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Research Article

Pain severity in renal colic: a retrospective evaluation of initial visits in patients at a medical center

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ABSTRACT

Background: Urinary stone disease is commonly seen in urology practices. Most patients with renal colic present with excruciating flank pain and thus seek urgent medical care. This study aimed to determine correlations between clinical parameters and the perception of pain.
Methods: 171 consecutive patients with initial presentation of renal colic due to a single ureteral stone were reviewed from January 2010 to November 2012. The visual analog scale (VAS) was used to assess pain intensity at the time of colic. Relationships between the clinical data and severity of colic pain were assessed. Demographic characteristics, e.g. sex, age, and body mass index (BMI), were also analyzed.
Results: The mean size of the stones was 5.3±2.2 mm, and 62% were found in the lower ureters. Medical expulsive therapy alone was effective in 48% of cases; the average time for stone passage was 9±5 days. The pain score did not vary according to age (P=0.153), sex (P=0.723), or stone location (P=0.816). BMI had a negative correlation with a high VAS score (P<0.01). The stone size (<5 mm) was also inversely correlated with the pain score (P=0.025). VAS is effective for evaluating individual discomfort, as it helps to assess patients' perception of pain.
Conclusions: Our study showed that a lower BMI and smaller stones (<5 mm) tend to contribute to more severe colic pain. These results provide us with information that is helpful in the clinical management of renal colic.

Keywords: Renal colic, Urinary calculi, Visual analog scale, Body mass index

INTRODUCTION

Urolithiasis is a common disease worldwide. In Taiwan, the reported age-adjusted prevalence in 2010 was 7.38%, and the overall recurrence rate at 5 years was 34.71%. Renal stones seldom cause symptoms while they remain in the kidney. However, renal stones can cause intractable pain as they enter the ureter, which triggers a periodic increase of pressure in the collecting system. Usually, such pain does not respond to oral medication, and most patients with such a condition visit the emergency department for parenteral analgesics.[1,2]

In many studies, the stone size was the most important determinant for spontaneous passage of ureteral stones. Recently, Preminger et al, noted that the passage rate for ureteral stones ≤5 mm and >5 mm, and ≤10 mm was 68% and 47% respectively. Therefore, even when the pain seems initially intolerable, a high percentage of such patients only require symptomatic management.[3]

Most studies on pain severity focus on how various medications may help relieve colic pain, whereas only a few studies have examined how clinical parameters may affect pain perception during renal colic. Therefore, this

study was conducted to determine whether patient characteristics influence patient pain perception during a renal colic episode.[4-7]

METHODS

A retrospective chart review was performed for 171 patients (146 males and 25 females) who underwent initial diagnosis with ureteral stone-related renal colic between January 2010 and November 2012. Asymptomatic patients with urolithiasis, patients who had been treated at other clinics, and those with incomplete data were excluded from this study. Then all patients were evaluated, treated, and followed up by urologists at our laboratory. This study was performed with appropriate approval from internal review boards.

Image studies with radiography and sonography were done first in those patients with uncomplicated renal colic. In addition, intravenous urography or computed tomography (CT) was performed to confirm the stone size and location. Pain over the past 24 hours after symptom onset was assessed in our emergency room or outpatient department using an 11-point modified visual analog scale (VAS). Hydronephrosis observed on CT or sonography scans was categorized as mild (grade 1), moderate (grade 2), severe (grade 3), or massive (grade 4) according to standard definitions. Patients with a stone size <1 cm were treated with primary medical expulsion therapy (MET) consisting of a daily alpha-blocker (terazosin or tamsulosin) and non-steroidal anti-inflammatory drugs. Urgent surgical intervention was performed if symptoms such as ongoing renal deterioration, an infected obstructed upper urinary tract, intractable pain, or severe vomiting presented. Elective surgery was performed after 1-2 week of observation, although the optimal duration of observation is uncertain. Sonography and plain radiography was performed repeatedly to confirm passage of stones. The relationship between the stone size and severity of pain was assessed. Patients' demographic characteristics, body mass index (BMI), age, and sex were also compared.[8-10]

Continuous data were expressed as mean±standard deviation. Relationships between the variables and pain scores were evaluated using Spearman's correlation model. All data were processed using SPSS, version 19 (IBM Corp., Armonk, NY, USA). A value of P <0.05 was considered statistically significant.

RESULTS

Of 171 patients, 146 were male, and the mean age was 45±12 years (range: 20-83 years) (Table 1). Fifty-five patients (32.2%) presented with recurrent renal colic, and the remaining 116 patients (67.8%) had renal colic for the first time. Four percent of the 171 patients had mild pain (VAS score, 1-3), 26% had moderate pain (VAS score, 4-6), and 70% had severe pain (VAS score, 7-10). The mean VAS score at the initial visit was 7.4±1.8.

Table 1: Demographic characteristics.

Characteristics	Total
Patients numbers	171
Age (y/o)	
Mean	45±12
Range	20–83
Gender	
Male	146
Female	25
Stone size (mm)	
<5 mm	64
≧5 mm	107
First time stone former	116
Recurrent stone former	55
Stone location	
Distal	96
Middle	9
Proximal	66

Upon radiologic examination, 56.1% of the stones (96 patients) were found in the lower ureter, 38.6% (66 patients) were in the upper ureter, and 5.3% (9 patients) were in the middle region of the ureter. The mean size/diameter of the stones was 5.3±2.2 mm (range: 2-16 mm). Mild, moderate, and severe hydronephrosis during the pain episode was observed in 76%, 12%, and 1% of the patients, respectively, whereas the remaining 11% had no discernible hydronephrosis.

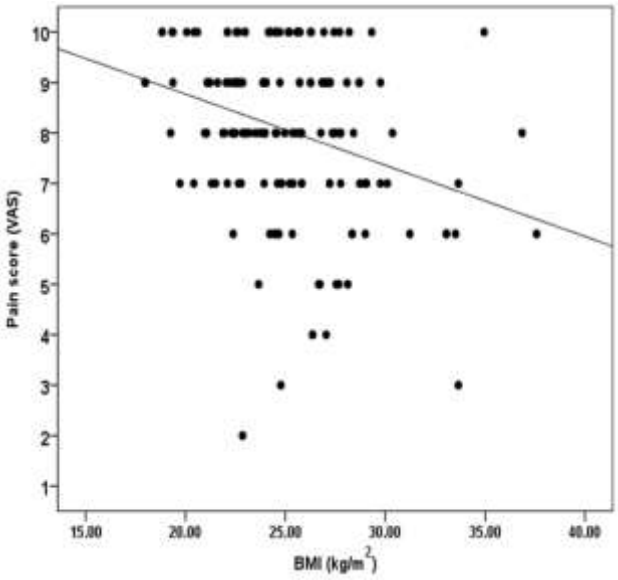

Figure 1: Negative correlation between the body mass index and pain severity as assessed using the visual analog scale (VAS) (r = -0.24, P < 0.01).

In this study, 68.6% of patients in stone size <5 mm and 33.7% of those in stone size ≥5 mm had been treated effectively with MET, whereas the remaining patients in each group received extracorporeal shock wave lithotripsy (ESWL) or ureteroscopy (URS). Overall, 52%

of the patients eventually required minimal invasive procedures, including ESWL and URS, to treat the stones; whereas, medical expulsion alone was effective in 48% of cases. Minimally invasive procedures were performed after an average of 8.7±6.3 days, while stone passage occurred at 9.2±5.8 days.

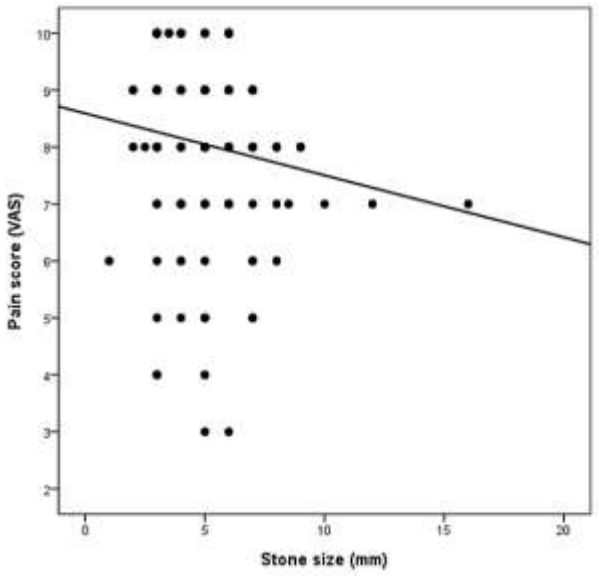

Figure 2: Inverse correlation between the stone size and the visual analog scale (VAS) (r = -0.2, P = 0.025).

Pain severity estimated with VAS was inversely related to BMI (r = -0.24, P < 0.01) (Figure 1) and the stone size (r = -0.2, P = 0.025) (Figure 2). Lower BMI (<25 kg/m2) tended to be associated with a higher VAS score (P = 0.02). Only weak correlations were found between the pain score and age (r = 0.112, P = 0.153). Although stone size had a modest relationship with the severity of hydronephrosis (r = 0.311, P < 0.01), the severity of hydronephrosis itself was not correlated with pain severity. Furthermore, the stone location and patients' sex were unrelated to the VAS pain scores.

DISCUSSION

We found that parameters such as sex, stone location, and degree of hydronephrosis were not correlated to the pain score. The only two parameters correlated to pain perception were BMI and the stone size. Particularly, our finding that small stones (<5 mm) tended to induce severe pain was similar to Kuehhas et al, findings, in which he claimed that a stone size <4 mm was a predictor of a high VAS.[7]

According to GV Kanda Swamy et al.'s study older patients presented with more severe pain and better response to pain-killer. Furthermore, increasing BMI seems to affect initial pain relief in this study population but no correlation with initial pain score. Moore et al, reported that clinical parameters such as male sex, pain duration, non-black race the presence of nausea/vomiting, and microscopic hematuria were reliable factors to predict stone-related colic. However, whether pain itself is relevant to the clinical diagnosis has not been fully examined. Using the VAS score to predict the stone size could be subjective; however, the correlation between these two factors does provide valuable information for clinical management. However, in a previous study regarding ESWL, Vergnolles et al, stated that young age, female sex, and a depressed mood were most predictive of pain.[11-13]

In addition, recent data also suggested that MET has significantly facilitated the passage of stones. Lee et al, claimed that <50% of patients with calculi <1 cm eventually require surgery if they first underwent MET. Our findings regarding the efficacy of MET are therefore consistent with a previous literature review.[14-15]

In this study, we inferred that a larger stone usually implies a chronic condition. This inference can be explained as follows: in chronic ureteral dilatation, the nociceptor is not sharply stretched, and the resulting pain is dull. Conversely, when a small stone (<5 mm in diameter) fails to pass, the surrounding ureteral lumen becomes smaller due to inflammatory oedema and thus the ureteral lumen may become totally obstructed. In a totally obstructed ureter, ureteral spasm causes higher intra-luminal pressure and triggers more severe pain. This may explain the aforementioned inverse correlation between the stone size and pain severity.

Another interesting finding was the fact that patients with a lower BMI tended to have a higher VAS score. Latthe et al, claimed that dysmenorrhea happened more frequently among patients with a low BMI. Although previous studies have suggested that the pain threshold may be increased in obesity, most studies have focused on experimental dermal pain stimulation. Until now, no study has shown a correlation between visceral pain and BMI.[16-18]

We would like to emphasize that the data in this current study did not address other etiologies of renal colic, e.g., renal infarction or malignancy. Primary imaging with sonography and plain radiography had been performed for the 171 patients in our study. However, the measurement of stone size from a plain radiography can sometimes be misleading. Nonetheless, approaches to treat renal colic clearly vary in different countries and by various insurance systems. In addition, the relatively small number of cases included in this analysis would be the major limitation of our study. Parameters such as the composition of stones and other psychosocial and biological factors should also be considered in order to perform a more thorough study on pain perception.[19-21]

CONCLUSION

VAS is an effective approach to evaluate patients' perception of colic pain. A lower BMI and smaller

ureteral stones (<5 mm in diameter) tend to cause more severe pain. Since only limited cases were included in this study, we believe a prospective study of a larger population would help to enhance our understanding of the relationship between colic pain and patients' clinical characteristics.

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