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Schatzker IV Tibial Plateau Fracture after Taser Utilization: A Case Report and Review of the Literature

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Introduction

A Taser is a type of conducted energy weapon (CEW) used to stun and disable targets via conduction of a high-voltage charge through a pair of barbed probes. Designed as a weapon to deter criminal behavior without causing lethal consequences, the Taser has been widely adopted by law enforcement across the United States. In fact, since its introduction in the 1970s, several design iterations have been released with its most recent touted as “state-of-the-art in conducted energy weapons, reducing injuries to officers and suspects”¹. Nonetheless, there is a paucity of research surrounding the Taser’s effectiveness in limiting civilian injuries during police-civilian encounters.

In fact, a review of the medical literature describes significant morbidity associated with Taser use. Multiple osseous injuries and injury patterns have been described including thoracic compression, phalangeal, and facial fractures. Phalangeal and facial fractures occur secondary to direct penetration of the Taser barb while spinal compression fractures result following high energy, seizure-like activity caused by the electrical discharge²⁻¹¹. Despite this, there have been no specific reports of orthopaedic injury patterns as a consequence of Taser use. In this case report, we describe a high energy tibial plateau fracture as a result of Taser utilization.

Patient Presentation

This is a 24-year-old male patient who presented to our hospital emergency department in police custody on the day of injury. Per police report, a Taser was utilized during the patient’s arrest. After the taser was fired into the patient’s right knee, he reportedly tripped and forcibly landed onto his right lower extremity. Following the incident, the patient was unable to ambulate and was transported to the hospital for emergency evaluation. His urine drug screen was positive for opiates, benzodiazepines, oxycodone, and tetrahydrocannabinol (THC).

The patient’s past medical history is significant for a previous facial gunshot

wound in 2019 resulting in comminuted left maxillary wall, left zygomatic arch, and right mandibular body and ramus fractures for which he underwent open reduction and internal fixation (ORIF) with plastic and reconstructive surgery. Following this injury, the patient self-reports depression and post-traumatic stress disorder resulting in paranoia and chronic auditory and visual hallucinations of persecution by assailants and police. Eight months prior to presentation, he sustained a gunshot wound to the right elbow and right thigh without fracture, soft tissue, or vascular injury. He reported taking suboxone for opioid use disorder.

On exam, the patient had diffuse swelling and obvious deformity of the right knee with a Taser probe embedded in the prepatellar soft tissue without surrounding ecchymosis or erythema. He endorsed significant knee pain with inability to actively flex or extend his knee. There were no open wounds about the knee concerning for open fracture. Neurovascularly, the patient had palpable dorsalis pedis and posterior tibial pulses and a normal Ankle-brachial index (ABI). He had 5/5 strength in his tibialis anterior, extensor hallucis longus, flexor hallucis longus, and gastrocnemius/soleus complex. His anterior and posterior lower extremity compartments were swollen and full but compressible. Ligamentous knee exam was limited by pain and no firm endpoint was felt on varus stress. He had no pain with passive stretch of his ankle or toes and there was low concern for acute compartment syndrome upon initial presentation. Secondary trauma evaluation did not reveal additional injuries.

X-ray and CT scan of the right knee, tibia/fibula, and ankle were obtained following initial evaluation as shown in Figures 1 and 2. Imaging revealed a comminuted, intra-articular medial tibial plateau split and depression fracture pattern extending from to the medial tibial spine with approximately 1.5 cm of articular depression consistent with a Schatzker IV tibial plateau fracture. There was also an ipsilateral fibular head avulsion fracture. The retained Taser probe is visualized



Figure 1. Anterior to posterior radiograph of the right knee demonstrating a Schatzker IV Tibial Plateau fracture and fibular head avulsion fracture as well as a retained Taser prong.

over the prepatellar soft tissue without bony penetration.

Initial attempts at gentle twisting and removing the retained Taser probe were unsuccessful due to the barbed projection at the distal aspect of the shaft. A Taser probe is similar to a #8 fishhook; most have a 4mm barb and 9.5mm shaft¹². A subsequent attempt was made using 1% lidocaine without epinephrine injected superficially around the retained probe. With an #11 blade scalpel, a 3mm longitudinal incision was made extending through the entry point into the skin which allowed for rotation and rocking of the probe until the barbed tip was freed from the soft tissue. Xeroform and a soft dressing were placed about the anterior knee and the patient received Tetanus prophylaxis in the emergency department. He was admitted to the orthopaedic surgical service for serial compartment checks and neurovascular monitoring pending surgical management.

Operative Fixation

For this particular injury pattern, and owing to his significant soft tissue swelling, operative considerations

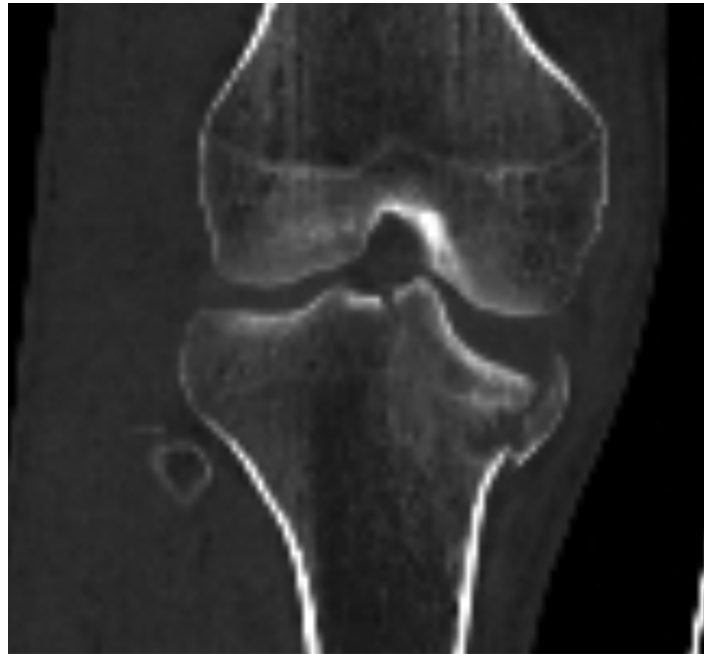


Figure 2. Coronal CT scan demonstrating medial articular depression and comminution consistent with a Schatzker IV fracture pattern.

included temporizing knee-spanning external fixation allowing for soft tissue rest versus acute open reduction internal fixation (ORIF). The day following the patient's injury, his lower extremity compartments were swollen, though compressible with adequate wrinkling, and the decision was made to acutely pursue definitive ORIF.

A medial approach to the tibial plateau was utilized to best visualize the fracture¹³. The fracture was thoroughly debrided and the medial articular depression was tamped superiorly to restore the anatomic joint surface. The resulting bony defect was filled with crushed cancellous allograft. A 3.5 Synthes medial tibial locking compression plate was utilized in buttress mode and plate balance was achieved under fluoroscopic guidance. The axillary screw was placed distal to the apex of the posteromedial fracture line permitting in-situ contouring and adequate compression across the fracture. A second, nonlocking screw was placed distally for rotational control. The remainder of the plate was secured via hybrid fixation using a combination of locking and nonlocking screws. Final fluoroscopic evaluation confirmed anatomic reduction of the articular surface without intra-articular penetration of hardware. The proximal fibula was minimally displaced and thus treated nonoperatively. The wound was thoroughly irrigated and closed in standard, layered fashion. The patient was made non-weight bearing in a knee immobilizer and discharged from the hospital after clearing a normal post-operative protocol including physical therapy.

Post-operative x-rays demonstrated application of the medial plate in excellent alignment as shown in Figure 3A. The patient was evaluated at four and ten weeks post-operatively. Radiographs at 10 weeks showed excellent interval healing of his fracture with maintenance of the

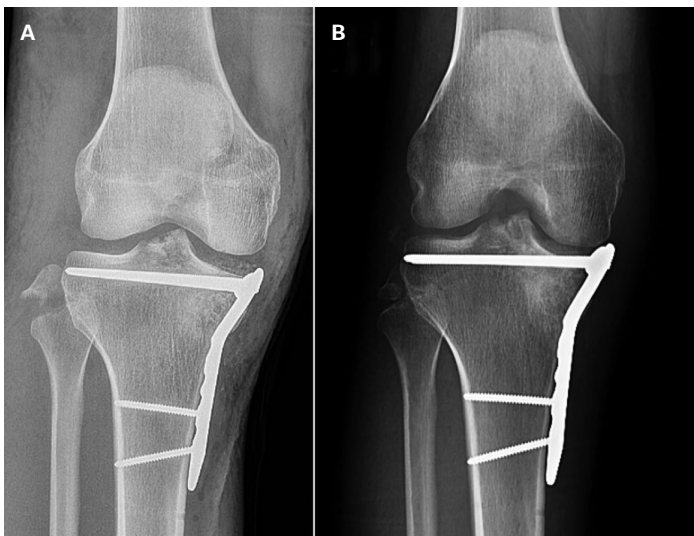


Figure 3 Post-operative open reduction internal fixation (A) 1 day post operatively (B) Ten weeks post operatively.

joint line and no hardware complications as shown in Figure 3B. He was advanced to weight bearing as tolerated on the operative extremity.

Discussion

The Schatzker classification is a ubiquitous, descriptive classification system aiding in both prognosis and management of tibial plateau fractures. Severity of injury tends to correlate with increasing numeric grade (I-VI) and worse functional outcome, illustrated in Table 1. Schatzker I-III tibial plateau fractures, for instance, typically result from lower energy trauma and are generally associated with osteopenic bone; in contrast, Schatzker IV-VI fracture patterns are caused by higher energy mechanisms such as motor vehicle collisions or pedestrians struck¹⁴.

Notably, the patient described in this report sustained a Schatzker IV tibial plateau fracture (medial split and depression) as a result of Taser utilization during an encounter with law enforcement. In addition to the osseous injury, this particular fracture pattern is commonly associated with soft tissue injuries including anterior cruciate ligament (ACL), lateral collateral ligament (LCL), and medial meniscal tears¹⁴. Based on the severity of this patient's injury, he likely landed directly onto his right knee with a varus force resulting in medial tibial plateau impaction from the medial femoral condyle and tension-sided avulsion of the lateral collateral ligament from the fibular head.

Given the location of the Taser probe in the anterior aspect of the patient's knee, he was presumably running towards the officers. The patient states he "flipped" once he was struck; the electrical current discharged from the Taser likely caused involuntary muscle contraction of his lower extremity with simultaneous incapacitation of compensatory protective fall reflexes such as extending the hands or rolling towards the shoulder or side. The confounding intoxication of our patient with opiates, THC, and benzodiazepines may also have dampened normal self-protective mechanisms.

Recently, the use of excessive force in civilian encounters with law enforcement has been subject to intense scrutiny and public concern. In the United States, police use of force remains significantly higher than comparable democracies; between 2015 and 2019, nearly 1,000 people per year were killed during an encounter with law enforcement¹⁵. Among Black Americans, the rate of fatal police encounters is much higher than any other ethnicity; the reality is even bleaker among patients experiencing psychological distress¹⁶ thus reifying the confounding consequences of racial disparity and mental health. Notably, the patient described in this

Table 1. Schatzker Classification for Tibial Plateau Fractures.¹⁹

Schatzker Classification	Definition	Classic Injury	Energy Required	Mechanism
Schatzker I	Wedge-shaped cleavage fracture of lateral tibial plateau	Sports injuries/osteoporosis	Low	valgus extension & flexion
Schatzker II	Splitting & depression of lateral tibial plateau	Sports injuries/osteoporosis	Low	valgus extension & flexion
Schatzker III	Pure depression of lateral tibial plateau & lateral depression	Sports injuries/osteoporosis	Low	valgus extension & flexion
Schatzker IV	Medial tibial plateau fracture	Motor Vehicle Accidents	High	varus extension & flexion hyperextension
Schatzker V	Wedge fracture of both lateral & medial tibial plateau	Motor Vehicle Accidents	High	varus and axial extension
Schatzker VI	Transverse tibial metaphyseal fracture & any type of tibial plateau fracture	Motor Vehicle Accidents	High	varus and axial extension

report is Black with a history of both substance use and psychiatric comorbidities.

Conclusion

Tasers are commonly perceived as innocuous weapons often used to reduce harm in civilian encounters with law enforcement. In practice, however, Taser discharge results in profound bodily force and is associated with significant morbidity¹⁷. Despite an effort by law enforcement to limit the use of excessive force in civilian encounters, non-fatal injuries have been on the rise¹⁸. There are few comprehensive studies on how these less-than-lethal weapons reduce harm and more research is needed pertaining to their enduring physiologic effect. While various Taser-related civilian injuries have been reported in the literature, this is the first report to describe a high-energy tibial plateau fracture as a consequence of Taser use.

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