The Journal of Emergency Medicine, Vol. 47, No. 1, pp. 26–29, 2014

0736-4679/$ - see front matter

ELSEVIER

http://dx.doi.org/10.1016/j.jemermed.2014.01.022

Selected Topics: Toxicology

ACUTE RENAL FAILURE AFTER INGESTION OF GUAIFENESIN AND DEXTROMETHORPHAN

Evan Small, MD, PHD and Benjamin J. Sandefur, MD

Department of Emergency Medicine, Mayo Clinic College of Medicine, Rochester, Minnesota
Reprint Address: Benjamin J. Sandefur, MD, Department of Emergency Medicine, Mayo Clinic, 200 First Street SW, Rochester, MN 55905

☐ **Abstract—Background: Guaifenesin is a common nonprescription medication that has been implicated in drug-induced nephrolithiasis. Dextromethorphan, a nonprescription antitussive found in some guaifenesin-containing preparations, is increasingly recognized as a substance of abuse by many youth and young adults. Renally excreted medications known to have poor solubility in urine have the potential to precipitate when ingested in large quantity, leading to acute obstruction of the ureters and renal failure. Objective: We describe the case of a 22-year-old male who developed severe bilateral flank pain, hematuria, and oliguria after an isolated recreational ingestion of guaifenesin and dextromethorphan. Case Report: The patient was found to have bilateral ureteral obstruction and acute renal failure, suspected to be secondary to precipitation of medication metabolites in the urine. Conclusions: This case highlights the potential for acute renal failure secondary to guaifenesin and dextromethorphan abuse.** © 2014 Elsevier Inc.

☐ **Keywords—guaifenesin; dextromethorphan; ureteral obstruction; renal failure; ureteral calculi/medication induced**

INTRODUCTION

Ureteral stones are frequently encountered in emergency medicine clinical practice. Drug-induced renal stones are believed to comprise approximately 1%–2% of all nephroliths (1). Although uncommon, renally excreted pharmaceuticals with poor solubility in urine have the potential to precipitate in the renal collecting system, resulting in ureteral obstruction and acute renal failure (2–6). Of drug-induced stones reported to date, approximately 35% are thought to be related to guaifenesin, a common nonprescription medication (7). Abuse of nonprescription medications such as dextromethorphan, which is often found in guaifenesin-containing preparations, is known to be increasing among United States (US) youth and young adults (8).

CASE REPORT

A 22-year-old man presented to the emergency department (ED) with flank pain and hematuria. The patient's pain began several hours prior and was sharp in nature and bilateral with radiation to the groin and testicles. There was associated hematuria and dysuria, as well as decreased urination after the onset of pain. He denied fevers, chills, nausea, vomiting, or diarrhea. He had no significant medical history. There was neither personal history nor known family history of kidney stones.

Upon review of systems, the patient reported taking 10 tablets of Mucinex® DM (Reckitt Benckiser, Parsippany, NJ), a nonprescription medication containing guaifenesin and dextromethorphan, 1 day before onset of pain. He stated that he ingested the medication recreationally, to dull the pain of a recent break up with his significant other. The patient denied suicidal ideation, stating that his intent was to "get high." Although the patient had a history of alcohol dependence, he specifically denied prior use of Mucinex® DM, guaifenesin, or

RECEIVED: 3 February 2013; FINAL SUBMISSION RECEIVED: 31 October 2013;
ACCEPTED: 30 January 2014

dextromethorphan-containing medications. He reported that a friend had tried Mucinex® DM once before and had found it to be "a pleasant rush." He endorsed sobriety from alcohol for 2 months, however, he continued to occasionally smoke marijuana. He denied other illicit drug use or abuse of pharmaceutical medications.

In the community ED, the patient was afebrile, with a heart rate of 90 beats/min and a blood pressure of 150/78 mm Hg. He did not appear intoxicated. A bladder scan demonstrated only 15 mL of urine in the bladder. The serum creatinine was found to be elevated at 1.52 mg/dL. A computed tomography (CT) scan of the abdomen and pelvis was performed. This reportedly revealed evidence of bilateral obstructing ureteral stones and stranding along the distal ureters. He was given 1.5 mg lorazepam, 4 mg morphine for pain, and a 1-L bolus of 0.9% normal saline. He was transferred to a tertiary care center for further management.

Upon arrival to the referral facility, the patient reported ongoing bilateral flank pain, which he rated as a 5 on a 10-point pain scale. He was afebrile with a temperature of 36.7°C (98.1°F). The blood pressure fluctuated between 146/82 and 206/99 mm Hg, and the heart rate was 85 beats/min. He was tachypneic with a respiratory rate of 20 breaths/min, and the oxygen saturation was 96%–98% on room air. Lungs were clear to auscultation bilaterally. His cardiac examination revealed a regular rate and rhythm, without murmurs, rubs, or gallops. The abdomen was soft and nondistended, with mild tenderness to palpation in bilateral lower abdominal quadrants. He endorsed mild bilateral costovertebral angle tenderness. Genitourinary examination revealed descended nontender testicles bilaterally and no evidence of inguinal hernias.

Repeat serum chemistries and a complete blood count were obtained. The serum creatinine was found to be 2.5 mg/dL, indicating progressive kidney injury. The white blood cell count was elevated at 21.1×10^9 cells/L. The urine was grossly bloody in appearance. The urine Gram stain was negative, and microscopy revealed >100 erythrocytes and >100 leukocytes. Urine toxicology was not obtained. A serum sample was negative for acetaminophen and salicylates. He was given 4 mg i.v. ondansetron and a 1 L bolus of 0.9% normal saline. He was offered 1 mg of i.v. hydromorphone for pain; however, he refused further analgesia.

As the CT images obtained at the referring facility were not available, a repeat CT of the abdomen and pelvis without contrast was performed. This demonstrated hyperdense material (10.7 Hounsfield units) present within the distal aspects of both ureters occupying 3 to 4 cm segments proximal to the ureterovesical junction (Figure 1). The radiographic differential diagnosis was noted to include fragmented stone material or clotted blood. The material was not the expected density of calcium-containing stones, and there was no stone-like mass in the ureters or kidneys. There was marked bilateral hydroureteronephrosis, perinephric edema, and fluid, consistent with acute obstruction (Figure 2).

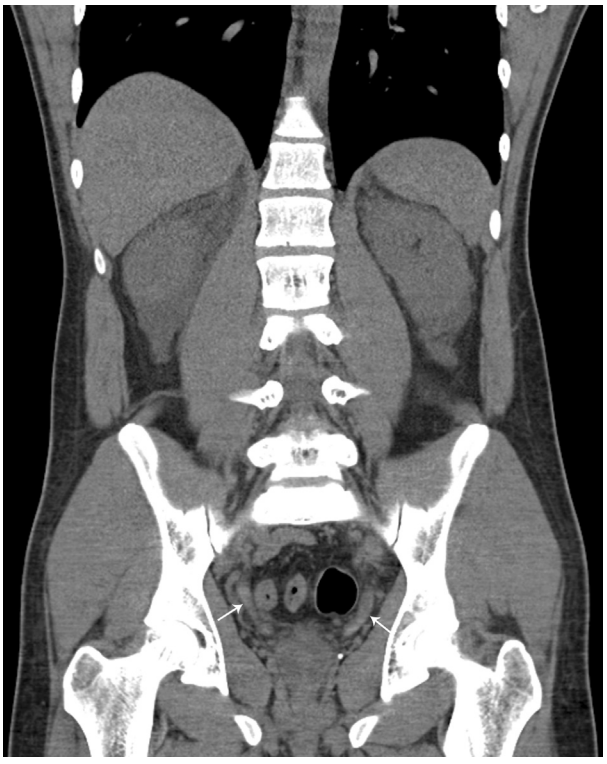

Figure 1. Computed tomography scan of the abdomen and pelvis without i.v. contrast demonstrating hyperdense material in the distal aspects of both ureters (denoted by arrows).

A urology consultation was obtained, and antibiotic administration was recommended. The patient was taken to the operating room for emergent cystoscopy, bilateral retrograde pyelograms, and decompression of the bilateral collecting systems with stent placement. During the procedure, rigid cystourethroscopy revealed debris of unknown etiology within the bladder. Retrograde pyelograms revealed filling defects in the distal ureters bilaterally with moderate proximal hydroureteronephrosis. Further debris was noted in the distal collecting system bilaterally. No filling defects were observed in the upper tracts of the collecting systems. Bilateral ureteral stents were placed into the renal pelvises under fluoroscopy. The patient was admitted to the hospital in stable condition.

Specimens of the debris from the ureteral and bladder aspirates were sent for laboratory analysis. The debris was analyzed by Fourier transform infrared spectroscopy, compared with a library of stone metabolites, and was found to contain predominantly guaifenesin metabolites. Although it is possible that other compounds were present in the sample, they comprised <10% of the sample.