Spontaneous dissolution of a guaifenesin stone

Thai T. Nguyen, MD, Bernard Fallon, MD, Howard N. Winfield, MD

Department of Urology, University of Iowa, Iowa City, IA, USA

NGUYEN TT, FALLON B, WINFIELD HN. Spontaneous dissolution of a guaifenesin stone. The Canadian Journal of Urology. 2005;12(4):2769-2771.

Guaifenesin is a commonly used expectorant whose use may lead to the occasional formation of guaifenesin urinary stones. We herein describe a patient who was taking 2400 mg Guaifenesin per day as part of his treatment for asthma. He had a past history of a guaifenesin stone removed ureteroscopically. His current presentation was with a 9 mm by 6 mm stone in the upper left ureter, seen on CT scan, and treated initially with a ureteral stent and hydration. After 3 weeks, the stone had disappeared, as confirmed by repeat CT scan. The genesis and treatment of guaifenesin stones is discussed.

Key Words: urolithiasis, kidney stones, guaifenesin, drug abuse

Introduction

The estimated prevalence of urinary tract stone disease is 2%-3%.[1] The lifetime risk for Caucasian males is about 10%-12%,[2] with a recurrence rate of 50% at 5 years in stone formers.[3] Although the vast majority of stones are composed of calcium, uric acid, struvite, or cystine, urinary calculi have also been demonstrated to be composed of various pharmaceuticals or their metabolites, such as indinavir,[4,5] triamterene,[6] ephedrine[7,8] and guaifenesin.[8,9] Prior reports on guaifenesin stones have described easy fragmentation using shockwave lithotripsy[8]or ureteroscopic intracorporeal holmium laser lithotripsy.[10] One reported case describes dissolution of ephedrine stones by urinary alkalinization.[11] We report on a patient with a suspected guaifenesin ureteral stone that resolved spontaneously without surgical extraction or passage.

Accepted for publication June 2005

Address correspondence to Dr. Howard N. Winfield, University of Iowa, Department of Urology, 200 Hawkins Dr., 3 RCP, Iowa City, IA 52242-1089 USA

Case presentation

A 38-year-old man with a history of nephrolithiasis presented to a local emergency room with left renal colic. Past medical history was significant for asthma and for multiple hospital admissions due to renal colic that would spontaneously resolve with conservative management. KUBs were consistently unremarkable. The patient also underwent one prior ureteroscopic stone extraction, and subsequent stone analysis demonstrated that the stone was composed of guaifenesin metabolites and trace amounts of ephedrine.

With the current presentation, a KUB was again unremarkable, and subsequent stone protocol helical CT scan without contrast demonstrated a 9 mm x 6 mm left proximal ureteral stone. A ureteral stent was placed and the patient was referred to our institution for further treatment and evaluation.

The patient was first evaluated at our institution 3 weeks after his initial presentation to the local emergency room. He denied any flank pain, nausea, fever, gross hematuria, or interval passage of calculi despite straining his urine. A KUB confirmed placement of the ureteral stent but detected no abnormal calcifications. Subsequent CT scan demonstrated normal kidneys bilaterally without nephrolithiasis, ureteral calculi, or bladder calculi.

A thorough history revealed that the patient was self-medicating with a guaifenesin-containing over-the-counter asthma medication. He admitted to taking at least 12 tablets daily on a chronic basis for treatment of his asthma. Also pertinent was the patient's occupation which required working outdoors during warm weather. He admitted to drinking little fluids while on the job.

The patient was instructed to discontinue the guaifenesin and was prescribed an albuterol inhaler for his asthma. Fluid intake was encouraged, especially on warm days at work. On recent follow-up over the telephone, the patient has not experienced any recurrent renal colic or nephrolithiasis since discontinuing the guaifenesin over 2 years ago.

Discussion

Guaifenesin is a commonly used expectorant, available in numerous nonprescription cold, allergy, and asthma remedies. This widespread use may explain guaifenesin's occurrence rate of 35% among stones composed of drug metabolites.[9] In addition, formulations of over-the-counter drugs containing ephedrine may contribute to the prevalence of guaifenesin stones. In 1994, the U.S. Food and Drug Administration restricted the use of pure ephedrine in over-the-counter drugs. Manufacturers subsequently reformulated over-the-counter preparations composed of a mixture of ephedrine (12.5 mg to 25 mg) and guaifenesin (200 mg). Those who used ephedrine for stimulatory effects switched to the new combination formulations, and thus, inadvertently consumed high levels of guaifenesin. Abusers of methamphetamine prepare their product by the conversion of over-the-counter bronchodilators and may also be susceptible to guaifenesin stone formation.

Guaifenesin stones, like indinavir stones, are radiolucent on plain X-ray imaging but are radio-opaque on unenhanced CT. These radiographic properties are similar to those of uric acid calculi and may lead to diagnostic confusion. A detailed medication history including over-the-counter remedies should be obtained on all urinary calculi patients demonstrating these radiologic characteristics.

Previous reports on guaifenesin stones have either described spontaneous passage or surgical management with subsequent collection of fragments for stone analysis. Although a stone was never collected in our patient to confirm that it was composed of guaifenesin metabolites, the radiologic characteristics of the stone, the past history of a guaifenesin stone, and the patient's current abuse of a guaifenesin-containing medication make the presumptive diagnosis likely. It is also unlikely that the patient spontaneously passed a 9 mm x 6 mm stone without being aware of the stone's passage or without catching the stone in the strainer. Placement of the ureteral stent also makes subsequent stone passage unlikely.[12-14]

We hypothesize that the patient's excessive use of guaifenesin and dehydration while at work resulted in the development of a guaifenesin metabolite stone with subsequent ureteral obstruction and development of renal colic. With rehydration, we believe that the stone spontaneously dissolved, obviating the need for further invasive procedures.

Conclusion

Guaifenesin, a widely used expectorant, may cause urolithiasis if taken in excess. This case emphasizes the importance of obtaining a complete medication and social history from patients presenting with urolithiasis. Initial treatment of patients with guaifenesin stones should be conservative, and

hydration and urinary alkalinization may result in dissolution of the stone.[15] Discontinuation of the guaifenesin, and in the case of drug abuse, drug rehabilitation are key to preventing further stone formation. □

References

1. Menon M, Resnick MI. Urinary lithiasis: etiology, diagnosis, and medical management, in *Campbell's Urology, vol. 4, chapter 96, 8th Edition*. Editors:Walsh PC, Retik AB, Vaughan, Jr. ED, Wein AJ. Philadelphia: WB Saunders;2002;3229–3305.
2. Shetty SD, Rivers K, Menon M. A practical approach to the evaluation and treatment of nephrolithiasis. *AUA Updates* 2000; v.19, lesson 30.
3. Sutherland J, Parks J, Coe F. Recurrence after a single renal stone in a community practice. *Mineral Electrolyte Metabolism* 1985;11:267.
4. Gentle DL, Stoller ML, Jarrett TW, Ward JF, Geib KS, Wood AF. Protease inhibitor-induced urolithiasis. *Urology* 1997;50:508-511.
5. Sutherland SE, Reigle MD, Seftel AD, Resnick MI. Protease inhibitors and urolithiasis. *J Urol* 1997;158:31-33.
6. Ettinger B, Oldroyd NO, Sorgel F. Triamterene nephrolithiasis. *JAMA* 1980;244:2443-2446.
7. Blau JJ. Ephedrine nephrolithiasis associated with chronic ephedrine abuse. *J Urol* 1998;160:825.
8. Assimos DG, Langenstroer MD, Leinbach RF, Mandel NS, Stern JM, Holmes RP. Guaifenesin- and ephedrine-induced stones. *J Endourol* 1999;13:665-667.
9. Pickens CL, Milliron AR, Fussner AL, Dversdall BC, Langenstroer P, Ferguson S, et al. Abuse of Guaifenesin-containing medications generates an excess of a carboxylate salt of beta-(2-merthoxyphenoxy)-lactic acid, a guaifenesin metabolite, and results in urolithiasis. *Urology* 1999;54:23-27.
10. Whelan C, Schwartz BF. Bilateral guaifenesin ureteral calculi. *Urology* 2004;63:175x-175xi.
11. Hoffman N, McGee SM, Hulbert JC. Resolution of ephedrine stones with dissolution therapy. *Urology* 2003;61:1035.
12. Ryan PC, Lennon GM, McLean PA, Fitzpatrick JM. The effects of acute and chronic JJ stent placement on upper urinary tract motility and calculus transit. *Br J Urol* 1994;74:434-439.
13. Lennon GM, Thornhill JA, Grainger R, McDermott TE Butler MR. Double pigtail ureteric stent versus percutaneous nephrostomy: effects on stone transit and ureteric motility. *Eur Urol* 1997;31:24-29.
14. Kinn AC, Lykkeskov-Andersen H. Impact on ureteral peristalsis in a stented ureter: an experimental study in the pig. *Urol Res* 2002;30:213-218.
15. Bennett S, Hoffman N, Monga M. Ephedrine- and guaifenesin-induced nephrolithiasis. *J Altern Complement Med* 2004;10(6):967-969.