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Predictors for Negative Ureteroscopy in the Treatment of Urinary Tract Stone Disease

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***Objective**: To Identify Factors Predictive Of Negative Ureteroscopy (URS). There Is Increased Effort To Limit CT Radiation Exposure. On Occasion, Patients Undergo URS And It Is Discovered That The Stone Has Already Passed*

***Methods**: Retrospective Chart Review Was Conducted On All URS Cases For Ureteral Stones Undergone From May 2013 To May 2015 In SSIMS &RC Davangere. Stone Size >10 Mm, Staged Procedures, And Previously Placed Ureteral Stent Were Excluded*

***Results**: 189 Patients Underwent Ursl. 38 Of Renal Units (20.1%) Did Not Have Stones Upon Direct Visualization. Negative Urs Was More In Patients Without Ct Scan. Stone Size (P=0.01) And Stone Location (P=0.04) Were Significantly Associated With Outcome On Analysis Conclusion Negative Urs Occurred In Almost 20% Of Cases, With Reasonable Chance Of Spontaneous Stone Passage. Our Data Support Smaller Stone Size And Distal Location As Predictive Of Negative Urs As Opposed To Preoperative Pain, Presence Of Hydronephrosis , And Use Of Met. Time Interval Since Ct Was Not Predictive. Rate Of Negative Ureteroscopy Is Not Insignificant, Thus Patients With Small, Distal Stones Who Elect To Undergo Urs Should Be Counselled Regarding Negative Urs With An Alternative Being Repeat Imaging*

I. Introduction

The Lifetime Risk Of Urolithiasis Is Estimated Between 5% And 12%.[1-4.]Non Contrast Computed Tomography (NCCT) Represents The Gold Standard For Acute Diagnosis Of Urolithiasis, With Nearly 100% Sensitivity.[5] Urologists Have Recently Been Attempting To Minimize This Modality Due To Excessive Radiation Exposure. Radiation Is Both A Mutagen And Carcinogen And Increases The Frequency Of Both Somatic And Heritable Mutations That May Even Enhance The Risk Of Gene-Linked Diseases In Present And Future Generations, Particularly In Cancers .[6] Physicians Must Continually Weigh The Risks And Benefits Of All Patient Interventions. There Are A Variety Of Procedures Available For The Treatment Of Calculous Disease; However, Many Patients Pass Their Stones Spontaneously. Medical Expulsive Therapy (MET) For Obstructing Ureteral Calculi, Which Is Now A StandardFirst-Line Therapy Offered To Patients With Ureteral Stones, [7] Aids In Stone Passage And Avoids Subjecting The Patient To Potentially Unnecessary And Costly Procedures; However, Prolonged Obstruction May Be Associated With Persistent Pain And Damage To Renal Function. Ureteroscopy (URS) Has Recently Become

One Of The Most Common Methods Of Treating Ureteral Stones, With Rare Associated Risks. Urologists Should Be Cognizant Of The Potential Long-Term Effects Associated With The Diagnosis And Treatment Of Urolithiasis. On Occasion, Patients Undergo A Planned URS With Laser Lithotripsy And It Is Discovered That The Stone Has Already Passed. American Urological Association Guidelines Suggest Interventions Based On Stone Characteristics, But There Are No Guidelines That Direct How To Follow These Patients And What Imaging Modality To Use. We Sought To Identify Predictive Factors Of A Negative URS From A Large Cohort Of Patients. The Ultimate Goal Is To Develop A Strategy To Help Identify Which Patients Need A Repeat CT Scan Before Surgery, Minimizing Cases Of Negative URS And Minimizing Excess Radiation

II. Material And Methods

A Retrospective Chart Review Was Done On All URS Cases Performed For Ureteral Stones At Our Institution From May 2013 To May 2015. Preoperative Patient
Characteristics, Radiographic Stone Characteristics (Including Stone Size And Location), Operative Findings, And Postoperative Outcomes Were Recorded. Cases Were Included For Both Single And Multiple Stones. Factors Under Examination Included Stone Size (Largest), Time Interval Since CT Imaging, Presence Of Preoperative Hydronephrosis, Presence Of Preoperative Pain, Use Of MET (A-Blockers), And Stone Location (Proximal Ureter, Mid Ureter, Distal Ureter).Exclusion Criteria Were Defined Stringently Before Analysis.

Patients Who Underwent Staged Procedures And/Or Had An Indwelling Ureteral Stent Were Excluded Because A Repeat Procedure Was Already Planned. Calculi With Largest Stone Size >10 Mm Were Also Excluded Because The Chance Of Spontaneous Passage Is So Low That Most Practitioners Would Perform A Procedure Without Consideration Of Further Preoperative Imaging. After Exclusions, Cases Were Defined As Positive Or Negative On The Basis Of Whether Stones Were Found Or Not Found, Respectively, At The Time Of The Operation.

Stone Size (Mm) And Interval Since CT Scan (Days) Were Treated As Continuous Variables. The Remaining Categorical Variables Were Dichotomized. We Performed Using Analysis Of Variance, Two-Side *T*-Test, And Test Of Proportions For All Of The Data Factors Based On Data Type And We Compared Negative And Positive Cases .Statistical Significance Was Again Set At $P < 0.05$

III. Results

189 Patients Underwent URS With. Indications For URS Included Persistence Of Stone And/Or Pain In Patients Diagnosed With Ureteral Stone, Pain Or Urinary Tract Infection, Males 106(56.1%),Females 83(43.9%),Mean Age (41.7±14)Years, Average Stone Size 6.8mm(5-10mm),Stone Location(Proximal 44(23.2%), Middle Ureter 57 (30.1%) Distal Ureter 88 (46.5%)

Presence Of Hydronephrosis 109 (57.6%). 153 (80.9%) Had Renal Colic Days Since CT 30(7-68 Days) Use Of Medical Expulsion Therapy 35 (18.5%) There Was No Statistically Significant Difference In Patient Characteristics (Age, Sex) Between The 2 Cohorts. Comparison Of Case Characteristics Found Stone Size (*P = 0*.01) And Stone Location (*P =0.04)* Were The Only Factors To Be Significantly

Associated With Outcome. Likelihood Of A Negative URS Drops Significantly With Each Millimetre Decrement In Stone Size. The Following Variables Were Not Predictive Of A Negative URS: Presence Of Hydronephrosis, Presence Of Preoperative Pain, Time Interval Since CT Imaging, And Use Of Medical Therapy.

Males	106 (56.1%)
Females	83 (43.9%)
Mean Age	41.7±14 Years
Average Stone Size	6.8 Mm (5-10mm)
Stone Location	
Proximal Ureter	44 (23.2%)
Middle Ureter	57 (30.1%)
Distal Ureter	88 (46.5%)
Presence Of Hydronephrosis	109 (57.6%)
Presence Of Preop Pain	153 (80.9%)
Days Since CT	30(7-68 Days)
Use Of Medical Therapy	35 (18.5%)

Risk Factors For Identification Of Stones At The Time Of Ureteroscopy

	Positive URS (N=151)		**Negative URS (N =38)**		
	Mean	N	Mean	N	*P* Value
Presence Of Preoperative Pain (153)	125 (82.7%)		19 (73.6%)		0.98
Interval Since CT Scan (D)	28		35		0 35
Presence Of Hydronephrosis (109)	89 (58.9%)		20 (52.6%)		0.82
Largest Stone Size	6.7		5.9		0.01
Use Of Preoperative Medical Therapy (35)	30 (19.8%)		5 (13.1%)		0.21
Stone Location					0.04
Proximal Ureter (44)	42 (27.8%)		2 (5.2%)		
Mid Ureter (57)	51 (33.7%)		6 (15.7%)		
Distal Ureter (88)	58 (65.9%)		30 (78.9%)		

Comment

The Goal Of This Study Was To Help Clinicians With A Common Clinical Scenario Wherein A Patient Presents With A Small Ureteral That May Spontaneously Pass. The Use Of Medical Expulsion Therapy Has Been Accepted As Standard Management For Ureteral Stones, But There Are No Guidelines Detailing How To Follow These Patients Radiographically And When To Surgically Intervene. We Questioned Whether It Is Better To Repeat A CT Scan To Determine Whether The Stone Has Passed, Or Attempt URS Without Further Investigation At The Risk Of Finding No Stone. We Sought To Identify Clinical Risk Factors That May Be Predictive Of Negative Findings At The Time Of URS.Stone Size And Location Are The Only Factors Associated With A Negative URS For These Data. The Literature On Spontaneous Stone Passage Is Plentiful And Corroborates Our Data. The American Urologic Association And European Association Of Urology Guidelines Have Reported That Stones <5 Mm Have A 68% Spontaneous Passage Rate, And Stones 5-10 Mm Have A 47% Spontaneous Passage Rate Based On A Meta-Analysis.[7]

Stones >10 Mm Are Highly Unlikely To Pass Spontaneously. Other Studies Have Illustrated The Relationship Of Spontaneous Stone Passage To Stone Location. There Is A Spontaneous Passage Rate Of 22, 46, And 71% For Proximal, Mid, And Distal Ureteral Stones, Respectively.[8]

Literature On Stone Passage Shows That Time Interval To Stone Passage During Observation Is Also Based On Size And Location, But Is Independent Of Age, Gender, And Degree Of Pain As Our Data Also Reflects. In Our Dataset, Time Interval Since Original CT Was Not Related To Findings At The Time Of Ureteroscopy. In Examining Those Stones Of Smallest Size (<4 Mm), Time Interval Remained Insignificant. Medical Therapy Has Been Used To Increase The Likelihood Of Stone

Passage, Decrease The Time Interval To Stone Passage, And Decrease The Pain Associated With Stone Passage For Obstructing Ureteral Stones.

In Another Study By Kreshover Et Al Found Negative URS Occurred In Almost 10% Of Cases, With Reasonable Chance Of Spontaneous Stone Passage And Smaller Stone Size And Distal Location As Predictive Of Negative URS[9]

The Radiation Exposure Concept Of ALARA (As Low As Reasonably Achievable) Was First Implemented In Paediatric Patients And Has Now Extended To Adults Some Physicians Have Explored Alternate Modalities To Standard-Dose CT For Diagnostic Evaluation, Including Altering The Dose And Timing Of Patients Undergoing CT Scans In Addition To The Combination Of Ultrasound And Kidney-Ureter-Bladder (KUB) A Combination Of KUB And Ultrasound Has A Sensitivity Of 77–79% And A Negative Predictive Value Of 46-68% Compared With CT With A Sensitivity Of 92-93% And A Negative Predictive Value Of 71-86%.[10] Thus, CT Remains The Most Effective Method For Evaluating Stone Location And Burden; And Radiation Risk Must Remain A Consideration When Using This Imaging Modality.

The Data From This Study Were Gathered From Only Those Patients In Whom CT Imaging Was The Radiographic Modality Used In Diagnosis Of Stone Disease.

IV. Conclusions

Negative URS Cases Were Performed In Almost 20% Of Renal Units With A Reasonable Chance Of Stone Passage. This Number Is Significant And Subjects Patient To Unnecessary Surgical Procedures And Anesthetic. Our Data Suggest

That Smaller Stone Size And Distal Location Is Associated With Increased Negative URS Cases As Is Intuitively Expected. However, In These Data, Preoperative Pain,

Presence Of Hydronephrosis, Use Of MET And Even Time Interval From CT Imaging To Surgery Did Not Correlate To Negative URS. Thus, Greater Emphasis Should Be Placed In Giving Informed Consent Regarding Negative Ureteroscopy

In Patients Who Elect To Undergo URS. In Cases In Which Stone Size Is >4 Mm And There Is Not Definitive Evidence Of Stone Passage, We Recommend Repeat Imaging With CT Vs. KUB And Ultrasound Before Surgery.

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