MANAGEMENT OF URIC ACID STONE

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Mohammad Nawaz Chugtai, Farakh Ahmad Khan, Mohammad Kaleem, Mumtaz Ahmed (Department of Urology, Postgraduate Medical Institute, Lahore.)

ABSTRACT

Uric acid stones are the most readily dissolvable of all types of urinary stones. By maintainingurinary pH between 6.2-6.8 with the use of sodium acid citrate or uralyt-U and reducing serum uric acid by allopurinol, we tried to dissolve 107 stones in 67 patients. Ninety three (86.9%) stones were dissolved and 6 (5.6%) passed spontaneously within a period of one year. Eight (7.5%) stones were removed surgically or with ESWL. Five (7.5%) patients had stone recurrence over a period of 3 years follow-up. Sefum urit acid was raised in 19 (28.5%) and urinary uric acid in 12 (18%) patients while urinary pH was low in 46 (69%) patients. For uncomplicated uric acid stones oral chemolysis on an out-patient basis is the treatment of choice. It is simple, safe and inexpensive. However, it requires rigid compliance by the patient and strict follow-up by ultrasonography (JPMA 42: 153, 1992).

INTRODUCTION

Uric acid stones are the third most common urinary stones after calcium oxalate and struvite stones and comprise of 5-10% of the stone population[1]. Uric acid is an end product of purine metabolism. It is formed from the degradation of nucleic acid via hypoxanthine and xanthine in the presence of xanthine oxidase. In other mammals uric acid is further converted into allantoin by enzyme uricase. Uric acid has limited solubility while allantoin is highly soluble in water. Therefore, man is prone to uric acid stone formation, while other mammals do not form these stones. The Pka of uric acid is 5.75 in urine at 37°C. Thus 50% of uric acid is in undissociated or insoluble form and 50% in dissociated or soluble form at this pH. As urinary pH reaches 6.5, most of the uric acid is in the more soluble monosodium urate form. Therefore, uric acid stones can be effectively cleared by alkaline therapy from urinary tract and cure can be guaranteed to the patient. The objective of this study was to find risk factors in uric acid stone formers and to evaluate the effect of chemolytic therapy in dissolution of pure uric acid stone and prevent their recurrence.

PATIENTS AND METHODS

Patients of any age, of either sex, who presented consecutively at Urology Centre Lahore with radiolucent stones in the kidney were included in this study. Patients with moderate hydronephrosis, urinary infection, persistent pain, calculous anuria and those with blood urea of more than 40 mg% or serum creatinine more than 1.5 mg% were excluded from the study. The diagnosis of uric acid stone was established by renal ultrasound, negative filling defect on IVU or retrograde pyclography. Serum uric acid (upper limit 7.0 mg/100 ml) and 24 hours urinary uric acid (upper limit 700 mg/24 hours) were estimated by enzymatic (uricase) method. pH of the urine was estimated by pFI meter in all patients. All these patients were treated with high fluid intake, dietary restriction of red meat and offal, allopurinol 100-300 mg daily and uralyt-U or sodium acid citrate daily. pFI of urine was monitored by the patient himself In case of uralyt-U, pFI strips were provided with the packet and dose was adjusted and pH was maintained between 6.2 to 6.8. The patients were followed at 3 monthly interval by renal ultrasound to see the size of stone, ureteric obstruction or recurrence.

RESULTS

Sixty-seven patients having 107 uncomplicated radiolucent stone in the kidney were studied. Age of the patients varied from 12 to 67 years (mean of 30.6 years). Male to female ratio was 3:1. Thirty-six patients had stones in the left kidney, 15 in the right and 16 patients had bilateral renal calculi. Five patients had stones in the solitary kidney. Seven patients had previous surgery. Forty-seven patients had solitary stones and 20 had multiple stones. Size of the stone varied from 0.6cm to 6.3 cm. Staghorn stones were present in 10 patients. Seventy percent stones were below 1.5 cm, 19.6% between 1.6 to 3.0cm and 10.4% were more than 3.0 cm in size. Serum uric acid was raised in 19 (28.5%), 24 hours urinary uric acid in 12 (18%) and both in 9 (13.5%) patients. Urinary piT was between 4.5-5.0 in 46 (69%) and 5.1-5.5 in 12 (18%) patients. Six (9%) patients gave positive family.history of stone formation. Three (4.5%) patients had clinical evidence of gout. The size of the stone gradually decreased over a period of time. After 6 months therapy, 63 (58.9%) stones were dissolved while ninety-three (86.9%) stones were dissolved by one year. Six (5.6%) stones passed spontaneously after reduction in their size. Eight (7.5%) stones were treated surgically or with ESWL. Five (7.5%) patients had recurrence of stone over a period of 3 years follow-up.

DISCUSSION

The factors which are conducive to uric acid stone formation are hyperuricosuria, low urinary p11 and low urine volume. Hyperuricosuria does not seem to be essential for stone formation as we found that only 12 (18%) patients had raised urinary excretion of uric acid. Our findings are similar to Seagmiller[2] who found hyperuricosuria in 25% of patients with idiopathic uric acid stone disease. Hyperuricosuria when present increases the risk of calcium oxalate stone formation in 10-20% of the patients[3]. Robertson[4] found normal serum and urinary uric acid in uric acid stone formers. In our study 55 (82%) patients had normal urinary uric acid. Lowurine volume due to environmental and occupational factors in our country may actually raise the concentration of uric acid in the urine leading to crystal formation and eventually stone formation. Urinary uric acid excretion depends upon the dietary proteins or endogenous breakdown of protein[5]. We reduced the dietary intake of purine (red meat and offal) while endogenous formation of uric acid was prevented by use of allopurinol. Allopurinol inhibits xanthine oxidase and thus prevents conversion of hypoxanthine orxanthine into uric acid[5]. Low urinary pH was found to be the major risk factor in stone formation in our patients. Forty-six (69%) patients had p11 below 5.0 while in 12 (18%) patients the pFl was between 5.1-5.6. Low urinary pH in these patients could be due to low ammonia secretion[6]. We found low urinary pH to he persistent as we monitored urinary pH three times a day for a week before starting the therapy. Yu and Gutman[7] found that persistent low urinary pH is due to loss of airaline tide after meals in uric acid stone formcrs. Uralyt-U and sodium acid citrate were used to alkalinize the urine. The dose of uralyt-U was so adjusted that the urine pH was maintained between 6.2 to 6.7. The dissociation curve of uric acid is such that little is achieved by increasing pH of urine more than 7.0. Rather high p11 increases risk of apatite deposition on existing uric acid stone and that may render the chemolytic therapy difficult[8]. Potassium citrate (uralyt-U) is better than sodium citrate as no patient on uralyt-U developed recurrence while three patients on sodium acid citrate had recurrence of stone formation. Uralyt-U forms potassium urate in the urine which is more soluble than sodium urate[9]. Moreover potassium salts of citrate cause hypocalciuria and thus prevent epitactic phenomenon[10]. Sixty-three (58.9%) stones dissolved over a period of 6 months while 93 (86.9%) by one year. But the stone may pass down the ureter after it has become smaller in size with therapy and patient may experience renal colic. In this study 11(16.5%) patients experienced renal colic and 1 (1.5%) patient having solitary kidney developed calculus anuria.

Even with ESWL the modern noninvasive modality for stone crushing the incidence of renal colic is 33%. Stone dissolution is a slow process but it is safe and can be used even in seriously ill or high risk patients. Ten staghorn stones dissolved without any morbidity which would have otherwise required surgery, percutaneous nephroli thotomy or extracorporcal shockwave lithotripsy. With ESWL the incidence of retreatment and use of auxiliary procedure for staghorn stone is high[11] and they take long time to clear[12]. Eighty (7.5%) stones were removed surgically or treated with ESWL. Stone analysis in these patients showed that they were mixed stones containing uric acid and calcium oxalate. Therefore, it is inferred that chemolytic therapy is effective when the target stone is composed of pure uric acid. Five (7.5%) patients developed new stone after dissolution of their existing stone over a period of 3 years follow-up. Two patients stopped the drugs on their own once they were free from existing stone while 3 patients were still using sodium acid citrate. Therefore, the medical therapy has the advantage over ESWL, PCNL and surgery which only treat the existing stone and have no effect on their recurrence.

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