

Thoracic Compression Fractures as a Result of Shock From a Conducted Energy Weapon: A Case Report

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The Taser is an electrical conducted energy weapon used by law enforcement officers throughout the United States and the world. Though generally regarded as safe, conducted energy weapons can produce injuries. In this case report we describe for the first time thoracic spine compression fractures resulting from a conducted energy weapon discharge. Physicians who may care for patients who have been exposed to a conducted energy weapon discharge should be aware of this as a possible complication. [Ann Emerg Med. 2007;50:584-586.]

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INTRODUCTION

The Taser X26 (Taser, Scottsdale, AZ) is an electrical conducted energy weapon that incapacitates subjects by causing pain and muscular contractions. It is widely used by police agencies throughout the United States and other countries. It delivers a series of 19 electrical shocks per second; each pulse delivers 0.36 J at up to 50,000 V. The discharge is delivered by 2 barbed metal darts that are propelled toward a suspect and remain connected to the device by insulated wires. The standard discharge time is 5 seconds, though this can be shortened or lengthened by the operator.¹

In this case report, we describe 2 thoracic compression fractures as a result of a shock from a conducted energy weapon. To our knowledge, this is the first such injury reported in the medical literature.

CASE REPORT

A 38-year-old previously healthy male law enforcement officer was participating in a conducted energy weapon instructor training class. As part of this training, he volunteered to receive a standard 5-second discharge from the model X26 conducted energy weapon. The discharge was delivered through wires attached by alligator clips to his right shoulder and left hip. During and after the discharge, the officer was supported by 2 other officers to avoid falling. As expected, the officer experienced pain and diffuse muscular contractions during the 5-second discharge. In addition, he immediately observed what he thought were severe muscle spasms in the thoracic area of his back.

Unlike the normal result of conducted energy weapon exposure, the officer continued to experience severe thoracic back pain after the discharge had ended. His lower extremity sensation and strength were normal and he was able to ambulate. However, the pain remained severe. Emergency medical services (EMS) was activated and the patient was transported to the emergency department (ED) without incident.

On arrival to the ED, the patient was able to walk from the EMS stretcher to the hospital gurney. He was still experiencing severe thoracic back pain. He denied any weakness, numbness, or paresthesias. He did not complain of chest pain, palpitations, or shortness of breath. He reported a medical history of gastroesophageal reflux disease, and his only medication was ranitidine hydrochloride. There was no history of back injuries or activities such as jumps or falls that might have placed him at high risk for occult vertebral fractures. In addition, there were no risk factors such as long-term steroid use, which might have placed him at higher risk for pathologic fractures. Vital signs included blood pressure 124/80 mm Hg, pulse rate 65, respiratory rate 24 breaths/min, oral temperature 96.6°F (35.9°C), and oxygen saturation of 99% on room air.

Physical examination was remarkable for a well-developed, well-nourished, 38-year-old man in obvious discomfort. On examination, he had diffuse tenderness over his thoracic spine, without point tenderness, step-offs, or contusions. The cervical and lumbosacral areas were unremarkable. A detailed neurologic examination result was normal. He was given lorazepam 1 mg intravenously for possible muscle spasm, followed by several doses of hydromorphone hydrochloride for pain, with some relief.



Figure. Saggital view of CT scan, showing T6 and T8 compression fractures.

Diagnostic studies included standard radiographs of the thoracic and lumbar spine. These demonstrated compression fractures at T6 and T8, with 30% loss of vertebral body stature. There was also anterior wedging at L2. A computed tomography (CT) scan of the thoracic and lumbar spine showed compression fractures of T6 and T8 (Figure). There was also age-indeterminate anterior wedging of the L2 level and several posterior disc bulges of the lumbar spine. There was no evidence of osteopenia or bony lesions, suggesting pathologic fractures.

An orthopedic spine surgeon was consulted. Review of the CT images with 3-dimensional reconstructions confirmed that the fractures were mechanically stable. The patient was admitted to the hospital for fitting of a Jewett hyperextension orthosis for comfort. He was discharged home the following day.

The patient was contacted by telephone 9 weeks after his injury. At that time, he was still in significant pain. He was able to ambulate with discomfort. He had returned to work at a limited-duty status, working at a desk for 2 to 3 hours a day for 2 to 3 days per week. Subsequent radiographs had not shown any further compression of his known fractures. The authors are not aware of any legal action or policy changes that have taken place as a result of this incident.

DISCUSSION

The modern versions of the conducted energy weapon were introduced in 1999 and 2003. According to the manufacturer, more than 11,000 law enforcement agencies, more than half of

the agencies in the United States, use the devices. An estimated 560,000 people have been exposed to a shock from a conducted energy weapon in either training or actual law enforcement settings.¹

The use of the conducted energy weapon has been associated with a reduced number of injuries to suspects and officers compared with use of other techniques available to police, including pepper spray, canines, and handheld impact weapons.² However, conducted energy weapons are weapons and, like other weapons, are clearly capable of causing injuries. Falls are common after conducted energy weapon use and can produce blunt trauma. Small puncture wounds caused by the conducted energy weapon's sharp metal probes are also common. These are typically minor soft tissue injuries, though ocular penetrations, as well as bony injuries, have occurred.³⁻⁵ Concerns remain about the relationship between conducted energy weapon use and unexplained deaths of suspects in police custody, as well as possible direct cardiac effects of the electrical shock,⁶ though recent studies in human subjects have supported the overall safety of conducted energy weapons.^{4,7,8}

A previously unreported cause of conducted energy weapon injuries is direct injury from strong paraspinous muscle contraction. In this case, the patient's thoracic fractures are almost certainly directly related to the paraspinous muscular contractions caused by the conducted energy weapon's electrical discharge. The patient did not fall or sustain any direct blow, and symptoms clearly began during the 5-second conducted energy weapon exposure.

There are numerous examples in the medical literature of bony fractures occurring because of muscular contractions induced by seizures and electrical shock.^{9,10} Rana and Banerjee¹¹ described a case of a scapular fracture after shock by household current. Other reports describe isolated fractures of the spine and other fractures after electrical shock.¹²⁻¹⁴ Common throughout these reports is that vertebral fractures caused by muscular contractions (from whatever source) tend to be mechanically stable and without neurologic sequelae. After recovery from the acute injury, recovery rates are high and long-term disability risk is minimal.

The manufacturer of the conducted energy weapon has recognized the possibility of muscular contraction injuries, including vertebral fractures, and placed specific information and disclaimers about this possibility in their product information. Even though this risk is acknowledged in the product information, this is not well known in the medical community. Volunteers who undergo conducted energy weapon exposure during training are required to sign a waiver of liability, which specifically includes these injuries.¹⁵

Even though conducted energy weapons are known as less lethal weapons and appear to be safer than many alternative forms of force, medical personnel and law enforcement officers should recognize that these weapons are still associated with injuries. Though rare, vertebral fractures as a result of severe muscle contractions induced by the conducted energy weapon

are a possibility that should be considered and evaluated when indicated by the clinical setting.

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REFERENCES

1. Taser International. X26E series electronic control device specification. April 2007. Available at: <http://www.taser.com/SiteCollectionDocuments/Controlled%20Documents/Spec%20Sheets/Law%20Enforcement/RD-SPEC-X26E-001-H.pdf>. Accessed April 15, 2007.
2. Jenkinson E, Neeson C, Bleetman A. The relative risk of police use-of-force options: evaluating the potential for deployment of electronic weaponry. *J Clin Forensic Med.* 2006;13:229-241.
3. Chen SL, Richard CK, Murthy RC, et al. Penetrating ocular injury by Taser. *Clin Exp Ophthalmol.* 2006;34:378-380.
4. Dearing M, Lewis TJ. Foreign body lodged in distal phalanx of left index finger-Taser dart. *Emerg Radiol.* 2005;11:364-365.
5. Ng W, Chehade M. Taser penetrating ocular injury. *Am J Ophthalmol.* 2005;139:713-715.
6. Amnesty International. November 2004. Excessive and lethal force? Amnesty International's concerns about deaths and ill-treatment involving police use of Tasers. April 2007. Available at: <http://web.amnesty.org/library/index/engamr511392004>. Accessed April 14, 2007.
7. Ho JD, Dawes DM, Bultmann LL, et al. Respiratory effect of prolonged electrical weapon application on human volunteers. *Acad Emerg Med.* 2007;14:197-201.
8. Ho JD, Miner JR, Lakireddy DR, et al. Cardiovascular and physiologic effects of conducted electrical weapon discharge in resting adults. *Acad Emerg Med.* 2006;13:589-595.
9. Shaheen MA, Sabet NA. Bilateral simultaneous fracture of the femoral neck following electrical shock. *Injury.* 1984;16:13-14.
10. Tompkins GS, Henderson RC, Peterson HD. Bilateral simultaneous fractures of the femoral neck: case report. *J Trauma.* 1990;30:1415-1416.
11. Rana M, Banerjee R. Scapular fracture after electric shock. *Ann R Coll Surg Engl.* 2006;88:3-4.
12. Dumas JL, Walker N. Bilateral scapular fractures secondary to electrical shock. *Arch Orthop Trauma Surg.* 1992;111:287-288.
13. Kotak BP, Haddo O, Iqbal M, et al. Bilateral scapular fractures after electrocution. *J R Soc Med.* 2000;93:143-144.
14. van den Brink WA, van Leeuwen O. Lumbar burst fracture due to low voltage shock. A case report. *Acta Orthop Scand.* 1995;66:374-375.
15. Taser International. April 12, 2006. Volunteer warnings, risks, liability, release, and covenant not to sue. April 2007. Available at: <http://www2.taser.com/SiteCollectionDocuments/Controlled%20Documents/Warnings/LG-FORM-VOLUNTER-001%20REV%20A%20Volunteer%20Exposure%20Release%20Form.pdf>. Accessed April 15, 2007.