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Urology

OBJECTIVE ASSESSMENT OF IMPACTION OF PROXIMAL URETERIC CALCULI BY NON-CONTRAST CT

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ABSTRACT This study aimed to evaluate the ability of radiological signs to predict the presence of impaction in patients with proximal ureteric calculi non invasively. We retrospectively analysed 74 patients with impacted proximal ureteric calculi who underwent URSL/PCNL between September 2017 and August 2018. Both clinical and radiological data of all cases were well evaluated on this aspect. Certain clinical and CT based parameters were assessed. There was statistically significant correletion between ureteral wall thickness, patients age, transverse diameter of the stone, proximal ureteric diameter, renal pelvic diameter , duration of renal colic attacks and stone impaction. Prediction of impaction will be helpful in reducing painful waiting periods in such patients and tailoring timely appropriate treatment.

KEYWORDS : proximal ureteric calculi, impaction, ureteric wall thickness

INTRODUCTION

Impaction of ureteric stone is the process of getting buried into the ureteric wall with time[1]. Controversies exist in literature regarding definition of impaction and they are based on subjective criteria. Recognition of impaction is important as it affects spontaneous stone expulsion as well as outcome of URSL/ESWL[2]. This study aims to evaluate the predictive value of certain parameters which can be used to assess impaction in Non Contrast CT KUB which is the gold standard now.

Our study aimed to evaluate the reliability of CT parameters in assessing impaction of proximal ureteric calculi as well as quantifying the degree of impaction.

MATERIALS AND METHODS

Our study population included 74 patients who presented with proximal ureteric calculi to Institute of Urology, MMC between September 2017 to August 2018 and underwent URSL/PCNL (n=2). All patients were diagnosed to have impacted calculi intraoperatively. Impaction was defined as calculi buried into ureteric wall or inability to pass a guidewire across the stone. Case files of all these patients were analysed retrospectively. Clinical data

like history and physical examination was noted. Hemogram, Renal Function test and Urine analysis were performed in all cases. All patients had underwent USG KUB, Xray KUB and NCCT KUB. Radiological data were analysed. Parameters like time since first colic attack till intervention, ureteric wall thickness at stone site, longitudinal diameter of stone, transverse diameter of stone, ratio of longitudinal to transverse diameter, ureteric diameter proximal to the stone, renal pelvic diameter, Hounsfield Unit of stone, periureteric fat stranding were analyzed.

Inclusion Criteria Proximal ureteric calculi which were found impacted during URSL/PCNL

Exclusion Criteria

- Distal Ureteric Calculi
- Non-impacted Calculi
- Patients with impacted calculi who presented after some sort of intervention like stenting/ URSL/ ESWL.

Statistical Analysis was performed using IBM SPSS software. 'Student t test' and Pearson correlation analysis were used to evaluate the data. Statistical significance was arrived at P < .01 and P <.05

RESULTS

Out of 74 patients in the study population 52 (70.3%) were male and 22 (29.7%) were females. Mean age group was 40.30. Mean stone size was 12.42 mm longitudinally and 8.22 mm transversely. The longitudinal to transverse stone diameter ratio was calculated mean of which was 2.5. Mean Hounsfield unit of the stones was 990.34. Mean ureteric wall thickness was 6.03 mm. The proximal ureteric diameter and renal pelvic diameter had a mean of 15.05 mm and 21.78 mm respectively. Periureteric fat stranding was present in 45 patients (60.8%). Clinical data like time since first colic attack was analyzed which had a mean of 2.54 months (TABLE 1).

In an attempt to validate the accuracy of radiological parameters for quantification of impaction Ureteric wall thickness was compared with other radiological and clinical parameters. Using Pearson correlation analysis correlation coefficients were derived for each. No significant correlation was seen with sex, longitudinal stone size and Hounsfield unit of the stone whereas significant correlation was seen with transverse stone diameter, L/T ratio, proximal ureteric and pelvic diameter and time since first colic. (TABLE 2).

TABLE 1

Variable	Ureteric wall thickness (mm)	
	Pearson Correlation Coefficeint (r)	P- value
Longitudinal size of stone (mm)	0.190	0.008
Transverse size of stone (mm)	0.577	0.001
Ratio of longitudinal/transverse diameter	-0.333	0.01
Proximal ureteral diameter (mm)	0.501	0.001
Renal pelvic diameter (mm)	0.407	0.046
HU (Hounsfield unit)	0.102	0.055
Pain period before treatment (months)	0.403	0.001

DISCUSSION

Definition of 'impaction' and management is still not clear among urologists. Morgantaler definition of it is that a guidewire cannot be passed across the stone[3]. Deliveliotis defined it as the stone that stays in the same place of the upper ureter for at least 2 months[4]. Because two thirds of all stones that passes spontaneously do so within 4 weeks, we used the term impacted for those stones that stay in the same position for more than one month[5], causes symptoms and that don't allow contrast past them in the IVU[6]. All these definitions are subjective with the exception of IVU which is more invasive and symptoms and that don't allow contrast past them in the IVU[6]. All these definitions are subjective with the exception of IVU which is more invasive and technically cumbersome.

TABLE 2

	Variable	Value
Sex	Male	52 (70.3%)
	Female	22 (29.7%)
Age (Yrs)		40.30±10.56 (18–70)
Longitudinal stone size (mm)		12.42±4.53 (8–22)
Transverse stone size (mm)		8.22±2.25 (5–13)
L/T ratio		2.5±0.78 (1.45–4.0)
Ureteric Wall thickness (mm)		6.03±2.16 (3–12)
Proximal Ureteric diameter (mm)		15.05±4.98 (6–28)
Renal Pelvic diameter (mm)		21.78±7.43 (10–48)
Hounsfield Unit (HU)		990.34±353.82 (384–1,862)
Periureteric fat stranding		45(60.8%)
Time since first colic attack (months)		2.54±1.24 (0.26–8)

As Non Contrast CT KUB is the gold standard now for ureteric calculi our study attempted to define impaction more objectively using certain parameters. On doing URS those who had a stone that is adherent to ureteral wall or causing severe edema, where a guidewire could not be passed across were documented as impacted stones and were included in this study. There are limited studies in literature on this context. Sarika et all in their series of 111 cases concluded that ureteric wall thickness predicted success of ESWL[6]. Lee et all in their series of 267 cases concluded that longitudinal stone diameter predicted success after MET[7]. All studies on this context confirmed the predictive value of ureteric wall thickness in predicting impaction and hence outcome of treatment[6]. Extrapolating this theory, in an attempt to quantify impaction we compared ureteric wall thickness with other parameters.

Based on the results of our study we categorized these parameters as follows :

Predictors of impaction

1) Ureteric wall thickness
2) Proximal Ureteric diameter
3) Renal Pelvic diameter
4) Transverse stone diameter and L/T ratio
5) Time since first colic
6) Age

No correlation with impaction

1) Longitudinal stone diameter
2) Hounsfield Unit

Doubtful Predictors

Periuretric fat stranding

Diagnosis of impaction is paramount in planning management as well as anticipating complications. Impacted calculi are less likely to pass spontaneously with expectant management or MET[8]. Moreover, impacted ureteral calculi are more difficult to fragment with SWL because of the lack of natural expansion space for the stones in the ureter, this result in a situation that is better managed by ureteroscopy[9]. Further impacted stones are associated with higher incidence of complications like hemorrhage, false passages, perforation, urosepsis and late strictures[10]. Hence diagnosis and quantification of impaction helps in timely and appropriate management of such calculi, also to anticipate and prevent intraoperative complications.

One drawback of our study was the limited sample size. With a larger data further studies on this aspect could aim at arriving at certain definitive scores based on these parameters.

CONCLUSION

Routine use of CT based parameters in predicting and quantifying impaction will reduce the painful unfruitful waiting periods of such patients and planning the appropriate line of management.

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