

Case Report Trauma

New TASER injuries: lacrimal canaliculus laceration and ethmoid bone fracture

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Abstract. The TASER is a non-lethal conducted electrical weapon intended to incapacitate a person. The growing use of the TASER has resulted in an increased risk of injuries, including those to the face. We report a case of lacrimal canaliculus laceration and ethmoid bone fracture caused by an extra penetration (XP) TASER X26 dart. A 35-year-old was subdued with a TASER head shot; the probe was discharged into the left medial canthus without causing any ocular lesions. A computed tomography scan revealed the probe to be embedded in the left nasolacrimal duct and showed a displaced ethmoid fracture. The barbed dart had sectioned the inferior lacrimal canaliculus without electrifying the lesion. This case expands the knowledge of injuries that may occur as a result of the use of this device and the management of peri-ocular TASER injuries.

Keywords: conducted energy weapon injuries; lacrimal apparatus; nasolacrimal duct; lacerations; catheterization; anastomosis; surgical; microsurgery; lacrimal duct obstruction; lacrimal apparatus diseases; tears.

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The TASER (Thomas A. Swift's Electric Rifle), a conducted electrical weapon, was introduced in 1974 and is increasingly being used by law enforcement agencies as a non-lethal means of incapacitating a person. The growing use of the TASER has resulted in an increased risk of injuries, including those to the face, despite the recommendations to avoid head shots (cases of ocular injuries^{1–4} and intracranial penetrations^{5,6} have been reported previously).

The TASER is a battery-powered unit that uses a nitrogen cartridge to propel two darts up to 10 m at a rate of 50 m/s. The darts, which are connected to the device by a wire, attach to the individual's skin or clothing, delivering up to 50,000 V of

electricity for up to 5 s. The peak voltage delivered to a subject is approximately 1200 V and the average current delivered is 2.1 mA.⁷ This high-voltage and low-current stimulation of the presynaptic motor nerve tissue inhibits alpha motoneurons and incapacitates the subject by causing involuntary tonic-clonic muscular contraction.

We report a case of lacrimal canaliculus laceration and ethmoid bone fracture caused by an extra penetration (XP) TASER X26 dart (13.5 mm long with a 4-mm barb). This case expands the knowledge of injuries that may occur as a result of the use of this device and the management of peri-ocular TASER injuries.

Case report

A 35-year-old man, with no significant medical history, presented to the emergency department after having been subdued with a TASER head shot. He had been struck in the left medial canthus by one of two TASER dart electrodes fired at a distance of 4 m while he was trying to jump out of a window following a period of agitation.

The patient was not in pain and a neurological examination was unremarkable. The TASER probe was noted to have become deeply embedded in the left medial canthus (Fig. 1), without causing any ocular lesions.⁸ A computed tomography scan of the head was obtained before



Fig. 1. Photograph of the TASER probe embedded in the left medial canthus.

making any attempt to remove the probe. This revealed the tip of the probe to have penetrated and become embedded in the left nasolacrimal duct and showed a displaced ethmoid fracture (lamina papyracea)⁹ (Fig. 2).

As a matter of urgency the patient was taken to the operating room to have the dart removed under general anaesthesia and for an exploration of the lacrimal system. A superficial electrical burn was

observed on the skin of the medial canthus, with a miniscule ecchymosis around the point of entry of the dart and the medial part of the superior eyelid. A left upper paranasal incision was made and prolonged in the medial suborbital region. The dissection was carefully extended along the probe to the frontal process of the maxilla and the nasolacrimal duct. The point of the XP TASER probe was slowly removed, under direct visualization, with a

firm pull directed perpendicular to the bone surface. The probe exhibited no resistance to removal.

The canalicular injuries were assessed with a lacrimal probe. The superior canalicular transection was safe, but an inferior canalicular transection was highlighted by visualizing the lacrimal probe in the wound bed, approximately 7 mm from the inferior lacrimal punctum. The localization of the distal edge required the use of loupe magnification, and this was finally located in the orbicularis muscle. The decision was made to repair the lacerated canaliculus with direct canalicular sutures without intubation (neither direct nor retrograde lacrimal catheterization were possible) under loupe magnification. A direct anastomosis of the cut ends of the canalicular mucosa was accomplished with a non-absorbable Ethilon 9-0 suture. Irrigation of the ducts highlighted the permeability of the anastomosis and the lacrimal system. The skin was closed with a dermal absorbable PDS 5-0 suture and an interrupted non-absorbable superficial Ethilon 6-0 suture.

The patient was given intravenous antibiotics (amoxicillin-clavulanate 1000/200 mg every 8 h), intravenous analgesics (paracetamol 1000 mg every 6 h), and eye drops (vitamin A, picloxydine dihydrochloride, carmellose sodium every 8 h). The postoperative course was uneventful and the patient left the hospital 2 days later with a prescription for oral

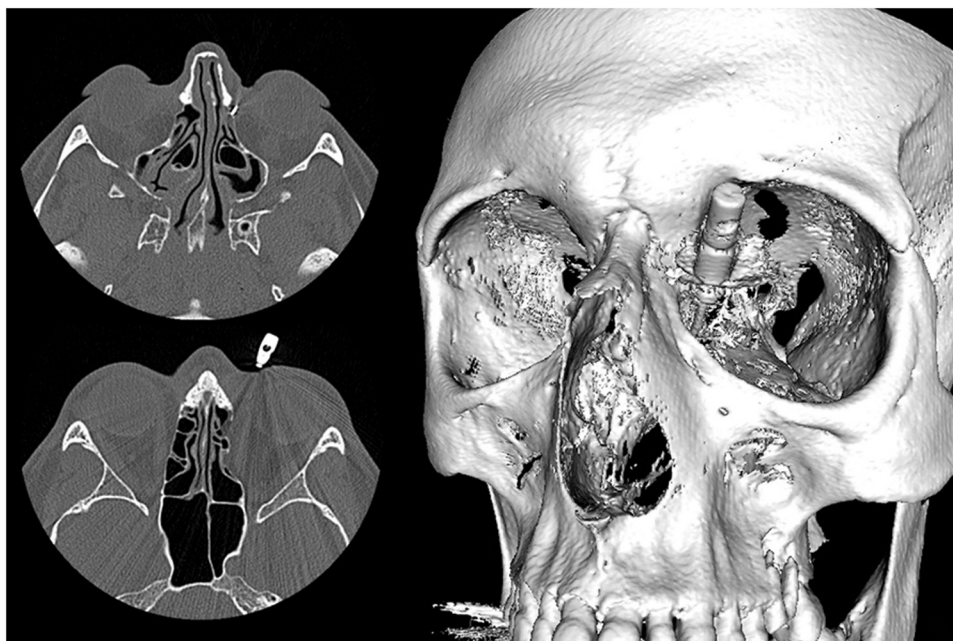


Fig. 2. Preoperative computed tomography scans. Top left panel: axial section showing the point of the TASER dart in the left nasolacrimal duct. Bottom left panel: axial section showing the ethmoid (lamina papyracea) bone fracture. Right panel: three-dimensional CT scan reconstruction showing the embedded probe.

analgesics and eye drops. One year later the patient presented no symptomatic epiphora and no lacrimal fistula.

Discussion

The TASER device has multiple damaging mechanisms including the conversion of electrical energy into thermal energy; this caused a minor superficial burn to the upper eyelid skin. The impact of the probe also fractured the ethmoid bone (without anosmia) and the barbed dart sectioned the inferior lacrimal canaliculus without causing an electrifying lesion.

The repair of the canalicular injury without silicone intubation of the lacrimal system was successful, with no postoperative obstruction or fistula, despite the mechanical trauma and the effect of the electric current.

Less than 0.7% of TASER victims experience a significant injury,¹⁰ but we should remain aware of the injuries that may arise following the use of this non-lethal weapon.

This case illustrates the complications that are directly related to the use of the TASER. It exemplifies the importance of recognizing a canalicular injury when a TASER dart is embedded in the medial canthus, and to extricate it carefully due to the barbed configuration.

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Competing interests

None declared.

Ethical approval

Not required.

Patient consent

Not required.

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