Original Article

Correlation between expulsion rate of distal ureteric calculus up to 8mm in size with CRP level, WBC count and Neutrophil percentage

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Abstract: Urolithiasis is a relatively common problem that encounters in our daily practice ranging from 2 to 20% of the worldwide population. Among them 3 to 5% are ureteric stone It is usually associated with flank pain, hematuria, urinary tract infection, nausea, vomiting. This study examined the relationship between CRP, WBC, and neutrophil percentage and distal ureteric calculus ejection up to 8mm. After describing conservative treatment and its negative consequences, patient gave informed permission. Perform recoded patient demographics like name, age, gender, and address. Taking an 8mm distal ureteric stone, normal and raised CRP were classified as <6mg/ld. and >6mg/dl, while normal and elevated white cell count were 4000-11000 and >11000 cells/cc. Normal and high neutrophil percentages were 40-70% and >70%. Distal ureteric stone on x-ray from the inferior sacral border to the ureteral orifice was KUB. Patients received Tamsulosin 0.4mg for 4 weeks and Diclofenac sustain release 100mg twice day till the pain eased. Patient turned to injectable Diclofenac if oral treatment didn't work. Drink plenty of water every day, get weekly follow-ups for 4 weeks, and report stone expulsion. X-ray KUB and USG Pelvis determined stone presence. If needed, CTU. X-ray KUB, USG, or CTD showed no stone, indicating stone expulsion. Result showed that medical expulsion therapy, 51 (55.4%) stones passed spontaneously. Of the patients, 15 had stones <4 mm and 36 had stones 4-8 mm, which spontaneously expelled. Average stone size was 5.41 mm. Of 92 patients with normal Total leucocyte levels, 44 passed their stone with medical expulsion therapy and 26 did not. Research indicates that patients with distal ureteric calculus and normal white cell counts have a better chance of spontaneous stone ejection with medical expulsion therapy (p value <0.010). The study concluded that normal CRP, TLC, and neutrophil counts can predict spontaneous distal ureteric stone passage with medical therapy. These exams are easy and inexpensive. Thus, distal ureteric calculus patients may benefit from medical ejection.

Keywords: ureteric calculus, CRP level, WBC count, Neutrophil percentage

1. INTRODUCTION

We come across cases of urolithiasis in the course of our day-to-day job. Urolithiasis is a condition that is quite common and affects anywhere from two percent to twenty percent of the total population of the world [1]. Ureteric stones account for between three and five percent of the total. There are a number of symptoms that are generally associated with it, some of which include discomfort in the flank, hematuria,

an infection of the urinary tract, nausea, and vomiting [2]. The problem can be treated in a conservative manner with the use of medical expulsive therapy (MET), extracorporeal shock wave lithotripsy (ESWL), endoscopic removal, and open surgery [3]. These are some of the therapeutic techniques that are available. Regarding the selection of the therapeutic approach, on the other hand, there are no predetermined guidelines to adhere to. More specifically, the rate of spontaneous ejection of small ureteric stones is significantly higher than that of larger stones. There is a possibility that the decision to undertake an invasive operation at an earlier time could be considered excessive treatment. This could lead to complications after the intervention as well as an increased cost burden [4]. Taking this into consideration, the urologist would be in a better position to decide whether or not to manage the patient in a conservative manner if they were aware of the predicted signs. The most important components of ureteric calculi are calcium salts, which include calcium phosphate, calcium oxalate monohydrate, and calcium oxalate dehydrate, among others. Nevertheless, the constituent parts of these calculi might be different. According to [5], the likelihood of uric acid, cysteine, xanthine, and striate being the components of this molecule is somewhat lower. When choosing a treatment option for a calculus, it is vital to take into consideration the severity of the patient's symptoms, the anatomy of the urinary system, the position of the stone, the availability of resources, and the patient's preferences. The C-reactive protein (CRP) in the serum, the white blood cell count (WBC), and the percentage of neutrophils are all examples of acute phase reactants that are accountable for the inflammatory response that occurs in the human body. It is possible to estimate the amount of inflammation by using these three parameters as clinical markers [6]. This is due to the fact that ureteral calculi have the potential to generate ureteral obstructions and triggers in the proximal submucosal layer, which can render the removal of the stone practically impossible [7]. The current inquiry will be carried out in order to investigate the link between spontaneous stone passage from the distal ureter that is smaller than 8 millimeters in size and serum C-reactive protein (CRP), white blood cell count (WBC), and neutrophil percentage [8]. This will be done in order to determine whether or not there is a correlation between these three factors. The findings of this study have the potential to act as a guide for the development of a procedure that allows for the treatment of small stones that are located in the distal portion of the ureter [9]. It was the purpose of this study to determine whether or not there is a connection between the CRP level, the white blood cell count, and the neutrophil percentage and the expulsion rates of distal ureteric calculus up to 8mm in size.

2. MATERIALS & METHOD

Informed consent was taken from patient after explaining about the conservative treatment, possible side effects of the outcomes Information regarding Patient demographics such as name, age, gender, address was recoded in preform. Detail history and finding of clinical examination were recorded in a preform complete hologram, Electrolyte, Renal Function Test, C-reactive protein level and urine investigations were sent to laboratory. X-ray Kidney, ureter, bladder, ultrasonography of pelvis was done. CT Urography, Non contrast computer tomography was done as per requirement. Distal ureteric stone of size 8mm was taken. Normal and elevated CRP was defined as <6mg/ld. and > 6mg/dl respectively, normal and elevated white cell count was defined as 4000-11000 cells/cc and >11000 cells/cc respectively. Normal and elevated neutrophil percentage was defined as 40-70% and >70% respectively. Location of distal ureteric stone on x ray KUB was defined from the inferior border of the sacrum to the ureteral orifice. Patients were given tablet Tamsulosin 0.4mg for 4 weeks, tablet Diclofenac sustain release 100mg was given twice daily, till the pain subsided. In cases where the pain didn’t subside with oral medicine patient was switched to injectable Diclofenac. Patients were asked to drink plenty of water daily, follow up was done weekly for till 4 weeks,

history of stone expulsion was taken. X-ray KUB and USG Pelvis was done for presence or absence of stone, and results were noted. CTU was done if needed. Stone expulsion was defined as no stone seen on x-ray KUB, USG or CTD oration for the expulsion of stone was also noted in the Preformat. Patient who was not passed stone at the end of 4 weeks was suggested for URS, Ureter lithotomy. The collected data was entered in Microsoft excel sheet to prepare master chart. Entered data analysis was done using Statistical Package for Social Sciences (SPSS) 27.0 version. The continuous variables were expressed as mean ± SD and categorical variables as frequency and percentage. Chi square test were used for correlation analysis. The confidence interval was set at 95% and p value < 0.05 was taken as statistically significant.

3. RESULTS & DISCUSSION

3.1 Result Interpretation

The study was conducted on 92 patients aged between 18-80 years, presented with distal ureteric calculi in surgery in National Medical College and Teaching Hospital, Barging among 92 patients, spontaneous passage of stone on medical therapy was observed in 51 (55.4%) patient.

Table 01: Sex -wise distribution of study subjects and spontaneous expulsion with medical expulsion therapy

Gender	Spontaneous expulsion		Total
	Present	Absent	
Male	29(56.8%)	25(60.9%)	54 (58.6%)
Female	22(43.2%)	16 (39.1%)	38(41.4%)
Total	**51**	**41**	**92**

In this study, there were 54 (58.6 %) Males and 38 (41.4 %) Females with Male to Female ratio of 1.42:1.

Table 02: Age-wise distribution of study subjects and spontaneous expulsionwith medical expulsion therapy

mean age=36.48 year Standard deviation= 13.78.

Age Group	Spontaneous expulsion		Total
	Present	Absent	
≤ 20	7	5	12 (13.04%)
21-30	14	11	25 (27.1%)
31-40	13	11	24 (26.08%)
41-50	9	7	16 (17.3%)
51-60	6	4	10 (10.8%)
61-70	2	2	4 (4.3.1%)
71-80	0	1	1 (1.08%)
Total	**51**	**41**	**92**

Out of 92 patients maximum number of patients were in the age group between 21 to 30yrs with total of 25 .The youngest patient was 18yrs and the eldest one was 72yrs of age.

Table 03: Distribution of study based on Laterality

LATERALITY	No. of Cases	Percent (%)
Right	42	45.6
Left	50	54.4
Total	**92**	**100**

Fifty patients (54.4%) had stone on left ureter while forty two patients (45.6%) had stone on right ureter.

Table 04: Spontaneous expulsion of the distal ureteric calculus with medical expulsion therapy

Stone size	Spontaneous expulsion		Total	P value
	Present	Absent		
<4 mm	15 (29.4%)	6 (14.6%)	21(22.8%)	0.093
4-8 mm	36 (70.6%)	35(85.4%)	71(77.2%)	
Total	**51**	**41**	**92**	

Spontaneous passage of stone with medical expulsion therapy were seen in 51(55.4%) cases. Out of which stone size <4 mm were 15 patient and stone size 4-8 mm were 36 patient with spontaneous expulsion. The mean stone size was 5.41 mm.

Table 05: Spontaneous expulsion of the distal ureteric calculus with medical expulsion therapy according to stone size

	Stone size (mm)		
Spontaneous expulsion	**2.1-4**	**4.1-6**	**6.1-8**
Present	16 (69.6%)	22(61.1%)	13(39.4%)
Absent	7(30.4%)	14(38.9%)	20(60.6%)
Total	**23**	**36**	**33**

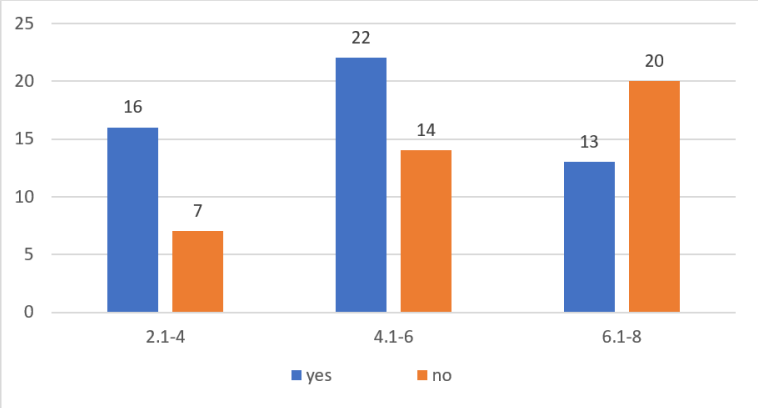

Figure 01: Bar diagram of spontaneous expulsion according to stone size

Stone size 2.1-4 mm 69.6% passed their stone while in patients with stone size of 4.1-6mm, 61.1% passed their stone, similarly stone size 6.1- 8mm only 39.4% of passed their stone spontaneously on medical therapy.

Table 06: Relationship between spontaneous of passage of stone with CRP level:

CRP (mg/l)	Spontaneous expulsion		Total	P value
	Present	Absent		
<6	42(82.4%)	21(51.3%)	63(68.5%)	0.0014
>6	9(17.6%)	20(48.7%)	29(31.5%)	
Total	**51**	**41**	**92**	

Out of 92 patient, 42 patients with normal CRP level passed their stone with medical expulsion therapy while 21 patients did not pass. 9 patients with high CRP level passed their stone while 20 patients did not pass. Patients with distal ureteric calculus with normal CRP level have high chances of spontaneous expulsion of stone with medical expulsion therapy (p value 0.0014).

Table 07: Relationship between spontaneous of passage of stone with Total leucocyte count:

Total Leucocyte count (cell/cc)	Spontaneous expulsion		Total	P value
	Present	Absent		
4000- 11000	44(86.3%)	26(63.5%)	64(69.6%)	0.010
>11000	7(13.7%)	15(35.5%)	28(30.4%)	
Total	**51**	**41**	**92**	

Out of 92 patient, 44 patients with normal Total leucocyte level passed their stone with medical expulsion therapy while 26 patients did not pass. Relationship of spontaneous expulsion of stone with medical expulsion therapy and white cell count was statistically significant, p value <0.010, patients with distal ureteric calculus and normal white cell counts have higher chances of spontaneous expulsion with medical expulsion therapy.

Table 08: Relationship between spontaneous of passage of stone with Neutrophil:

Neutrophil (%)	Spontaneous expulsion		Total	P value
	Present	Absent		
40-70	44(86.2%)	20(48.7%)	64(69.5%)	0.0001
>70	7(13.7%)	21(51.2%)	28(30.4%)	
Total	**51**	**41**	**92**	

Out of 92 patient, 44 patients with normal neutrophil level passed their stone with medical expulsion therapy while 01 patients did not pass which is statically significant p value 0.0001, patients with distal ureteric calculus and normal neutrophil level have higher chances of spontaneous expulsion with medical expulsion therapy.

3.2 Discussion

The study include 93 patient who presented with distal ureteric calculus out of 92 patients, 51 patients had spontaneous expulsion of stone with medical expulsion therapy [10, 11, 12]. The incidence of spontaneous expulsion was 55.43 %. This is similar to studies done by Kumar A, KK Bohme, with the rate 78.3%, 58.7%, 59.75%, 61.5% respectively. In this study the mean age of patient was 36.48 year with SD 13, 78 [13]. The maximum age was 72 year and minimum age was 18 year [14]. Most of the spontaneous expulsion of distal ureteric stone was seen in 21-30 year of age group, which was similar to study conducted. In this study out of 92 patient 38 were female (41.4%) and remaining 54 (58.6%) were male with male to female ratio 1.42:1. Among 54 male patient 29 (56.8%) patient had spontaneous expulsion of stone which was similar to study done by Puntub A male (66.7%) were found to be more than female (48.1%), were as Kumar A also revels s male predominance with male to female ratio of 1.10:1 [15]. This study revealed male dominance, the study 50 patients (54.4%) had stone on left side while 42 (45.6%) had stone on right side [16]. Ratio of right to left was 1.38:1 which was similar to Puntub 71 patient in left side and 68 patient in right side had stone [17]. Park CH also shows that 95 patient had left side and 92 patient had right side stone [18]. There is no specific laterality noted in this study, majority of the stones was between 4-8 mm in size 77.2% while 22.8 % of stones were less than 4 mm, the mean stone size was 5.41 mm, similar in the study conducted [19], it observed the mean size of the stones to be 4.87±3.49 mm [20]. In present study stone size less than 6mm had high chance of passage their stone while in patients with stone size of more than 6mm, low chance passage their stone [21]. Revels that stones smaller than 6mm had 88.7% chance of spontaneous passage while stone 6mm or larger had 57.5%. A study reveals that 98% of stone less than 5mm are passed spontaneously with conservative management. Observed that incidence of spontaneous expulsion of distal ureteric stones for less than 5mm of stone was 71-98% and 25-51% for stone more than 5mm. In this study out of 92 patient, normal C reactive protein (CRP) (<6mg/l) was seen in 63 cases (68.5%), out of which 44 patient had spontaneous expulsion stone. The incidence of expulsion was 82.3% [22], an association between CRP and spontaneous expulsion was found statically significant [23, 24]. The present study comparable with other studies, Park Chows that the incidence of expulsion of stone with medical expulsion therapy rate was 67%,%,94.1%, 92.3%, 41.9%, 91.8 respectively and those studies revealed that normal CRP level was significant factor for predicating spontaneous expulsion of stone with medical expulsion therapy [25]. In present study out of 92 patient normal Total leucocyte count (4000- 11000cells/cc) was seen in 64 patient [26], out of which 44 (86.3%) patient had spontaneous expulsion of stone which was found statically significant. Similarly study compared to other studies, revels that the incidence of expulsion of stone rate was 86.4%,89.7%, 54.6%, respectively and those studies revealed that normal TLC count was significant factor for predicating spontaneous passage of stone [27], it also shows that normal TLC count is factor for predication spontaneous passage of distal ureteric stone [28]. In this study 44(86.2%) patient had spontaneous expulsion of stone was seen with normal neutrophil count (40-70%) which was similar to the study conducted ,shows that the incidence of expulsion of stone was 58.6%, 96.6%, 85.2% respectively [29], it also revealed that normal neutrophil count is predicating factor of spontaneous expulsion of stone and was statically significant. Mean duration of spontaneous passage of stone was 14.2± 2.82 days similar to Ahmad also shows that mean duration of passage of stone was 24 ±8.09 days [30].

4. CONCLUSIONS

Urolithiasis is a relatively common problem that encounters in our daily practice ranging from 2 to 20% of the worldwide population. Among them 3 to 5% are ureteric stone, it is usually associated with flank pain, hematuria, urinary tract infection, nausea, vomiting. Various treatment methods are available which include conservative management by medical expulsive therapy (MET), extracorporeal shock wave lithotripsy (ESWL), endoscopic removal and open surgery. However, there are no clear guidelines regarding the selection of treatment modality. In particular, small ureteric stone has high spontaneous expulsion rate. An early selection of invasive procedure might considered overtreatment and leads to complications after intervention and economic burden. Therefore, recognizing predictive factors would help the urologist to decide whether to manage the patient conservatively or not Ureteric calculi varies in composition but most of them are made up of calcium salts like calcium oxalate monohydrate, calcium oxalate dehydrate and calcium phosphate. Less likely composed of uric acid, cysteine, and xanthine and striate. Summarizing the results of our study we conclude that the normal CRP, TLC and neutrophil counts can significantly contribute to the prediction of spontaneous passage of distal ureteric stones with medical therapy. These tests are simple, easy and cost effective. So, medical expulsion therapy can be considered in patients with distal ureteric calculus.

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