



Staged Reconstruction of a Multiplane Post-traumatic Deformity: A Case Report

Thomas A. Brosky II, DPM, FACFAS¹, Joshua J. Mann, DPM, AACFAS^{1,2}, Sean Patrick Dunn, DPM¹, Grant W. Gonzalez, DPM³

¹ Attending Surgeon, Dekalb Medical Residency Program; Faculty, Podiatry Institute, Decatur, GA; and Foot and Ankle Clinic of Oakwood, Oakwood, GA

² Faculty, Podiatry Institute, Decatur, GA; and Ankle and Foot Centers of Georgia, Jonesboro, GA

³ Resident, Dekalb Medical, Decatur, GA

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ABSTRACT

Damaging effects of joint function can occur after fractures of the lower extremity that have healed with an angular malunion. Surgical techniques have been described to restore the normal mechanics and establish a plantigrade foot, including osteotomy and fusion. In the present report, we describe a unique case of a 17-year-old male who had initially experienced a severe injury to his left lower extremity and foot when he had been run over by a jeep. Originally, a Lisfranc injury with navicular and cuboid fractures were surgically corrected. He had also sustained an extra-articular distal tibial and fibular fracture, which had been conservatively managed. Seven months after the initial incident, he underwent 3-staged reconstructive surgery because of a malaligned valgus ankle with fibular malunion and a painful collapsing pes planovalgus deformity. A supra-malleolar tibial osteotomy with fibular lengthening was first performed, followed by triple arthrodesis with removal of hardware and then syndesmosis repair. The present report discusses our clinical evaluation and surgical technique for this multiplanar post-traumatic deformity.

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Fractures of the lower extremity and foot that heal in a malaligned position can cause detrimental effects to joint function and bipedal gait (1). The altered distribution of weightbearing stresses of the lower extremity can lead to abnormal force concentrations across the joints (2). When malunions exist, a thorough clinical evaluation is necessary to fully define all components of the deformity.

Early correction of malaligned ankle deformities has been recommended to prevent the development of later degenerative joint changes. When malalignment of the ankle mortise exists after lower extremity trauma, supramalleolar osteotomies have been used to restore the anatomic joint position (3). Emphasis should also be placed on performing structural restoration of the ankle mortise by appropriate lengthening and correction of the angular and rotational deformities of the fibula when a residual incongruity exists (4–6).

Triple arthrodesis has been shown to be a powerful method for correcting major forefoot to hindfoot deformities (7). The primary goals when performing triple arthrodesis should be to create a

plantigrade foot with the purpose of increasing stability and reducing pain. Symptomatic post-traumatic malalignment with significant deformity is an indication for triple arthrodesis, and studies have shown patient satisfaction of more than 90% after 5 years (8,9).

Disruption of the distal tibiofibular syndesmosis has frequently been encountered in rotational ankle injuries and can commonly be missed during the initial clinical assessment. Several different methods are available that can be used in repairing the syndesmosis, and many controversies exist regarding which is the best option. When instability is present, it is believed that surgical stabilization is critical in preventing the development of lateral talar shift and degenerative joint changes of the ankle (10).

In the present report, we describe a unique case of a 17-year-old male who had initially experienced a severe injury to his left lower extremity and foot after a crushing injury from a jeep tire 5 months earlier. At 7 months after the initial incident, he underwent 3-staged reconstruction owing to a malaligned valgus ankle with fibular malunion and syndesmosis instability and a painful collapsing pes planovalgus deformity. This level of post-traumatic deformity and the young age of the patient required a stepwise approach, with reconstruction of the extremity from proximal to distal to achieve maximal results. The patient provided informed consent before we submitted the present case report, and all procedures were

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Address correspondence to: Joshua J. Mann, DPM, Dekalb Medical, 2701 North Decatur Road, Decatur, GA 30033-5918.

E-mail address: mannjj0618@gmail.com (J.J. Mann).



Fig. 1. Anterior posterior ankle view of initial injury consisting of a distal tibial extra-articular fracture and fibular fracture.



Fig. 3. Dorsoplantar foot view of initial foot injury consisting of fractures of the cuboid and navicular and Lisfranc dislocation.



Fig. 2. Lateral ankle view showing initial injury consisting of a distal tibial extra-articular fracture and fibular fracture.

performed by the senior author (T.A.B.). We discuss the clinical evaluation and surgical technique of this multiplanar post-traumatic deformity.

Case Report

A 17-year-old healthy male presented to the senior author (T.A.B.) because of a painful collapsed left foot and stiff ankle. He had experienced a severe injury to his left lower extremity and foot after a crush injury 5 months earlier. He had sustained fractures to his tibia, fibula, navicular, and cuboid during this event (Figs. 1 to 3). The Lisfranc joint had also been violated at that time. Initially, the patient presented to the emergency department to undergo closed reduction of the fractures. The patient was treated by another surgeon after the emergency department visit. Open reduction with internal fixation for the Lisfranc injury, navicular, and cuboid fractures was performed (Fig. 4). The tibial and fibular fractures were treated conservatively with cast immobilization. Other than the trauma, he had no significant medical or family history, no known drug allergies, and denied any tobacco or alcohol use.

During follow-up care, the surgeon referred the patient to the clinic of the senior author (T.A.B.) for a second opinion regarding possible reconstruction of the clinically collapsed left foot and stiff ankle. All previous records were reviewed. At presentation, the patient stated that he was using a controlled ankle motion boot for stability. The patient also stated that during ambulation he had been walking on the medial side of his foot because it was “deformed and angled outward.” He related that he had decreased ankle motion and that the pain was approximately 5 of 10 on the visual analog scale (11) when ambulating.

On physical examination of the left foot, a severe collapsing pes planovalgus deformity and ankle valgus were present (Figs. 5 and 6).

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