DEBATE

Argument against Repairing the Deltoid Ligament in Ankle Fractures

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ABSTRACT

Ankle fractures are extremely common orthopedic injuries. There is evidence that the deltoid ligament becomes insufficient in the setting of acute ankle fractures. Whether this finding is clinically relevant to address with surgical repair is a topic that has been debated for years. There is literature documenting the repair or reconstruction of the deltoid ligament dating back in the 1950s, although most orthopedists have adopted the mainstay of treating the fibula fracture without directly repairing the deltoid ligament. This current standard of practice is based on the literature from the 1980s, which itself has not been revisited in the current literature. We present an argument and critique of the literature that supported not repairing the deltoid ligament in the setting of ankle fractures. The deltoid ligament has proven to confer at least some element of stability of maintaining a concentric ankle mortise. At any rate, the literature that supports not repairing the deltoid has significant limitations and needs to be investigated further to provide clarity to this difficult yet common orthopedic injury.

Keywords: Ankle fracture, Deltoid ligament, Fibula fracture, Repair.

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INTRODUCTION

Ankle fractures are among one of the most common orthopedic injuries. The estimated incidence per year is 187 fractures per 100,000 people.1 For instance, in India alone, there are an estimated 2.4 million ankle fractures per year given an estimated population of 1.3 billion people. Some have suggested that the deltoid ligament is concurrently injured in about 10% of all ankle fractures.2 Additionally, 37–65% of all isolated Weber B fibula fractures have positive external rotation stress views demonstrating increased medial clear space (MCS).3

There has been significant and prolonged debate with regard to addressing the injured or ruptured deltoid. The deltoid can be managed with either repair, reconstruction, or indirect reduction to allow for healing. In Duvries’ Surgery of the Foot, published in 1959, primary deltoid repair in the setting of degeneration, sprains, and ankle fractures is described.4 Nearly 30 years later, Johnson et al. published on performing primary deltoid repair of the viable tissue in the setting of acute ankle fracture surgery.5 Around the same time, Kelikian described a technique performing deltoid ligament reconstruction in those cases with degenerative tissue, such as in adult-acquired flatfoot deformity.6

Regardless of multiple publications, the debate continues with regard to how best to address the insufficient deltoid ligament. Even though there is a high incidence of deltoid insufficiency, which may be due to medial clear space (MCS) widening, it is difficult to firmly establish the clinical significance, given the difficulty of accurately defining functional instability at the medial ankle. With generally small case series, it has been difficult to correlate objective radiographic measures of instability to subjective outcomes and long-term clinically relevant instability. Our group was tasked with presenting the argument for lack of necessity in addressing deltoid ligament injuries in the face of ankle fractures. In recent years, some authors have suggested that routine indirect reduction of deltoid ligament tears is standard of care, given the lack of robust studies suggesting otherwise.

CLASSIC STUDIES” AGAINST REPAIR

Some current foot and ankle literature may suggest that surgical repair or reconstruction of the deltoid ligament is unnecessary. More specifically, the argument is made that the medial ankle ligaments can be effectively disregarded in the setting of traumatic ankle fractures. The current standard of practice in not directly addressing the deltoid is primarily based off of a few studies with limited patient enrollment in the 1980s and 1990s.

Some surgeons suggest that the most important and clinically relevant aspect of ankle mortise stability comes from solely anatomically reducing the lateral column of the ankle (i.e., fibula fixation) as long as the MCS is statically restored. This relies on the assumption that the deltoid complex will adequately heal on its own without direct repair. De Souza et al. published their results in 1985 supporting such practice. They presented a group of 24 fibula fractures with concurrent MCS widening, of which 22 of 24 were treated with fibula ORIF without deltoid repair. All patients had “satisfactory” results at 3½-year follow-up. A good or satisfactory result could be obtained even if the patient had residual pain or deformity. Additionally, as much as 2 mm of lateral displacement
of the medial malleolus or the lateral malleolus was compatible with a “satisfactory” result, as was lateral displacement of the talus of up to 2 mm. 7

A few years later, Baird et al. reported their results of 2-year follow-up in 24 patients with fibula fracture and concurrent deltoid disruption. A total of 21 of 24 patients with deltoid disruption did not have deltoid repair. There was no reported ankle instability, and 19 patients had good or excellent outcomes with no restriction to running and no reported pain with ADLs. The three ankles that did have deltoid repair were simply described as “not as good of a result.” Additionally, these three patients who did not have great results were discounted on the basis of the group being “too small to run results.” Additionally, these three patients who did not have great results were discounted on the basis of the group being “too small for valid comparison.” 8

Harper, in 1988, demonstrated satisfactory results at 1-year follow-up with 36 lateral malleolar fractures with deltoid disruption despite the vast majority not being repaired. Nearly 20% of the patients reported fair or poor results, which did not distinguish medial ligamentous pain. 9 In 1989, Zeegers et al. reported on 28 fibula fractures with deltoid ruptures. Open reduction internal fixation (ORIF) of the fibula was performed without deltoid ligament repair in all 28 ankles. This authors reported 20 of 28 had “good or very good” results with no medial laxity, and only five ankles had MCS widening. Eight patients, or greater than 25%, did not have at least “good” results. Additionally, there was little commentary on the functional status of those patients with MCS widening. 10 In 1995, Stromsoe et al. performed ORIF in 50 stress-positive Weber B and Weber C ankle fractures with a ruptured deltoid ligament. These 50 ankles were randomized to undergo direct deltoid repair surgically or to ignore the medial ankle ligamentous injury. There were no reported outcome differences between the two groups other than an increased operative time in the repair group. 11

In 2012, Stewart et al. performed a cadaveric study to evaluate fracture stability in ankles with fibular osteotomy, deltoid transection, or both. This group axially loaded the ankles under the three conditions up to 50 kg in order to simulate weight-bearing. There was no appreciable radiographic shift in the talus under any of the three conditions. 12 The authors suggested that an axial load in and of itself must provide a critical inherent amount of stability to the ankle mortise. This may suggest that direct repair of the deltoid is unnecessary.

**Discussion**

Upon comprehensive literature review, there is some supporting evidence supporting not surgically repairing the deltoid in setting of ankle fractures. The current standard of practice in how to approach these ankle injuries is generally derived from the literature 30–40 years old and consists of relatively small patient series. In a broad sense, it appears that patients who did not have the deltoid surgically repaired did relatively well. However, on more detailed evaluation, some of the results suggest unsatisfactory results by today’s standards up to 30% of the time. Some of the outcomes may not be acceptable with current expectations. Given the prolonged debate of how to treat the insufficient deltoid, it has clearly not been delineated in available publications thus far.

The deltoid ligament’s contribution to maintenance of a concentrically reduced talus under the mortise is something that is less controversial. The two distinct layers of the deltoid complex provide differing contributions to ankle stabilization. Biomechanical cadaveric studies have demonstrated that transection of the superficial deltoid generally contributes to valgus instability, and transection of the deep deltoid generally contributes to external rotation instability. 13 The instability effectively results in the radiographic evidence of MCS widening or medial talar tilt.

Although demonstration of MCS widening may not be difficult to diagnose with radiographic studies, the clinical relevance is not quite as straightforward. In Zeegers study, 5 of the 28 ankle fractures demonstrated MCS widening, although there was no correlation with radiographic development of osteoarthritis. This group also made no comment on the function of those patients with MCS widening. 14 In 2014, Nortunen et al. performed an assessment of supination-external rotation-type ankle fractures and the utility of MRI to further evaluate the injury patterns. There were a total of 61 patients with lateral malleolar ankle fractures and MRI findings of deltoid ligament injury. In all 61 ankles with MRI evidence of deltoid injury, 33 had MCS widening and 28 did not. The study findings suggest that MRI findings of deltoid injury should not be used for clinical decision making, as not all injured deltoid ligaments exhibited instability medially. 14 More recently, Dabash et al. performed a systematic review on deltoid ligament repair in ankle fractures with five studies and 281 total patients included. A total of 137 patients underwent fibula ORIF with deltoid repair and 144 underwent fibula ORIF without deltoid repair. Both groups had similar functional and radiographic outcomes. 15

**Summary**

In conclusion, the deltoid ligament certainly does play a role in maintenance of the talus concentric reduction within the ankle mortise. The clinical relevance of surgically addressing the radiographic findings of MCS widening or talar tilt in the setting of ankle fractures is not as clear. In the classic external rotation ankle injury, an anatomic and stable fracture reduction and fixation of the fibula may restore normal ankle biomechanics to an acceptable level with predictable long-term outcomes. However, most of the current literature of not repairing the deltoid ligament does have significant limitations. Some of the studies demonstrate significant rates of less than optimal outcomes when not repairing the deltoid ligament in unstable ankle fractures, and the explanation for these results is not clearly delineated.

Axially loading the ankle certainly confers a component of stability. Additionally, repairing the deltoid ligament can provide another point of stability, and the repair can be done with generally low complications. It is difficult to know which patients would clinically benefit from a repair. Further investigation of this topic will more clearly delineate clinical outcomes and specific patient populations that may benefit from repair in the face of continued medial instability despite stable fibula fixation.

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