Timing of Definitive Fixation for Comminuted Talar Fractures in Patients with Multiple Injuries: A case report

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Comminuted talar fractures are commonly the result of high-energy trauma. In the literature, the timing for treatment of comminuted talar fractures remains controversial, even in the presence of multiple injuries. We present the case of a stable patient with multiple long bone injuries and a comminuted talar fracture, the subsequent management and outcome, and review the current literature for management of comminuted talar fractures.

Key Words: Comminuted talar fractures, high-energy trauma, early definitive care, damage control techniques.

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Comminuted talar fractures are commonly the result of high-energy trauma and associated with multiple injuries. These injuries are treated in descending order from most life threatening, and the definitive treatment of talar fractures may be staged.\textsuperscript{16} However, the risk of developing osteonecrosis has been suggested with delayed fixation after fracture displacement.\textsuperscript{4} Others have proposed that surgical treatment of talar fractures may promote revascularization to the talar body.\textsuperscript{6} Early reduction may help preserve any remaining blood supply to the area. In poly-traumatized patients, there are frequently more vital injuries to be addressed first, however care to the foot and ankle cannot be overlooked.\textsuperscript{14} For all cases of talar fractures, treatment goals remains anatomic reduction, preservation of motion, joint stability, and minimization of complications.\textsuperscript{3}

We present the case of a stable patient with multiple long bone injuries and a comminuted talar fracture. The subsequent management and outcome, and review of the current literature for management of comminuted talar fractures are presented.

Case Report

A 43 year-old male was involved in an unrestrained motor vehicle accident while being chased by police. Multiple Injuries were sustained including a left open intra-articular comminuted supracondylar femur fracture, right femoral shaft fracture, right intertrochanteric hip fracture, right intertrochanteric hip fracture, right tibial plateau fracture, and a left closed talar body and neck fractures. (Fig. 1) He was immediately evaluated by the trauma service, and they determined he was relatively stable for invasive treatment. Orthopaedic trauma service again thoroughly evaluated the patient and determined he to be stable for early total care. However, due to the comminuted nature of the talar fracture, definitive surgery was delayed for three days post-injury. (Figs. 2 and 3)
At the time of injury, his vitals were within normal range, but laboratory values were significant for pH of 7.46, pCO2 of 25, bicarbonate of 17, anion gap of 17, CPK of 295, WBC of 10.6, neutrophils at 89%, and an INR of 1.0. Three days following initial treatment, the patient was afebrile with vital signs stable. Laboratory findings included Anion gap 8.0, WBC 6.0, platelets 124, hemoglobin 8.2, hematocrit 22.9, neutrophils 79, lymphocytes 8(L), Monocytes 11, eosinophils 2, basophils 0. His abnormally high value for neutrophils was determined to be an inflammatory reaction to the initial injury.

Open reduction internal fixation techniques were used for definitive fixation of the comminuted talar fractures. (Fig. 4) Transfixation pins were placed across the calcaneus to allow distraction of the tibiotalar joint and facilitated adequate visualization of the talar body fracture. Status post internal fixation, the talonavicular, subtalar and tibiotalar joints were unstable per intra-operative examination. An external fixation device was placed to address the instability of the injured foot. The patient received prophylactic antibiotics prior to and post surgery.

After discharge from the hospital, the patient’s multiple injuries were followed uneventfully. In regard to his comminuted talar fracture, he remained non-weightbearing to his injured side for a total of three months.

The external fixator addressing his foot instability was removed at six weeks, and the patient was allowed to begin passive range of motion exercises. Normal post-operative pain and tenderness was apparent but insignificant. Following removal of external fixator, he was placed into a non-weightbearing CAM boot.

Radiographs were taken at all follow-up appointments, and at six months status post definitive treatment, the radiographs showed healing of talar body fracture without hardware complications. There was no clinical or radiographic evidence of talar avascular necrosis. (Fig. 5)
Discussion

The blood supply of the talus is clearly vulnerable after traumatic injury.\(^2\) Comminuted fractures involving the neck and body carry a risk of osteonecrosis due to the retrograde supply of blood to the head and body. This tenuous blood supply is often cited as the reason for high complication rates\(^5\) with comminuted talar fractures. Delay in definitive fixation of comminuted talar fractures may also be due to concerns of soft tissue complications.\(^7\) These complications include wound dehiscence, infection, and skin necrosis.\(^10\)

Traditional treatment of these fractures evolved from reduction and immobilization, to limited fixation, and currently, open reduction internal fixation is performed on most talar fractures.\(^16\) Although there are recommendations for primary arthrodesis or takedown for severe talar fractures,\(^9\) the consensus has been to maintain anatomic alignment and preserve motion at the joint.\(^17\) In poly-traumatized patients, these goals remain valid although the timing of talar fracture fixation in this patient population remains controversial.\(^1\) Vallier, et al.\(^16\) found no correlation between surgical delay and development of osteonecrosis, but did find a significant association of osteonecrosis with comminuted fractures.

Pape, et al.,\(^11\) recommended that careful considerations be made when determining initial fixation or a staged surgical approach in poly-traumatized patients. Although the authors were not specifically referring to talar fractures, the degree of initial surgery may represent additional burden to patients at high risk for complications. Primary fracture stabilization with secondary surgery may be implemented if clinical conditions warrant a staged treatment course.

In our case, the soft tissue edema was well controlled around the ankle, and the talar fracture was definitively fixated three days after initial injury. An external fixator was used for two reasons: to provide a rigid splint and to stabilize the rearfoot. By definition, the soft tissue envelope around the foot and ankle is considered tenuous and severely traumatized in most cases of talar fractures.\(^14\)
Delicate care of the soft tissue is vital to the traumatized limb. As with our patient, the multi-injured patient typically does not require an initial lengthy foot and ankle procedure, but reduction of fractures and dislocations must be addressed adequately. Because of his multiple injuries, provision of basic skeletal stabilization proceeded after the patient was determined to be stable. This is regarded as early care, however early care does not mean total care. Early care for fractures has been recommended if the patient is determined to be stable, but damage control orthopaedic (DCO) techniques have been recommended for patient that are considered borderline, unstable or in extremis. DCO techniques recommend that definitive fixation surgery for unstable patients with long bone fractures are delayed until they are hemo-dynamically stable. External fixation is commonly implemented for compromised soft tissue structures and gross instability. By allowing for inflammatory mediators including interleukins, tumor necrosis factors, interferons and colony stimulating factors to decrease, the hope is to prevent a “second hit phenomenon.” The application of this concept to foot and ankle trauma has the potential to help prevent post-operative complications. However, the role of inflammation control still needs to be investigated in foot and ankle trauma when confronted with multiple injuries. In our case, the patient was admitted post-operatively and discharged after four days without complications. His subsequent follow-up appointments were uneventful and absent of radiographic evidence for osteonecrosis.

Because comminuted talar fractures are generally associated with multiple injuries, it is important to prioritize trauma based on clinical condition. However, talar fractures should not be undervalued when planning treatment protocols. Tran and Thordarson determined that patient functional outcomes were significantly worse off in poly-traumatized patients with foot and ankle injuries than those without. It is therefore critical to implement aggressive care for poly-traumatized patients with comminuted talar fractures.

References


