in USG was 90% in our study and is more than the study conducted by Juul N et al¹³ in which it is 90%. But it has the user bias associated with it and also dependent on the experience of the radiologist. The most sensitive investigation is plain CT KUB which is also the current GOLD STANDARD investigation for ureteric calculus. In my study the sensitivity to CT KUB was 100% and was comparable to other studies, of which 98% in Fielding et al¹⁴ and 96% Miller et al¹⁵.

Stone free rates after primary treatment for Upper, Mid and Lower Ureter: For proximal ureteral stones <10mm, ESWL had a higher stone free rate than URS. For stones > 10mm, URS had higher stone free rates. For the proximal ureter the stone free rate with URS did not correlate with size; but for ESWL, stone free rates negatively correlated with size. This is comparable to the study conducted by Ordon et al¹⁶.

For mid ureteral stones, URS appears superior but the small number of patients may have prevented the results from reaching a statistical significance and these were comparable with the study conducted by Ordon et al¹⁶.

For distal stones, URS yields better stone free rates overall and in both size categories. This was also comparable to the study done by Ordon et al¹⁶.

Thus URS stone free rates were significantly better than ESWL rates for distal ureteral stones <10 mm and >10 mm and also for proximal ureteral stones >10 mm. Stone free rates for mid ureteral stones were not statistically significant due to small sample size. Very few patients reported on laparoscopic ureterolithotomy, there were none for Open surgery and percutaneous antegrade ureteroscopy. These procedures are usually reserved for special cases, therefore cannot be compared with ESWL and URS. These invasive procedures are known to have a higher stone free rates when used.

The drawbacks of URS include high cost, invasive nature, need for anaesthesia, need for specialized equipment and skilled endourologist and the potential for ancillary procedure owing to the risk of retropulsion of calculi during fragmentation.

The most common complication following ESWL was bacteriuria which was present in 27.5% patients in our study and was comparable to the study by Alessandro D Addressi et al¹⁷. This can be treated by simple antibiotics. Renal haematoma is a dreaded complication which can be prevented by pre-operative assessment of the patients for bleeding disorder. The other complications which occur are very rare.

The most common complications after URS are fever and UTI when considering the post op complications and failed access and stent migration when considering the intra op complications. These complications were comparable to the study conducted by BK Somani et al¹⁸. The other complications are very rare and were not seen in the present study probably due to the low sample size.

Conclusion

Males are affected more with 62% having Ureteric stones. The most commonly performed investigations X ray KUB and USG - had the sensitivities of 75% and 90% respectively. Plain CT KUB had a sensitivity of 100%.

Conservative management included watchful waiting and/or Medical Expulsion Therapy , especially for the lower ureteric calculus less than 10mm with no associated pain or complications. Out of the total 78 patients managed with surgical intervention, a total of 47 (60.2%) patients underwent URS, 29 (37.1%) underwent ESWL and 2 (2.7%) underwent laparoscopic ureterolithotomy.

Analysis shows that URS yields significantly greater stone free rates for majority of the stone stratifications -except for the upper ureteric calculi <10mm, where ESWL yielded better results than URS

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