Case report

Bilateral patellar tendon rupture after stun gun shock

Lauren Ann Hudak *, Jonathan Joseph Marti, Debra Elaine Houry

Emory University School of Medicine, Department of Emergency Medicine, Grady Memorial Hospital, 49 Jesse Hill Jr. Drive, SE, Atlanta, GA, USA

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1. Introduction

Injuries from Electroschock Weapons (EWs), which include the Taser and Stun-gun devices, are becoming increasingly documented within the scientific community. These devices deliver short bursts of high voltage, low amplitude direct current designed to incapacitate the recipient by disrupting normal neuromuscular conduction. The typical complications include direct injuries from prongs of EW devices, and indirect injuries from falls after discharge of EWs have also been documented. Bilateral cases, also have been reported of cardiac abnormalities, as well as rare single cases of pharyngeal perforation, pneumothorax, rhabdomyolysis, and spontaneous abortion.

Bilateral patellar tendon rupture is usually associated with systemic immunologic or connective tissue disease, steroid use, fluoroquinolone antibiotic use, or renal disease. Amongst the spontaneous cases, bilateral ruptures are exceedingly rare and have only been documented in a few case reports. The simultaneous bilateral patellar tendon rupture after EW use has never previously been reported and is presented here.

2. Case report

The patient presented with a chief complaint of bilateral knee pain and the inability to walk. He claimed to have been “tasered” from behind by an acquaintance whilst attempting to flee the scene of an altercation earlier that evening. He reported falling forward and striking both knees simultaneously on the pavement whilst receiving shocks from a handheld Stun-gun device. After the incident, the patient had immediate inability to bear weight and extend his legs bilaterally and called EMS.

On presentation, he was noted to be an obese (body mass index of 36.3 kg/m²) 36-year-old African American male in no acute distress. His medical and surgical histories were unremarkable, and he reported no previous knee problems. He was taking no medications, and he denied recent use of steroids or antibiotics. His family history was negative for connective tissue and immune disorders. His reported use of alcohol and occasionally of marijuana, but denied use of tobacco or other illicit drugs.

His vital signs were stable, and he was noted to be moderately intoxicated consistent with his history of recent alcohol use. His extremity exam demonstrated moderate swelling and superficial abrasions of the anterior leg at the level of the knee bilaterally. Additionally, he was unable to actively extend his legs or maintain passive extension bilaterally. He was unable to bear weight due to instability and pain.

On palpation, the superior edges of bilateral patellae were elevated to the level of the lines indicated in Fig. 1(A and B). In addition, palpable patellar tendon defects were noted bilaterally. Further orthopaedic exam techniques were limited due to pain and swelling of the areas. He was neurovascularly intact distally with palpable bilateral dorsalis pedis pulses and appropriate sensation intact to light touch. No other injuries were noted.

Initial laboratory values including CBC and CMP were unremarkable, and the ETOH level was noted to be 120 mg/dL. Two views of bilateral knees (non-weight bearing AP and lateral views) were ordered in the ED, demonstrating bilateral patella alta, or high riding patellae, as seen in Fig. 1(C and D).

Whilst in the Emergency Department (ED), the patient complained only of nausea. One litre of intravenous (IV) normal saline and 4 mg of IV Ondansetron were given with improvement of symptoms. 0.5 mg of Tetanus toxoid was given intramuscularly and bilateral knee abrasions were cleaned and bandaged. Orthopaedic surgery was consulted and the patient was admitted to their service with anticipation of staged repair for bilateral patellar tendon rupture. Due to concern for infection from the abrasions sustained on bilateral knees, repair of his left patellar tendon was delayed until 11 days into his hospital admission. The patient was deemed stable after his first repair, and outpatient repair of his right patellar tendon was considered optimal. He was discharged home in bilateral knee immobilizers, with weight bearing as tolerated with a walker.

Repair of his right patellar tendon was conducted 2 weeks after the first procedure, and the patient remained in bilateral hinged knee braces post operatively for 10 weeks, with no significant complications noted.

3. Discussion

Traumatic patellar tendon ruptures are rare events, and bilateral patellar tendon rupture in an otherwise healthy individual is noted as an exceptionally rare event. This patient
had no underlying risk factors associated with his condition, but the Stun-gun deployment could provide a possible explanation for his injury. The patellar tendon is the second strongest tendon in the human body, behind the Achilles tendon. Direct trauma to the tendon is a clear risk factor for rupture, but the added force acquired from the EW could provide a sufficient amount of force to overcome the physiologic threshold and cause rupture. Whilst no current source exactly quantifies the amount of force needed, there is a consensus that it is substantial in an otherwise healthy patient, up to 17.5 times the patient’s body weight. Based on this estimation, our 118 kg patient would require the considerable force of 2065 kg to rupture his patellar tendons. In reviewing the mechanism of action of EWS, the devices produce a peak voltage of up to 50,000 V and about 0.8 J of energy when deployed. In

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Fig. 1. (A and B) Photographs of the right and left legs, respectively, anterior view; arrows indicating the superior edges of bilateral patellae. (C and D) X-ray lateral views of the right and left knee, respectively, demonstrating bilateral patella alta with no acute bony injury.
addition, the electrical current provided by the EW selectively targets skeletal muscle, and a discharge of 1–2 s will cause tetany to the point of incapacitating the recipient. Whilst Tasers are controlled in the amount of electricity administered, the effects of stun guns have been reported to increase with the duration of application. Furthermore, when the stun gun is applied to the recipient, it is designed to bring the individual to their knees as described by our patient. The typical mechanism of patellar tendon rupture is contraction of the quadriceps muscles against sudden knee flexion, the stun gun application could amplify the force needed for rupture to occur. It seems that our patient had the “perfect storm” of mechanical risk factors, resulting in significant injury.

It is important to note that the use of EWs in the law enforcement, correctional, military, and security settings is regarded as a safer alternative when compared to the use of firearms. Additionally, the use of these weapons is increasing in the commercial and personal safety arenas. Whilst this case does not attempt to address the acceptability of these weapons, further research in this area could help determine if additive forces involved in EW deployment place recipients at increased risk for significant musculoskeletal injury.

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References