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Prediction of Spontaneous Stone Expulsion by Serum C-Reactive Protein in Patients with Distal Ureteric Calculi

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ABSTRACT

Introduction

Ureter obstruction caused by a ureteral stone triggers inflammatory change in the proximal submucosal layer and prevents passage of the stone which can increase C-reactive protein level. The present study was designed to see if CRP plays a role in predicting the expulsion of distal ureteric calculi of <10 mm in patients presenting to urology department.

Methods

A cross-sectional study was done at National Medical College, Department of Surgery, Birgunj from January 2022 to June 2022. Total of 60 cases were included in the study who presented with distal ureteric calculi. Level of CRP was recorded and divided into <6 mg/dl and >6 mg/dl. Size of stone and rate of spontaneous expulsion was noted.

Results

Among the 60 cases, 34 (56.7%) were males and 26 (43.3%) were females. Mean age of the study cases was 36.1±11.76 years and mean size of stone 6.72±1.54 mm. among the total cases 28 (47%) had CRP level <6mg/dl and 32 (53%) had CRP level >6mg/dl. Among the total cases 35 (58.3%) did not pass stone spontaneously and the size of stone was 6.9743±1.74598 mm. spontaneous passage of stone was not seen in 21 (60%) male and 14 (40%) female cases. Significant difference (p=<0.001) was seen between expulsion and non-expulsion of stone.

Conclusion

Measurement of CRP at the time of presentation with distal ureteric calculi of small size can help the urologist to predict whether spontaneous expulsion is possible or not.

Keywords

C-reactive protein; distal ureteric calculi; spontaneous expulsion of stone

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INTRODUCTION

Urolithiasis is one of the most common urological problem worldwide with estimated prevalence of 1-5% in Asia,5-9% in Europe and 13% in USA.[1] Likelihood of the stone to pass spontaneously is preferably based on size <2mm where the stone has chances of passing spontaneously in about 97% of cases whereas >6mm stones has chances of passage of nearly about 1%.[2] Serum C-reactive protein (CRP) was so named because it was first discovered as a substance in the serum of patients with acute inflammation that reacted with the C(capsular) polysaccharide of pneumococcus.[3] CRP increases as a result of inflammatory responses and are clinically used as indexes of the degree of inflammation. Ureter obstruction caused by a ureteral stone triggers inflammatory change in the proximal submucosal layer and prevents passage of the stone.[4]

This study aims to see if CRP plays a role in predicting the expulsion of distal ureteric calculi of <10mm in patients presenting to urology department.

METHODS

Putting the value in the above equation the calculated sample size is 52. Taking 10% as unresponsive subjects the study sample size will be 57. Hence, we will include 60 cases in the study.

Level of CRP was recorded and divided into <6 mg/dl and >6 mg/dl. Size of stone and rate of spontaneous expulsion was noted.

Data collection was done in data collection sheet and later entered in Office Excel version 2016. Data analysis was done using Statistical Package for the Social Sciences (SPSS) version 16. Variables were expressed in mean ± standard deviation, frequency and percentage where applicable. Comparison between rate of expulsion of stone and level of CRP was done using Chi square test where p value less than 0.05 was considered significant.

A cross-sectional study was done at National Medical College, Department of Surgery, Birgunj from January 2022 to June 2022. Total of 60 cases were included in the study who presented with distal ureteric calculi. Informed consent was obtained from the cases that were included in the study. Ethical clearance (F-NMC/577/078-79) was obtained from institutional review committee of NMC Birgunj. Patients were assessed with ultrasonography (USG) and a plain abdominal X-ray. Intravenous Urography (IVU) or Computed Tomography (CT) was used in few patients depending on specific indications. Ureteric stone of size less than 10 mm were included in the study. In first visit, history was taken, a physical examination, serum CRP, urine analysis, blood urea nitrogen and serum creatinine levels were measured. Patients with acute infection, elevated levels in renal function tests at presentation, severe hydronephrosis, bilateral ureteric stones, pregnancy or lactation, current use of a-blockers, calcium-channel blockers or steroids, age <18 years were excluded from the study.

The sample size was calculated using the formula:

n=(Z^2 x p(1-p))/e^2

n= required sample size

Z= confidence level at 90 % (standard value of 1.64)

p = proportion of population = 0.736

m= margin of error at 10% (standard value of 0.1)

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RESULTS

Among the 60 cases, 34 (56.7%) were males and 26 (43.3%) were females. Mean age of the study cases was 36.1±11.76 years and mean size of stone 6.72±1.54 mm. Among the total cases 28 (47%) had CRP level <6mg/dl and 32 (53%) had CRP level >6mg/dl (Figure 1).

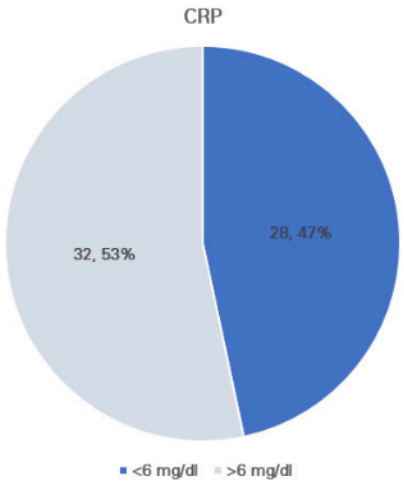

Figure 1. *Distribution of C-reactive protein (CRP)*

Table 1. Demography of stone passage

Variable	SSP	No SSP
Number	25 (41.7%)	35 (58.3%)
Size of stone	6.36±1.13	6.97±1.74
Age	33.28±10.23	38.11±12.48
Gender		
Male	13 (52%)	21 (60%)
Female	12 (48%)	14 (40%)

Table 2. Expulsion rate of stone as per CRP (n = 60)

Expulsion	CRP <6 mg/dl	CRP >6 mg/dl	p value
SSP	19 (76%)	6 (24%)	<0.001
No SSP	9 (25.7%)	26 (74.3%)	

Among the total cases 35 (58.3%) did not pass stone spontaneously and the size of stone was 6.9743±1.74598 mm. Spontaneous passage of stone was not seen in 21 (60%) male and 14 (40%) female cases (Table 1).

Significant difference (p=<0.001) was seen between expulsion and non-expulsion of stone. Expulsion rate was less in cases with high CRP level when compared with low CRP level (Table 2)

DISCUSSION

The prevalence of urolithiasis in Asia is 1-5% which is one of the most common urological problems encountered by urologist.[1] Studies have shown that low level of CRP had high level of spontaneous expulsion of small distal ureteric calculi. [5–7]

In our study 56.7% were males and 43.3% were females. Mean age of the study cases was 36.1±11.76 years and mean size of stone 6.72±1.54 mm. Among the total cases 47% had CRP level <6mg/dl and 53% had CRP level >6mg/dl. The result was consistent with study done by Mohammad et al where 53% were female subjects.[8]

In our study spontaneous stone passage (SSP) was seen in 41.7% participants. Which was similar to study done by Mohammad et al where SSP was seen in 41.1% participants.8 Similar result was also seen in study done by Hassan et al which showed 46.67 SSP.[9] But, in another study, done by Timilsina et al showed 80.9% SSP which was higher than that of our study.[10]

Our study showed that 76% expulsion was seen in participants with CRP <6 mg/dl and only 24% expulsion was seen in participants with CRP >6 mg/dl which was statistically significant (p <0.001). This was consistent with study done by Hassan et al where 47 participants with CRP <6 mg/dl expelled stone spontaneously and only 44 participants with CRP >6 mg/dl expelled stone spontaneously (p<0.005).[9] Similarly, Timilsina et al showed that 92.1% participants expelled stone spontaneously with CRP >6 mg/dl and only 47.1% participants expelled stone spontaneously with CRP <6 mg/dl (p<0.001).[10]

Studies have shown that different factors play role in expulsion of ureteric stone among which most common being size and location of stone. Along with the anatomical variations different inflammatory markers have also been related to spontaneous expulsion of ureteric stone. All these factors when taken into consideration helps the urologist to decide the mode of treatment for distal ureteric calculi.

Most commonly studied inflammatory markers are white blood counts (WBC) and CRP. Among the WBC neutrophil lymphocyte ratio has shown better correlation with expulsion of stone spontaneously.[5,10–12]

Our result showed that participants with low CRP expelled stone spontaneously whereas participants with high CRP were more likely have to undergo intervention even though the size of stone was similar. We only included CRP level in our study but other extensive studies are needed which includes different inflammatory markers which can give us a better picture and help us to plan our management accordingly.

CONCLUSION

The prediction of spontaneous expulsion of distal ureteric calculi of small size will help the urologist to select the mode of treatment. Serum C-reactive protein is helpful to predict whether spontaneous expulsion of the stone is possible or not. Furthermore, studies that include other inflammatory markers have to be done for more accurate result.

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CONFLICT OF INTEREST

The author(s) declare that they do not have any conflicts of interest with respect to the research, authorship, and/or publication of this article.

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