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Case Report

A case of Tannerite® target mixture causing severe blast injury

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ABSTRACT

Tannerite® is a proprietary blend of an oxidizer, ammonium nitrate, and aluminum powder catalyst used to make homemade exploding targets. While it is currently approved for unrestricted sale in the United States, it can be used to form devices capable of inflicting major blast injury. We present here a case of close proximity exposure to detonation of the mixed Tannerite® blend. In our patient, the exposure lead to injuries typical of blast injury, such as tympanic membrane rupture, globe injury, and severe burns. We review here the sequelae of blast injuries that one must consider when treating a patient with close proximity exposure to Tannerite, with considerations unique to this product.

1. Introduction

Tannerite® is a product currently sold without restriction in the United States as a binary exploding target package. The components are stable separately, but when mixed become explosive when shot with the kinetic energy of a center fire rifle. This feature allows the operator of the rifle to visualize if their target is hit from long distances. According to its patent, the mixture is resistant to and will not explode when lower energy is applied, including heat energy (fire) or even rim fire cartridges. The resulting explosion is intended to be non-incendiary [1].

In addition to the multiple safeguards inherent in the design of the product, the manufacturer provides details about proper use of the material. As with all products, unintended consequences can occur when the product is misused. We present here a case of burn injury caused by the Tannerite® compound, with elements of the injury indicative of major blast injury.

2. Case presentation

A 41 year old man presented to our emergency department from a referring institution. Reportedly, the patient had placed the Tannerite® inside of a lit charcoal grill and discharged a firework into the binary explosive at point blank range. The kinetic energy generated by the firework was enough to cause the product to react, creating an explosive force against the surrounding charcoal, metal, and other surrounding objects.

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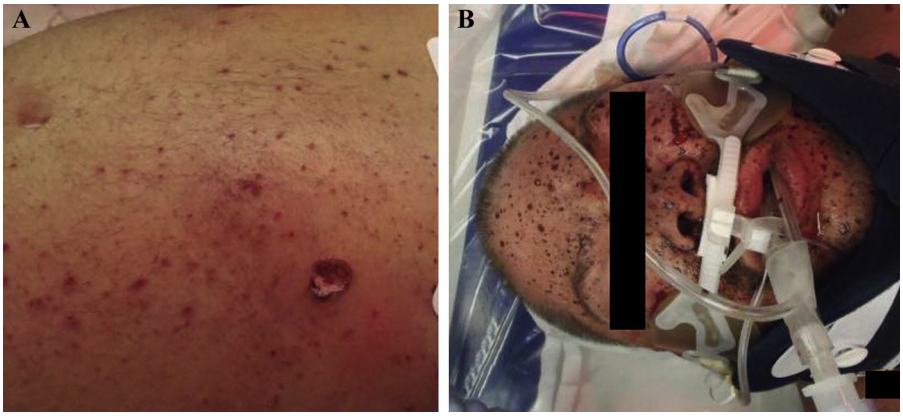

Fig. 1 – Multiple pinpoint lesions on the abdomen (A) and face (B) indicative of fragment injury. Many of these wounds ultimately underwent further debridement and closure due to foreign body reaction.

He was transferred intubated to our facility due to reported episodes of oxygen desaturation. On arrival he was approximately 3 h from post injury. Primary survey revealed a previously secured airway, adequate ventilation, and adequate IV access. His vital signs were stable with a Temperature of 98.0 °F, HR of 70 bpm, RR of 14, Oxygen Saturations of 100%, and BP of 137/90 mmHg. Secondary survey revealed significant bilateral ocular trauma, bilateral apparent hemotympanum, burn injuries and lacerations to his face, bilateral hands, and chest indicative of fragment injury. No foreign bodies were appreciated on initial survey.

The patient was admitted to our burn unit and extubated the same day without issue. His injuries following further assessment were as follows:

1. Superficial burns to his face, bilateral hands, forearms, and chest with evidence of pinpoint areas of full thickness skin defects and imbedded fragments (Fig. 1)
2. Bilateral absence of tympanic membranes with exposure of middle ear components (Fig. 2)
3. Thermal/Chemical burns of both eyes with large corneal abrasions and embedded foreign body; limbal ischemia evident in his left eye
4. Distal phalanx tuft fractures of the right hand thumb and index finger
5. Fracture of the proximal phalanx of the left thumb

The patient was managed four days in the burn unit for wound care, pain control, and occupational therapy. During that time his burn wounds and hand injuries were managed by the plastic surgery service with antibiotic lotion to his face and silver sulfadiazine to his hands and forearms. Due to the open fractures and multiple open wounds of his hands, the patient was also begun on Dial soap soaks. His tympanic membrane injuries and corneal abrasions were managed expectantly by ophthalmology and the otolaryngology department, respectively. As the patient did have significant disability of hearing, eyesight, and hand function, he underwent admission to an inpatient rehabilitation facility for eight days.

Subsequent management included operative treatment for open reduction and internal fixation of his left thumb proximal phalanx fracture and debridement of his wounds. (Fig. 3) His fracture was reduced through a dorsal midline incision and fixed with crossing 0.45 mm Kirschner wires. Small sand-like fragments was removed from multiple areas of his face and chest and his wounds were closed as appropriate. Following surgery his thumb and surgical sites healed without issue. Pins were removed one month after surgery and he achieved normal range of motion with proper occupational therapy.

His corneal abrasions were managed expectantly with artificial tears and antibiotic eye drops. At ten months these were noted to heal completely with minor refractive error. He was noted to have fragments embedded in his cornea, however

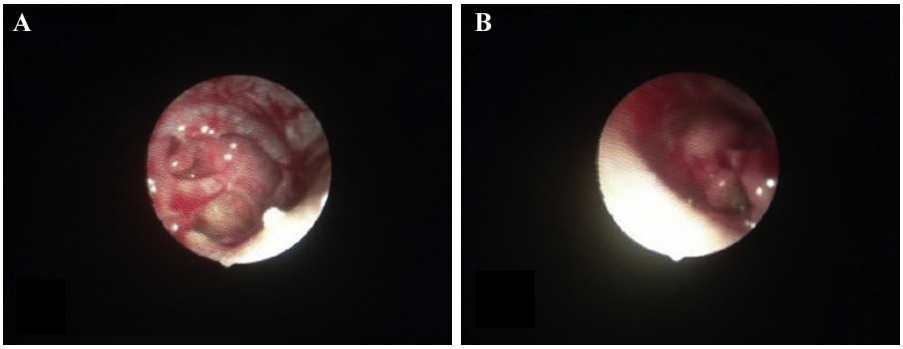

Fig. 2 – The patient had evidence of left (A) and right (B) tympanic membrane rupture. Ossicles are in direct view with direct visualization of the middle ear.