Muriatic acid ingestion complicated by penetrating head injury: A case report and literature review

Dear Editor,

Suicide remains one of the most common causes of preventable death in the United States, ranking number ten in the leading causes of death for all ages in 2010. Complex suicides are extremely uncommon.

We present a rare case of a 44-year-old male who presented to our emergency department after attempting suicide via the combination of acid ingestion and nail gunshots to the head. When reviewing reported cases of penetrating brain injuries caused by nail guns, survival upon complete penetration of the intracranial cavity is very uncommon. As of 2012, only ten such reports appear to have been published. Acid ingestion appears to be far more common, especially among younger populations. However, one cannot mistake frequency for a benign course. Acid ingestion can cause often fatal damage to the esophagus and upper gastrointestinal (GI) tract. When you combine the patient’s survival post intracranial injury with caustic acid ingestion, this patient’s survival is an exception.

This case presents the extraordinary survival of a patient who suffered a combination of acid ingestion and nail gunshots to the head.

This 44-year-old male arrived to the trauma bay after he was found by his wife with altered mental status. He was reported to have ingested a large amount of muriatic acid and fired two nails into his head with a nail gun. On arrival, his initial Glasgow Coma scale was 10 which quickly improved to 15.

The patient was resuscitated and stabilized. Neurologic examination revealed intact sensation bilaterally, but with some left hemiparesis and a positive Babinski and Hoffman on the same side. A computed tomography (CT) of the head showed two nails in the right temporoparietal lobe that had crossed the midline with a small amount of interventricular blood. Initially, he was treated conservatively; repeat CT’s were formed without neurologic deterioration.

Given concerns for toxic ingestion, an esophagoduodenoscopy (EGD) was performed. The EGD revealed full thickness necrosis of the upper airway beginning at the epiglottis as well as full thickness necrosis of a majority of the stomach down to the duodenum.

The patient later developed an acute abdomen with pneumoperitoneum found on imaging. He was taken to the operating room (OR) for an exploratory laparotomy where gastric perforation with pancreatic inflammation was found. All areas were copiously irrigated. A partial gastrectomy was performed to remove necrotic stomach. His abdomen was left open, and he underwent multiple re-explorations. A completion gastrectomy was performed with duodenostomy tube and jejunostomy feeding tube placement. His abdomen could not be closed and later required grafting.

Neurosurgery removed both of the nails in his head due to concerns for abscess formation, and he remained neurologically...
intact. Fortunately, after extensive angiography to rule out potential sequelea of removal, the nails were both removed without complication.

He had a prolonged hospital course complicated by enterocutaneous fistulas and total parenteral nutrition dependence.

He was subsequently discharged home with tube feeding, tracheostomy, and wound care requirements. At 1 year follow-up he is awaiting reconstruction.

The above patient suffered debilitating injuries after a rarely combined suicide mechanism including muriatic acid ingestion with a subsequent penetrating head injury with a nail gun. Though penetrating head injury itself has a high fatality rate, given this patient's stable neurologic examinations, initial treatment was focused on his GI trauma.

Initial management of a patient with known toxic ingestion includes early resuscitation and correction of acid/base abnormalities. If the presentation is within the 1st h after ingestion, neutralization with half-strength vinegar or citrus juice for alkali ingestion or milk egg whites or antacids for acid ingestion should be attempted.[8] Unfortunately, our patient did not present within the 1st h window. After the acute phase had passed, attention is focused on managing the resulting burns. The patient is aggressively resuscitated, placed in the Intensive Care Unit (ICU) and kept nil per os (NPO) with IV fluids, antibiotic, and an antacid. The use of steroids in the management is controversial since they can potentially mask the symptoms of peritonitis. With that in mind, they were not used in this patient. Further management is directed by findings on EGD. As seen in our patient, necrotic tissue needs to be removed while preserving the maximum amount of viable tissues. A questionable esophagus and stomach requires an exploratory laparotomy for any needed surgery and debridement. Once stabilized and feeding tube is in place, chronic management is required with a focus on minimizing strictures including serial dilations. Management needs to be aggressive and multi-faceted.

One small study showed that when compared to a purely supportive approach a surgical tactic yielded vastly improved survivability; with 67% surviving short term solely with supportive care, and 100% with surgical intervention.[4] Despite reduced initial fatalities, many patients still die during post-op and follow-up. In one study, 3 out of the 13 of patients treated successfully did not survive past the immediate post-op period.[5] Still, surgery with extensive exploration, removal of all nonviable tissue and thorough peritoneal and mediastinal drainage remains the treatment of choice in severe caustic injury. Extensive gastric perforation and pancreatic saponification made irrigation particularly important in protecting the pancreas. There is no standardized reconstructive approach to such extensive transmural injury.[7] Our patient required extensive resection of his GI tract, and widespread stenotic injury of his esophagus made it unsalvageable even upon reassessment via repeat esophagoscopy. Therefore, it was decided that a solid diet would be out of the question, and the patient would have to be indefinitely sustained by jejunostomy feeding tube.

Traumatic brain injury normally leads to significant disabilities. In fact, it remains the leading cause of death in North America for people between the ages of 1 and 45 and causing socioeconomic burden.[9] Because of this patient's comparative benign neurologic presentation, high Glasgow rating, and stable vitals, there was not an urgent surgical exploration. It is very common for deterioration in the initial hours post injury. Immediate imaging was and should be done as quickly as possible to rule out fractures, edema, and developing hematoma. Even without initial findings, CT should be repeated at the first sign of deterioration, since evolving CTs are common with our patient's kind of penetrating injury.[10] Since his head wounds were without cerebrospinal fluid leak, a simple dressing was placed, and prophylactic antibiotics were administered which has been shown to reduce the incidence of infection.[8] Preventing any sequelae from increased intracranial pressure and secondary epilepsy was done in the ICU setting by raising the bed 30° and ensuring good venous flow along with administration of Dilantin prophylactically.[11,12]

Given this patient's persistent suicidal ideations, he underwent multiple psychiatric evaluations and close observation. Eventually, a regimen of cogentin, clexa, and risperdal was found to provide relief of these symptoms.

After extensive postoperative and patient/family education, our patient was discharged. His family was confident that they would be able to care for his basic needs of living and various drainage sites.

Suicidal ingestion of caustic substances is a life-threatening injury. Here, we present a rare case of muriatic acid ingestion complicated by intracranial nail gun injury. After a prolonged hospital course, he has survived his injuries and is awaiting reconstruction.

Unsuccessful multiple modality suicide is a fairly rare presentation to see in the Emergency Department. Both alkali ingestion and penetrating head trauma are highly fatal independent of one another. When combined, there is an exceptionally low survival rate. This report presents a case of successful management of one such patient. His extensive treatment required aggressive medical and surgical management with frequent re-assessment in the face of decompensation. Considering the extent of our patient's injuries, he was able to make an excellent recovery.

Financial support and sponsorship
Nil.
Conflicts of interest
There are no conflicts of interest.

Eric Shub, Andrew McCague
Arrowhead Regional Medical Center, Colton, CA, USA
E-mail: mccaguea@gmail.com

REFERENCES

1. Centers for Disease Control and Prevention. National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS). Available from: http://www.cdc.gov/ncipc/wisqars. [Last accessed on 2015 Dec 30].
2. Springborg JB, Eskesen V, Olsen NV, Gjerris F. Cranio-cerebral injuries caused by nail guns: Report on two cases, review of the literature and treatment algorithm. J Trauma 2007;63:E59-64.
3. Luo W, Liu H, Hao S, Zhang Y, Li J, Liu B. Penetrating brain injury caused by nail guns: Two case reports and a review of the literature. Brain Inj 2012;26:1756-62.
4. Riffat F, Cheng A. Pediatric caustic ingestion: 50 consecutive cases and a review of the literature. Dis Esophagus 2009;22:89-94.
5. Fisher RA, Eckhauser ML, Radivoyevitch M. Acid ingestion in an experimental model. Surg Gynecol Obstet 1985;161:91-9.
6. Townsend CM, Beauchamp RD, Evers BM, Mattox KL, editors. Sabiston Textbook of Surgery: The Biological Basis of Modern Surgical Practice. 17th ed. New York: Elsevier Saunders; 2004. p. 2388.
7. Lai KH, Huang BS, Huang MH, Huang MS, Wu JK, Liu M, et al. Emergency surgical intervention for severe corrosive injuries of the upper digestive tract. Zhonghua Yi Xue Za Zhi (Taipei) 1995;56:40-6.
8. Javed A, Pal S, Krishnan EK, Sahni P, Chhaptadhyay TK. Surgical management and outcomes of severe gastrointestinal injuries due to corrosive ingestion. World J Gastrointest Surg 2012;4:121-5.
9. Brain Trauma Foundation; American Association of Neurological Surgeons; Congress of Neurological Surgeons; Joint Section on Neurotrauma and Critical Care, AANS/CNS, Carney NA, Ghajar J. Guidelines for the management of severe traumatic brain injury. Introduction. J Neurotrauma 2007;24 Suppl 1:S1-2.
10. Oertel M, Kelly DF, McArthur D, Boscardin WJ, Glenn TC, Lee JH, et al. Progressive hemorrhage after head trauma: Predictors and consequences of the evolving injury. J Neurosurg 2002;96:109-16.
11. Antibiotic prophylaxis for penetrating brain injury. J Trauma 2001;51 2 Suppl:534-40.
12. Hauser WA. Prevention of post-traumatic epilepsy. N Engl J Med 1990;323:540-2.

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

Access this article online

Quick Response Code: www.onlinejets.org

DOI: 10.4103/0974-2700.179459

How to cite this article: Shub E, McCague A. Muriatic acid ingestion complicated by penetrating head injury: A case report and literature review. J Emerg Trauma Shock 2016;9:86-8.
Received: 14.05.15. Accepted: 30.12.15.