

Tetanus: A Rare Complication of Black Tar Heroin Use

Elisa M. Pichlinski,^{1,2} Emily Hoff,^{1,2} Lindsey Claire Epperson,^{1,3} Elizabeth Morley,⁴ James Dazhe Cao,³ Joby Thoppil,⁴ Steven Field,⁴ Prayag Mehta,⁴ Daniel Good,^{1,4} and Ank E. Nijhawan^{1,5}

¹Parkland Health and Hospital Systems, Dallas, Texas, USA, ²Department of Internal Medicine, University of Texas Southwestern Medical Center, Dallas, Texas, USA, ³Department of Emergency Medicine, Division of Medical Toxicology, University of Texas Southwestern Medical Center, Dallas, Texas, USA, ⁴Department of Emergency Medicine, University of Texas Southwestern Medical Center, Dallas, Texas, USA, ⁵Department of Internal Medicine, Division of Infectious Disease and Geographic Medicine, University of Texas Southwestern Medical Center, Dallas, Texas, USA

Tetanus is associated with high morbidity and mortality, although this is rarely encountered in high-income countries. We present a case of tetanus in an unvaccinated patient secondary to black tar heroin use that highlights the importance of considering tetanus in appropriate clinical contexts, harm reduction interventions, and universal tetanus vaccination campaigns.

Keywords. case report; heroin; immunization; substance use; tetanus.

Tetanus is a disease first described in ancient texts and is contracted through exposure to *Clostridium tetani* spores in soil and animal excrement. Although tetanus is rare, identification and early aggressive treatment of generalized tetanus is paramount because mortality reaches 28%, usually secondary to autonomic instability and respiratory compromise [1]. Ubiquitous childhood vaccinations have almost eliminated tetanus in the United States; an average of 29 cases are reported annually [2]. However, specific populations are at higher risk for acquiring tetanus, including the undervaccinated, elderly, foreign-born, and people who inject drugs (PWID) [2–4]. We present a case of an unvaccinated, foreign-born male who presented to the emergency department (ED) with chest pain and was diagnosed with generalized tetanus secondary to intramuscular black tar heroin (BTH) use.

PATIENT CONSENT STATEMENT

The patient's written consent was obtained.

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Correspondence: Lindsey Claire Epperson, DO, Division of Medical Toxicology, Parkland Hospital: Parkland Health and Hospital System, 5201 Harry Hines Blvd, Dallas, TX 75235 (lindseyepperson@gmail.com).

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STUDY DESIGN

The design of the work conforms to standards currently applied in the United States. The authorizing body is Parkland Health and Hospital System.

CLINICAL PRESENTATION

A 38-year-old male with a history of heroin dependence and drug-induced psychosis presented to the ED for 1 day of worsening, pressure-like chest pain that radiated to his back. On physical examination, he appeared tachypneic, diaphoretic, and uncomfortable. Computerized tomography of the aorta was negative for pathology including dissection. He was administered 50 µg of fentanyl and discharged from the ED. Twelve hours later he returned for worsening back and chest pain, muscle spasms, and trismus. He was tachycardic at 104 beats per minute (bpm) and diaphoretic with thoracolumbar spinal tenderness. He had brisk bilateral upper extremity reflexes, increased muscular tone, and no clonus. Upon further history, he disclosed recent intramuscular BTH use 15 hours before his initial presentation. Subsequent magnetic resonance imaging was negative for spinal epidural abscess as the source of back pain. His episodic spasms progressed to neck stiffening and jaw clenching with limited ability to open his mouth. Intravenous diphenhydramine was administered for possible dystonia without effect. The spasms intensified to platysma contractions, risus sardonicus (Image 1), opisthotonos, and generalized rigidity. During these episodes he remained alert and oriented with worsening diaphoresis, tachypnea, and tachycardia up to 140–160 bpm. Episodes were triggered by minor stimulation from noise, light, or touch. He had bilateral skin abscesses on the shoulders and multiple track mark scars. When questioned, he reported a 5-year history of daily BTH use—initially via insufflation, then via intravenous injection, and most recently via intramuscular injection. He denied sharing needles but re-used his own needles after cleaning them with alcohol. He was never vaccinated in Mexico nor immunized after moving to the United States.

DIFFERENTIAL DIAGNOSIS

The combination of risus sardonicus, opisthotonos, and diffuse stimuli-induced spasms is clinically consistent with tetanus, although multiple other etiologies were considered. His initial ED presentations were concerning for aortic dissection and spinal epidural abscess; however, imaging ruled these out. Strychnine poisoning can present as a mimic of tetanus and has been reported as a contaminant in heroin [5]. Although their pathophysiologic mechanisms are different (strychnine inhibits

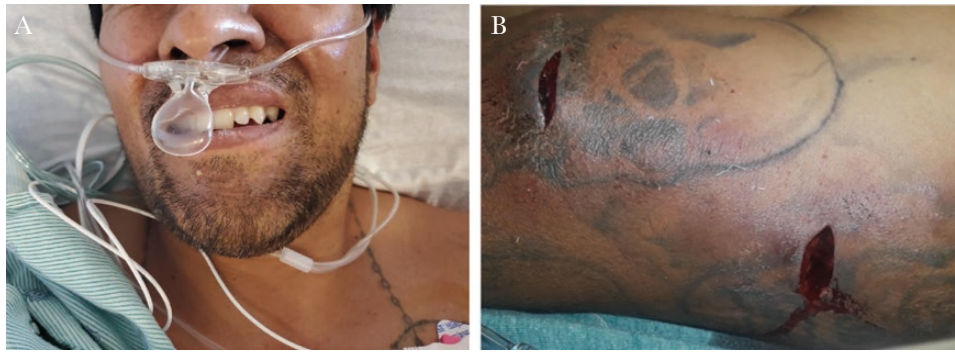


Image 1. (A) Risus sardonicus: a fixed grimace with drawing up of the corners of the mouth due to facial muscle and masseter spasms. Spasms progressed to neck and trunk rigidity with arching of the back (opisthotonos). The facial grimacing and jaw clenching were initially attributed to dystonic reaction from risperidone. Patient had difficulty handling oral secretions as the duration and frequency of facial spasms increased, prompting early nasotracheal intubation followed by continuous sedation and neuromuscular paralysis. (B) Shoulder abscesses after incision drainage: the patient had multiple bilateral skin abscesses on the shoulders due to local intramuscular injections of black tar heroin. Tetanus toxin production at infection sites was reduced with incision and drainage, proper wound care, and administration of appropriate antibiotic treatment. Human tetanus immune globulin was administered, with a single dose of 500 units administered intramuscularly, with part of the dose infiltrated around the wounds, and the rest administered in the thigh.

postsynaptic glycine binding, whereas tetanus prevents presynaptic GABA and glycine release), they share a similar clinical presentation. Both are associated with involuntary, painful skeletal muscle spasms from minor physical or auditory stimuli, and both can present with opisthotonos, risus sardonicus, and autonomic instability. Unlike tetanus, which takes days to weeks to manifest, symptoms of strychnine toxicity can occur within 20 minutes of poisoning. Our patient's urine tested negative for strychnine. His rigidity, autonomic instability, and diaphoresis in the setting of prescribed risperidone presented the possibility of neuroleptic malignant syndrome, but he denied recently taking risperidone and lacked altered mentation, bradyreflexia, and lead-pipe rigidity. Alternative but less likely etiologies included the following: serotonin syndrome (no clonus, hyperthermia, gastrointestinal symptoms, or history of causative agent), acute dystonic reaction (did not resolve with diphenhydramine, nor would it explain the autonomic dysregulation and opisthotonos), hypocalcemic tetany (ionized calcium was normal), and orofacial infection (would not explain diffuse muscle spasms).

MANAGEMENT

While in the ED, his bilateral shoulder abscesses were incised and drained. Vancomycin, ceftriaxone, and metronidazole were initiated. Five hundred units of human tetanus immune globulin (HTIG) was administered intramuscularly, with a portion of the dose infiltrated around the wounds and the rest administered in the thigh. He received fluid resuscitation, a dose of diphenhydramine, and as-needed benzodiazepines for muscle spasms. He was admitted to a general medicine team. Thirty-six hours later, the diffuse spasms increased in frequency and severity. He was transferred to the intensive care unit (ICU) and nasally intubated for airway protection. He received 7 days of metronidazole for tetanus treatment [6]. His ICU course was notable for episodic autonomic instability involving hyperthermia, alternating hypertension (200s/120s), and hypotension requiring vasopressors, and bursts of tachycardia to 160 bpm. He was paralyzed with cisatracurium for approximately 30 days, with daily paralytic holidays to reassess the presence of tetany. He underwent tracheostomy on day 12 of admission (Figure 1). Once the

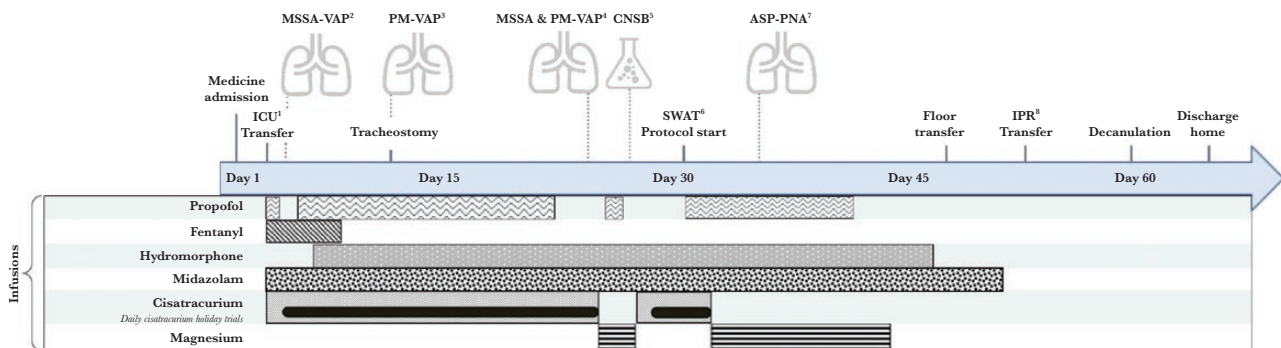


Figure 1. Clinical course timeline. ¹Intensive care unit (ICU), ²methicillin-sensitive *Staphylococcus aureus* (MSSA) ventilator-associated pneumonia (VAP), ³*Proteus mirabilis* (PM) VAP, ⁴MSSA and PM VAP, ⁵coagulase-negative staphylococcal bacteremia (CNSB), ⁶slow wean after tracheostomy (SWAT), ⁷aspiration pneumonia (ASP), ⁸inpatient rehabilitation (IPR).

paralytic was weaned, a high-dose magnesium infusion was used to prevent recurrent spasms. His course was complicated by multiple secondary infections (Figure 1) and new systolic heart failure with a left ventricular ejection fraction of 40%. He was progressively weaned off sedation and ventilator support, then discharged to inpatient rehabilitation on day 55. After another week, tracheostomy was decannulated and he was deemed independent for most activities of daily living, then discharged home with a first dose of tetanus vaccine, a buprenorphine prescription, and a follow-up appointment with addiction psychiatry.

DISCUSSION

This case demonstrates how the perfect storm of injection drug use and lack of vaccinations lead to generalized tetanus, a highly preventable disease rarely seen in high-income countries due to widespread vaccination. Although our patient ultimately recovered, he experienced a prolonged hospitalization and rehabilitation course. In addition to ensuing economic and financial implications for patients from long-term health effects, lengthy hospitalizations with extended ICU stays portend a large cost burden to the healthcare system, especially amid a global pandemic. We highlight the importance of considering tetanus in an initial differential, discuss the unique toxicologic and infectious exposures associated with BTH use, and advocate for implementation of preventative measures for patients at risk of tetanus.

The classic presentation of tetanus is well known; however, the onset and clinical progression are variable, depending on total body toxin load. Early tetanus presentations can potentially lead emergency providers down other roads of emergent must-not-miss diagnoses. For PWID who present to the ED, serious infectious complications from injection practice such as skin and soft tissue infections (SSTIs), necrotizing fasciitis, infective endocarditis, and epidural abscesses are often encountered. Most of these infections are caused by introduction of skin flora, and rarer complications from *Clostridium* sp such as botulism or tetanus might not initially come to mind. Although tetanus is rare, it is associated with high morbidity and mortality. Diagnosis and appropriate prophylaxis must be considered in at-risk ED patients such as PWID, elderly patients, and those with uncertain vaccination status.

The use of intramuscular BTH uniquely predisposed our patient to tetanus. The heroin market in the United States largely comprises white powder heroin (WPH) from Colombia and BTH from Mexico. The WPH is more commonly found on the East Coast, whereas BTH is more commonly found in the western United States [7]. The associated infectious risks follow similar geographic allocations: rates of human immunodeficiency virus (HIV) transmission are higher in the eastern United States where use of WPH predominates. The gummy texture of BTH obstructs syringe barrels and necessitates frequent

irrigation, which is associated with less transmission of HIV but higher rates of SSTIs secondary to nonsterile water irrigation [8]. The resinous impurities of BTH cause venous sclerosis and scarring, leading PWID to transition from intravenous to intramuscular routes of injection, which subsequently facilitates anaerobic bacterial growth for *Clostridium* sp-contaminated wounds [5].

Although it is difficult to treat and frequently fatal, generalized tetanus is easily avoidable. Prevention strategies such as needle exchange programs (NEPs), medication-assisted treatment for opiate and opioid use disorders, and tetanus immunization are key. Needle sharing and other injection behaviors are associated with SSTIs [8]. The NEPs help decrease rates of SSTIs by decreasing high-risk practices and providing sterile injection supplies. It is important to note that *C tetani* is resistant to alcohol based cleaner. Because of *C tetani* spores' resilience and heroin contamination, NEP alone will not prevent all cases of tetanus, thus prevention efforts should also focus on scrutinizing immunization history, appropriately administering HTIG and tetanus vaccines, and addressing addiction with medications for opioid use disorder (MOUD). Buprenorphine initiation in the ED has been successfully implemented in multiple settings and decreases mortality, reduces healthcare utilization, and improves patient quality of life [9]. Ideally, vaccination takes place during routine health maintenance visits, but PWID might not have access to primary care due to social determinants of health, and they might delay seeking care due to stigma surrounding substance use [10–12]. Our case illustrates the crucial importance of expanding tetanus vaccination to PWID at any healthcare visit, including the ED.

CONCLUSIONS

We present a unique case of generalized tetanus in an unvaccinated, foreign-born male with a history of intramuscular drug use. We recommend including tetanus and botulism in the differential for patients with wound infections secondary to drug use, particularly BTH, and implementation of widespread vaccination campaigns in the ED for at-risk populations along with harm reduction and MOUD for addiction treatment.

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References

1. Ataro P, Mushatt D, Ahsan S. Tetanus: a review. *South Med J* 2011; 104:613–7.
2. Liang JL, Tiwari T, Moro P, et al. Prevention of pertussis, tetanus, and diphtheria with vaccines in the United States: recommendations of the advisory

- committee on immunization practices (ACIP). *MMWR Recomm Rep* **2018**; 67:1–44.
3. Finkelstein P, Teisch L, Allen CJ, Ruiz G. Tetanus: a potential public health threat in times of disaster. *Prehosp Disaster Med* **2017**; 32:339–42.
 4. Lu PJ, Rodriguez-Lainz A, O'Halloran A, et al. Adult vaccination disparities among foreign-born populations in the U.S., 2012. *Am J Prev Med* **2014**; 47:722–33.
 5. Cole C, Jones L, McVeigh J, et al. Adulterants in illicit drugs: a review of empirical evidence. *Drug Test Anal* **2011**; 3:89–96.
 6. Rodrigo C, Fernando D, Rajapakse S. Pharmacological management of tetanus: an evidence-based review. *Crit Care* **2014**; 18:217.
 7. Ciccarone D, Bourgois P. Explaining the geographical variation of HIV among injection drug users in the United States. *Subst Use Misuse* **2003**; 38:2049–63.
 8. Dahlman D, Håkansson A, Kral AH, et al. Behavioral characteristics and injection practices associated with skin and soft tissue infections among people who inject drugs: a community-based observational study. *Subst Abus* **2017**; 38:105–12.
 9. Jaeger S, Jr, Fuehrlein B. Buprenorphine initiation to treat opioid use disorder in emergency rooms. *J Neurol Sci* **2020**; 411:116716.
 10. Harris RE, Richardson J, Frasso R, Anderson ED. Experiences with skin and soft tissue infections among people who inject drugs in Philadelphia: a qualitative study. *Drug Alcohol Depend* **2018**; 187:8–12.
 11. Whittaker E, Swift W, Roxburgh A, et al. Multiply disadvantaged: health and service utilisation factors faced by homeless injecting drug consumers in Australia. *Drug Alcohol Rev* **2015**; 34:379–87.
 12. Paquette CE, Syvertsen JL, Pollini RA. Stigma at every turn: health services experiences among people who inject drugs. *Int J Drug Policy* **2018**; 57:104–10.