Cardiac Infection and Sepsis in 3 Intravenous Bath Salts Drug Users

Patrick Belton,1 Tenzing Sharngoe,2 F. Michael Maguire,3 and Mark Polhemus1,4
1College of Medicine and 2Division of Infectious Diseases, Department of Medicine, Upstate Medical University, 3Critical Care Associates of Syracuse, Department of Medicine, Crouse Hospital, and 4Infectious Diseases, Syracuse VA Medical Center, New York

The street drug “bath salts” are psychoactive mixtures of cathinone derivatives. We report 3 cases of disseminated Staphylococcus aureus infection with cardiac involvement (2 endocarditis and 1 pericarditis), secondary to intravenous bath salts use.

Keywords. bath salts; endocarditis; S. aureus; pericarditis; MRSA.

“Bath salts” are psychoactive mixtures composed of cathinone derivatives, primarily 3,4-methylenedioxypyrovalerone, 4-methylmethcathinone (methamphetamine), or 3,4-methylenedioxy-N-methylcathinone (methylone) [1–3]. These substances display monoamine uptake inhibition, including of dopamine and norepinephrine, and cause release of 5-HT and dopamine [4]. Users consume these substances for effects similar to methamphetamines, cocaine, and 3,4-methylenedioxy-N-methylamphetamine (“ecstasy”), and the prominent toxicologic symptoms can vary based on the relative composition of ingredients [5]. Routes of consumption include insufflation, ingestion, smoking, and injection [5]. Cathinone derivatives may have acquired the street name “bath salts” as a result of customs manifests used for importation, which took advantage of their visual resemblance to Epsom salts to evade further inspection [6]. The mixtures were initially sold out of retail stores and over the Internet, labeled as “not for human consumption” to circumvent drug control laws [2]. Injection use of bath salts appears to be an emerging phenomenon, with earliest reports of injection use originating out of Europe [7], and more recent reports from Virginia [2] and Louisiana [8]. Injection use presents additional potential for complications, including infections and systemic circulation of drug adulterants.

Bath salts use first came to the attention of the medical field because of their alarming toxicologic presentation. Emergency clinicians described a strongly sympathomimetic syndrome with accompanying agitation, tremors, and psychosis [1, 2]. The acute intoxication syndrome has been characterized as a serotonin syndrome, with tachycardia, hypertension, and hyperthermia, progressing to rhabdomyolysis and renal failure [2, 9]. Increasing attention has been paid to the sequelae of longer-term bath salts use, including addictive potential [10]. Subsequent infections resulting from injection of bath salts have included complicated cellulitis at the injection site [7] as well as necrotizing fasciitis [8].

We report on a series of disseminated Staphylococcus aureus infections with cardiac involvement, associated with intravenous bath salts use, presenting over a 3-week period in 2 central New York tertiary care hospitals. Two of the cases involved echocardiogram-documented endocarditis and the third case involved electrocardiogram (ECG)/echocardiogram-documented pericarditis. All 3 patients had cavitary lung lesions and 1 also had septic joint lesions. To our knowledge, these are first reported cases of cardiac infections associated with the use of intravenous bath salts.

CASE REPORTS

Patient 1
Patient 1, a 34-year-old woman, presented to a community hospital emergency department with complaints of severe weakness, dyspnea, and right lower extremity pain for 1 week. She had been to the same emergency department 3 days prior with the same complaints and was treated for musculoskeletal pain and discharged with crutches. She had been injecting bath salts for approximately 1 month. In the emergency department, the patient was found to have hemoptysis. Chest radiography showed a left pleural effusion. Chest computed tomography showed septic pulmonary emboli and cavitations. Blood samples showed anemia, thrombocytopenia, hypotremia, and other electrolyte disturbances. She was transferred to
a tertiary care center the following day for care of severe sepsis. On admission to the tertiary care center, the patient was febrile and tachycardic. Transesophageal echocardiography (TEE) showed 2 vegetations on the anterior leaflet of the tricuspid valve, the larger measuring 2.0 × 1.8 cm. Blood cultures remained positive for methicillin-sensitive *Staphylococcus aureus* for 1 week after admission despite appropriate antibiotic therapy. The hospital stay was complicated by respiratory failure requiring mechanical ventilation (19 days), pneumonia, urinary tract infection, deep vein thrombosis, and empyema with pneumothorax. After several weeks of antibiotic therapy, repeat TEE showed a resolution of vegetations on the tricuspid valve. The patient was discharged after 55 days in the hospital.

**Patient 2**

Patient 2, a 39-year-old man and former boyfriend of patient 1, presented with complaints of weakness to the same community emergency department. He had been injecting bath salts with patient 1. He began smoking bath salts approximately 6 months prior and had started injecting bath salts 2 months prior. He had constitutional symptoms for “weeks” and reported nausea, vomiting, and a productive cough. Chest computed tomography showed bilateral “masslike” lung opacities and a possible bronchopleural fistula. He was transferred to a tertiary care center 2 days later. On admission, he was febrile, tachycardic, hyponatremic, and thrombocytopenic, with evidence of disseminated intravascular coagulation. Liver function tests were elevated. Despite the seriousness of his clinical condition, the patient was alert, orientated, and in no obvious distress. TEE revealed multiple vegetations on the tricuspid leaflets, the largest 2.5 cm × 1.5 cm and likely perforating the leaflet. Cultures of blood, urine, and a lung aspirate were all positive for methicillin-resistant *S. aureus* (MRSA). His hospital stay was complicated by ileus, loculated pleural effusion and empyema, pericardial effusion, and anemia. He was discharged after 42 days in the medical center.

**Patient 3**

Patient 3, a 38-year-old woman, with no relationship to either patient 1 or 2, presented to her community hospital emergency department with a 2-week history of joint pain and body ache. She had been injecting bath salts for approximately 1 month. She was found to have pericarditis by ECG and cavitary lung lesions, and blood cultures and sputum grew MRSA. She was transferred to a tertiary care center for infectious disease consultation. On admission, she was tachycardic and leukocytotic. Pericardial effusion was seen on TEE. Painful joint swelling occurred at both small and large joints, and synovial fluid grew MRSA. After intravenous antibiotic treatment, repeat ECG showed resolution of the ST segment changes seen on initial presentation. The patient left against medical advice after 15 days in the tertiary care center.

**Drug Use Profiles**

All 3 patients had long histories of drug abuse. However, patients 1 and 2 reported that bath salts were the first intravenous drugs they had used; patient 3 reported previous injection drug use with discontinuation 5 years prior. Notable risks that emerged in their accounts were very high numbers of injections, averaging 40–60 and up to 100 times per day (patients 1 and 2) and a drug that did not require heating to dissolve, nor use of a cotton ball to filter debris (patient 2). Patient 2 also reported that he purchased the drug in a plastic tube containing approximately 40 doses (consistent with other reports [10]) and from which up to 6 individuals would draw doses once the drug was dissolved in water. All 3 patients injected the drug in a group (6 people for patients 1 and 2, 10 people for patient 3). All 3 patients increased their use of the drug after becoming ill and only reported to care once this use could no longer compensate for their illness. Patient 3 reported that one other member of her group had developed an infection requiring partial leg amputation.

**DISCUSSION**

Endocarditis and cardiac infection has a known association with intravenous drug use. However, estimates have been that, among intravenous drug users, there is an average of 1.5–20 cases of endocarditis per 1000 person-years [11]. Bacterial pericarditis is even more rare in the group [12]. There are <10 other cases of MRSA pericarditis in the literature [12, 13]. We are alarmed to see these 3 cases in such short time, concurrent with the large number of bath salts reports to poison control centers [14].

All 3 of these cases featured a rather dramatic presentation of bacteremia, cardiac infection, and cavitary lung lesions. Patient 3’s combination of cavitary lung lesions with pericarditis, either from direct extension or hematologic seeding, is particularly unusual. While there are scattered reports of non-mycobacterial infectious lung lesions together with bacterial pericarditis in recent years, these generally are from highly immunocompromised individuals [15, 16].

If our experience with intravenous bath salts–associated cardiac infection is repeated in other case reports and registries, then it may indicate that bath salts carry a particularly high risk of cardiac infection and sepsis. Based on experience with other intravenous drugs, possible reasons for heightened endocarditis risk could be [11]:

1. Direct cardiac toxicity or vasoactive properties, somewhat comparable in bath salts to other stimulants [16].
2. Adulterant toxicity and/or deposition of adulterant on the cardiac valves.
3. Infectious material from the drug mixture, concurrent with reduced septic precautions due to high solubility in water, comparable in bath salts to pentazocine/tripelennamine use patterns.
4. Very frequent injections (up to 100/day), comparable to cocaine use patterns.

To these previously recognized issues common with other drugs, we add that bath salts are used out of shared depots.

At a minimum, we believe that practitioners seeing cases of sepsis and endocarditis in intravenous drug users should inquire about bath salts use. Contrary to the sympathomimetic presentation of acute toxication, a weak and dyspneic intravenous bath salts user should carry with them a high index of suspicion for infection and sepsis. To date, there has been relatively little study of these drugs in the laboratory setting [17], and cardiac interactions of the cathinone derivatives may be a ripe topic for further study.

Notes

Acknowledgments. We thank the staff members of Upstate University Hospital and Crouse Hospital for their help in gathering the data presented. P. B. thanks Upstate Medical University’s Department of Internal Medicine for allowing him to participate in its Clinical Experience Elective.

Potential conflicts of interest. All authors: No reported conflicts.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

References