



The Toxic NOSE (Novel Opioid and Stimulant Exposure)

Report #6 from Toxic’s Rapid Response Program for Emerging Drugs of Abuse

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Wound Botulism: A Rare, Difficult, and Deadly Diagnosis Associated with Injection Drug Use

Introduction

Botulism is a rare but serious neurologic illness caused by botulinum neurotoxin (BoNT) from the bacterium species *Clostridium botulinum*. Six forms of clinical botulism exist, including infantile, adult, wound associated, food borne, inhalational, and iatrogenic (e.g., secondary to botulinum toxin injected for cosmetic or medical reasons). Wound botulism was originally associated with traumatic injuries,¹ but over the last several decades is most frequently seen as a complication of injection drug use (IDU), particularly with black tar heroin.² It is unclear how *Clostridium botulinum* gets into black tar heroin, but since the germ lives in soil it could occur during the process

The Toxic Novel Opioid and Stimulant Exposures (NOSE) Reports

As a project of the Opioid Response Network (ORN), the American College of Medical Toxicology (ACMT) Toxicology Investigators Consortium (Toxic) is using the enhanced sentinel detector field to identify and report on novel and emerging opioid and stimulant exposures reported in Toxic every quarter over a 2-year period.

The goal of this project is to disseminate this novel information to the medical toxicology community as well as the ORN as part of a Rapid Response program.

of production, transportation, through cross-contamination, addition of fillers, or during its preparation for use.

When black tar heroin is injected under the skin, a practice called skin popping, the botulinum spores produce BoNT locally. These toxins thrive in the anerobic environment of the wound and attack the nervous system. More specifically, BoNT binds presynaptically to peripheral neurons, preventing the release of acetylcholine (ACh) via interference with SNARE proteins responsible for ACh exocytosis into the nerve terminal.³ This causes a progressive descending paralysis. Patients develop a flaccid paralysis, often starting with bulbar symptoms (blurry vision, diplopia, dysphagia, fixed dilated pupil, ptosis) followed by symmetric limb weakness and reduced reflexes. Initial gastrointestinal symptoms including nausea and vomiting often present in foodborne botulism are typically absent in wound botulism. Untreated, botulism can cause respiratory failure secondary to paralysis, and ultimately lead to death. Patients with botulism often have a prolonged hospital course that can result in significant morbidity, particularly when treatment is delayed.^{2,3}

Toxic Case

A 29-year-old female presented to the Emergency Department complaining of new weakness for the prior 3 days. Specifically, she noted trouble lifting her purse straps over her shoulder and difficulty swallowing. On further questioning, she reported double vision prior to the onset of weakness. The patient had a long history of IDU, and injected fentanyl and methamphetamine into her neck on a regular basis. She was admitted to the hospital, but her symptoms were initially attributed to intoxication and illicit drug use. Her respiratory status worsened, and she was intubated. She was initially diagnosed with pneumonia and given antibiotics without improvement. The patient received an extensive work up including lumbar puncture and bronchoscopy, and was treated with intravenous immunoglobulin (IVIG), prednisone and pyridostigmine for possible myasthenia gravis, an autoimmune cause of muscular weakness. An attempt was made to extubate her which failed, and she was intubated again 48 hours later. She

was transferred to a tertiary care intensive care unit (ICU) where she could receive a neurology and medical toxicology consultation.

On exam, her upper extremities were weaker than her lower extremities, and her proximal muscle groups were more significantly affected. Among the possible differential diagnoses with proximal muscle weakness, a presumptive diagnosis of wound botulism was made. Botulinum antitoxin was obtained in conjunction with assistance from public health authorities, however due to the significant delay, her respiratory function did not improve significantly. She required a tracheostomy and had a lengthy hospitalization after which she was transferred to a Rehabilitation facility for further care. Subsequent neuromuscular testing with an electromyography (EMG) was consistent with botulism.

Discussion

In the United States, wound botulism is most associated with black tar heroin injection, though reports of botulism after methamphetamine and other stimulant use are reported.⁴ Though no further wound botulism cases were found in ToxIC Registry, the CDC estimates that 20 cases of wound botulism are diagnosed in the US each year.⁵ Most cases are associated with skin popping. The diagnosis of wound botulism can be particularly challenging, as it is a rare disease that requires a high degree of suspicion. Alternative diagnoses with similar descending weakness should be considered, such as Lambert-Eaton Myasthenic Syndrome or Miller-Fisher Syndrome. Research shows that in the case of wound botulism from IDU, bulbar symptoms including double vision, blurry vision, difficulty swallowing, and voice changes are common presenting complaints.² Patients often report a history of heroin use, skin popping, and frequently have a visible wound when they present to health care.⁶ Early diagnosis is key as the treatment, botulinum antitoxin, only neutralizes BoNT that remains unbound to nerve terminals. Clinical outcomes are linked to timely initiation of treatment, with a reduction of ICU length of stay and a decreased incidence and duration of mechanical ventilation by early administration of botulinum antitoxin.^{2,7} Serum testing for botulism is not routinely available and was not reported in our case. In addition, serum testing may not be sensitive.

Unfortunately, confirmatory testing with neuromuscular studies is not immediately available. Empiric treatment with antitoxin is often required when the diagnosis is suspected. Prompt wound management to remove the source of BoNT is also imperative. Contact with local public health organizations, followed by the CDC, is required for confirmatory testing and to obtain botulinum antitoxin, further underscoring the importance of prompt clinical recognition of this disease.

Conclusion

Wound botulism is a rare but serious illness that can occur in patients who inject drugs, such as black tar heroin. The diagnosis can be challenging, and prompt recognition and treatment is key to ensuring the best possible clinical outcome. Botulism should remain on the differential diagnosis of patients with a history of IDU who present with complaints of bulbar palsies or weakness.

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About the *Opioid Response Network (ORN)*:

ORN provides free, localized training and education for states, communities, organizations and individuals in the prevention, treatment and recovery of opioid use disorders and stimulant use. Learn more and submit a request at www.OpioidResponseNetwork.org.



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