A 26-Year-Old Man with Substance Abuse, Agitation, and Pneumomediastinum

Abstract

A 25 year old male with a history of substance abuse (cocaine, marijuana, and alcohol), anxiety, and psychosis was brought to the emergency department (ED) by law enforcement officers. The officers had responded to a call from his wife during a domestic dispute. On their arrival he was found to be disrobed and incoherent and was threatening his wife with a knife. He was subdued and brought to the ED in handcuffs for evaluation of altered mental status and agitation.

Abbreviations

ECD: Electronic Control Devices; ED: Emergency Department; ExDS: Excited Delirium Syndrome; CEWs: Conducted Electrical Weapons

Introduction

The patient had no other past medical history. He had recently been discharged from an inpatient psychiatry unit for psychosis and was prescribed risperidone, but had not been taking it. He had surgery for a jaw fracture remotely. Because of agitated delirium, psychotic behavior and combativeness, he was physically restrained in the ED and haloperidol was given in repeat doses.

On physical examination, he was a febrile with a pulse of 136, BP 135/68, respiratory rate 20, SpO2 96% on 3 liters nasal cannula. He was agitated and having visual hallucinations. His voice was muffled. He had abrasions on his hip and shoulder and marked crepitus throughout the neck and upper chest. Trachea was midline. There was a small skin defect overlying the larynx consistent with minor trauma. Lung fields were clear and abdomen was benign. One examiner thought that there may have been a Haman’s crunch, but because of extensive crepitus over the thorax this could not be confirmed. Neurological examination was grossly non-focal.

Laboratory results were remarkable a WBC count of 21,000, HCO3- of 5.7, lactate level of 5.0 mmol/L, a CK level of 21,000, a creatinine level of 1.8, and a urine toxicology screen positive for amphetamines and cocaine.

Radiographic Findings

Chest X-ray and representative CT images of the chest are shown (Figure 1).

What are the diagnosis and etiology?

Diagnosis: Pneumomediastinum, pneumopericardium and pneumothorax caused by TASER injury of the larynx and Valsalva maneuver in a patient with Excited Delirium Syndrome (ExDS)

Discussion

Law enforcement agencies have increasingly adopted non-lethal tactics to subdue subjects during apprehension and arrest, and the use of Electronic Control Devices (ECDs; also referred to Conducted Electrical Weapons, CEWs) such as the TASER has increased dramatically in the last decade. This device delivers a low current, high voltage electric shock via two barbed electrode darts (Figure 2) that are fired into the skin of the subject at distances of up to 35 feet. The electrical discharge causes

Figure 1: Chest X-ray and representative CT images of the chest.

Figure 2: TASER dart.
both intense pain and the involuntary contraction of skeletal muscles, temporarily incapacitating the subject and allowing him to be subdued with less risk of injury to arresting officers and, in theory, the subject himself. Several categories of adverse medical effects of ECD use have been reported in the literature and must be considered in subjects in police custody undergoing medical evaluation. In addition, because widespread use of ECDs is a recent development, novel mechanisms of injury must be considered.

Much attention has been focused on fatalities after ECD exposure and the possible role of induction of cardiac arrhythmias by ECD use during apprehension and arrest. While experimental studies and extensive anecdotal evidence (approximately half of TASER exposures have involved volunteers during TASER training sessions) have generally failed to document adverse cardiac effects of ECD exposure in healthy volunteers under controlled conditions, the majority of ECD exposures in the field have involved young male subjects who were under the influence of drugs and alcohol [1]. The presence of these substances confounds attempts to determine the independent contribution of the ECD discharge to adverse outcomes. With one notable recent exception, retrospective investigations of fatalities after field exposure to ECDs have failed to conclude that ECDs cause malignant arrhythmias and death [1-3]. ECD use has been determined in most studies to be a potential or contributory factor in a minority of deaths, but evidence of bias on the basis of study funding has also emerged [4]. In any case, fatalities after ECD use are rare, and the mechanism of death in these instances is a subject of ongoing inquiry.

Excited Delirium Syndrome (ExDS) is a clinical entity characterized by altered mental status, adrenergic hyperactivation, "superhuman strength", hyperthermia, acidosis, aggressiveness, high tolerance to pain and violent resistance to restraint, often in patients with psychiatric disturbances and acute or chronic drug abuse especially that involving stimulants. Like our patient, they may also have recently stopped antipsychotic medications and dissipation of the effects of illicit drugs. Our patient was monitored in the ICU overnight and his lactic acidosis resolved over several days with supportive case management. His Pneumomediastinum, pneumothorax, and subcutaneous air are possible after ECD exposure due to punctured tissues in the oral cavity with needles and fish bones and induced air dissection via Valsalva maneuver, with suspected escape intent.

Our patient was monitored in the ICU overnight and his lactic acidosis resolved. His Pneumomediastinum, pneumothorax, and rhabdomyolysis resolved over several days with supportive care and his mental status also improved with reinstitution of his chronic medications and dissipation of the effects of illicit drugs.

Clinical Pearls

The vast majority of exposures to ECDs do not result in significant injury and testing and monitoring are not warranted in uncomplicated cases; nonetheless, patients exposed to ECDs are at risk for several categories of injury, and novel forms of injury must be considered depending on the clinical scenario. Patients with drug and alcohol intoxication as well as ExDS appear to be at increased risk of injury and death in association with ECD exposure. Trauma and falls from loss of postural control are significant causes of injury from ECD exposure; lactic acidosis and rhabdomyolysis from forceful muscular contractions are usually self-limited. Pneumomediastinum, pneumothorax, and subcutaneous air are possible after ECD exposure due to penetrating trauma, Valsalva maneuver, or some combination thereof. Relatively minor injury to the tissues of the oropharynx and neck can lead to dissection of air, especially if accompanied by Valsalva maneuver.

References

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