

The Application of KUB for Detecting of Submucosal Ureteral Stones

AGHAMIR SMK*, MOHSENI MG, ARDASTANI A

Department of Urology, Sina Hospital, Tehran University of Medical Sciences, Tehran, Iran

ABSTRACT

Purpose: The accurate diagnosis of submucosal ureteral stones in order to choose a proper and less complicative method of treatment is of significant importance. The use of KUB to detect submucosal ureteral stones has been studied in this research.

Materials and Methods: This prospective study has been carried out on 33 patients (23 males and 10 females) with lower ureteral stone (17 cases in the right ureter and 16 in the left) located under iscial spine as was indicated in their KUB. The distance from the lower end of stone to the midline of sacrum was measured per millimeter using KUB. All patients underwent ureteroscopy, and accordingly those with submucosal ureteral stones were distinguished. The correlation between the distance of the lower end of stone from the middle line of sacrum and the existence of submucosal ureteral stone was analyzed.

Results: Nineteen out of 33 studied patients had submucosal ureteral stones. The average distance between the peak of stone and the middle line of sacrum in patients with submucosal ureteral stone was 9.7 mm with an accuracy of 1.4 mm, a confidence interval 95% and standard deviation of 3.1 mm. Accordingly, if the distance of stone from the middle line of sacrum is lower than 13.7 mm, in 90% of cases the stone will be submucosal.

Conclusion: In patients with lower ureteral stone, the KUB of whom indicates a stone under iscial spine, if the distance of the peak of stone from the midline of sacrum was lower than 15 mm, the stone could most likely be submucosal, a point, which should be considered during treatment. In such cases the intravesical approach should be considered intraoperatively and preparation for submucosal ureteral incision must be provided. This method would be useful in stone removal, if the classic ureteroscopy was not successful.

KEY WORDS: submucosal ureteral incision, ureteral meatotomy, KUB, submucosal ureteral stone

INTRODUCTION

The method of treating submucosal ureteral stones is always a matter of discussion in urology. The surgery of submucosal ureteral stone is difficult and occasionally leads to the dissection of ureter from behind the bladder and ultimately to open surgery. The classic use of endourologic devices, particularly in impact submucosal ureteral stones, is not always possible, since fac-

Accepted for publication

tors such as submucosal ureteral edema, the change of ureteral orifice posteriorly, and bolus edema formation around the ureteral orifice may cause unsuccessful classic ureteroscopy. Thus, sometimes it is necessary to apply other methods of treatment such as submucosal ureteral incision (ureteral meatotomy) in order to remove submucosal ureteral stones.

Thus, the detection of these stones is of great importance and it leads the urologist to use sub-

stitutional methods. Definite diagnosis of submucosal ureteral stones is obtained by cystoscopy.

In the following situations, the submucosal ureteral stone is suspected: observation of stone in ureteral orifice, bulging of stone in submucosal ureter, and bolus edema around the ureteral orifice.

A noninvasive method that could detect submucosal ureteral stone accurately has not been reported yet. It is just mentioned that if a stone in KUB is located in the lower ureter horizontally, it could likely be a submucosal ureteral stone.⁽¹⁾ In this study the distance of stone from the midline of sacrum (which is measured by the use of KUB) is evaluated as a quantitative criterion in submucosal ureteral stone diagnosis.

MATERIALS AND METHODS

From Dec. 1999 to Sep. 2000, 87 patients were referred for lower ureteral stone, of whom the KUB of 33 patients indicated a stone parallel to or lower than iscial spine. Of these, 17 and 16 had right and left side ureteral stone respectively. Twenty three patients were male and 10 were female. The mean age was 43 years (range 24-66). The ureteral orifice and submucosal ureter were seen by an 8.5 Fr ureteroscope. If the stone was seen at the ureteral orifice or there was a stone bulging in submucosal ureter, the diagnosis of submucosal ureteral stone would be made. Ureteroscopy was carried out at lithotomy position and under general or spinal anesthesia. When classic ureteroscopy was possible, the stone was fragmented by lithoclast, otherwise it was removed by mucosal ureteral incision, and then the whole ureter up to the kidney was observed.

In order to reduce edema and prevent postoperative pains, ureteral stent was placed in all patients for 48 hours.

Using KUB, the horizontal distance of stone from the midline of sacrum was measured per millimeter and the correlation between this distance and the existence of submucosal ureteral stone was studied (fig.1).

RESULTS

Nineteen out of 33 studied patients had submucosal ureteral stone (table 1). The mean distance

TABLE 1. *The frequency of patients with submucosal ureteral stone according to the distance between the peak of stone and the midline of sacrum*

<i>Number of patients with submucosal ureteral stone (%)</i>	<i>Total number of patients</i>	<i>The distance from midline of sacrum (mm)</i>
13(100%)	13	X≤ 10 mm
3(43%)	7	10<X≤15 mm
3(23%)	13	X> 15 mm

between the peak of stone and the midline of sacrum in patients with submucosal ureteral stone was 9.7 ± 3.1 mm. Regarding the sample size formula of descriptive studies, if we assume $\alpha=0.05$, $\sigma=3.1$, and $n=19$ (the number of patients with submucosal ureteral stone), the standard deviation with 95% confidence interval would be 1.4 mm.

Considering the obtained results, if the distance of stone from the middle line of sacrum is lower than 13.7, the stone is likely to be submucosal ureteral by a chance of 90%.

DISCUSSION

The definite diagnosis of submucosal ureteral stone before any treatment could lead the urologist to choose a proper and less complicative method of treatment. Nowadays, the use of ureteroscopy is regarded as a preferable treatment of submucosal ureteral stones.⁽²⁾ However, the occasional failure of classic ureteroscopy leads to the application of substitutional methods such as ureteral meatotomy. Now, ureteral meatotomy is considered as the most common approach in the treatment of submucosal ureteral impact stones.^(3, 4) Thus, the failure in detecting submucosal ureteral stone, while using alternative methods is impossible for the urologist can yield to unsuccessful treatment.

A few studies of detecting submucosal ureteral stones have been conducted and available data indicates that there is not any definite noninvasive method of detecting such stones to be reported.

In this study the distance of the peak of stone from the midline of sacrum has been studied as a quantitative criterion in the diagnosis of submucosal ureteral stones. Ninety percent of these stones were located at lower than 13.7 mm. Form the middle line of sacrum. Accordingly, there is a correlation between the distance of the peak of

stone from the midline of sacrum and the existence of submucosal ureteral stone.

Hence, if this distance is lower than 15 mm, the stone will most likely be in submucosal ureter. In such cases, it may be simple to access the stone intravesically during surgery.

However, ureteral meatotomy devices should be available while using endourologic methods. Ureteral meatotomy could be used to remove the stone whenever classic ureteroscopy is impossible.

CONCLUSION

In patients with lower ureteral stone, the KUB of whom indicates a stone under iscial spine, if the distance of the peak of stone from the midline of sacrum was lower than 15 mm, the stone could most likely be submucosal, a point, which should be considered during treatment. In such cases the intravesical approach should be considered intraoperatively and preparation for submu-

cosal ureteral incision must be provided. This method would be useful in stone removal, if the classic ureteroscopy was not successful.

REFERENCES

1. EL-Sheriff AE. Endoscopic management of impaired stones in intramural or meatal part of ureter without performing meatotomy. *British J Urol* 1995; 76: 394-396.
2. Kapoor DA, Leech JE, Yap WT, et al. Cost and efficacy of extracorporeal shock wave lithotripsy versus ureteroscopy in treatment of lower ureteral calculi. *J Urol* 1992; 148: 1095-1096.
3. Hussain I. *Topical urology and renal disease*. Edinburgh: Churchill Livingstone; 1984. p. 165-199.
4. Clarck P. *Operations in urology*. Edinburgh: Churchill Livingstone; 1984. p. 256-272.

FIG. 1. A 23 year female with left submucosal ureteral stone. The distance between the tip of the stone and midline is 9 mm.