

The Diagnostic Accuracy of Mortise Radiographs and MRI in Predicting Deltoid Ligament Ruptures in Supination External Rotation Ankle Fractures

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Purpose: Supination external rotation (SER) ankle fractures represent the most common pattern of ankle injury, and operative indications for these injuries depend on the integrity of the medial structures. In the absence of a medial malleolus fracture, the status of the deep deltoid ligament should determine whether operative or conservative treatment is indicated. Despite the importance of assessing deep deltoid ligament injuries in these patients, the accuracy of common diagnostic tests has not been established. The objective of this study was to compare the ability of injury and stress radiographs and MRI to diagnose deep deltoid ligament ruptures in operative SER ankle fractures.

Methods: Patients who underwent open reduction and internal fixation of SER ankle fractures from 2010 to 2013 by a senior surgeon were identified from a prospective registry. Patients with medial malleolus fractures were excluded. Inclusion criteria consisted of all patients with an injury mortise ankle radiograph, manual stress test radiographs if the medial clear space (MCS) <5 mm on injury radiographs, preoperative ankle MRI, and intraoperative assessment of deep deltoid integrity by direct visualization. The MCS was considered positive for all values >5 mm on the injury or stress mortise radiographs. MRI analysis of the deep deltoid ligament injury was performed by two fellowship-trained musculoskeletal radiologists. Intraoperative direct visualization of the deltoid was performed using a medial ankle approach by a single surgeon who recorded the integrity of the deep deltoid.

Results: 53 patients met the inclusion and exclusion criteria. Based on intraoperative direct visualization, 46 patients (87%) had a complete rupture of the deep deltoid. Using intraoperative visualization as the gold standard, MCS measurements diagnosed a deep deltoid ligament rupture with 91% sensitivity, 14% specificity, and accuracy of 81%. MRI had a sensitivity of 80%, specificity of 100%, and accuracy of 83% to diagnose a deep deltoid rupture. In cases where the MCS was <5 mm on injury radiographs and stress tests were performed, MCS measurements were much less accurate than MRI in predicting deltoid ruptures (53% vs 80%, respectively). In contrast, an MCS measurement of greater than 5 mm on injury radiographs was a strong predictor of deltoid rupture (accuracy of 92%).

Conclusion: Diagnosing deep deltoid ligament injuries in SER ankle fractures often dictates treatment options; however, the ability of common diagnostic tests to predict these injuries is unknown. Using direct visualization of the deltoid ligament intraoperatively as the gold standard, these data support the diagnosis of deltoid ruptures when the MCS measurement is >5 mm on injury radiographs. However, when the MCS is <5 mm on injury radiographs, MRI has improved accuracy over stress tests. Given these data, we recommend proceeding with surgery when the MCS on injury radiographs is >5 mm without any additional stress

tests or advanced imaging. When the MCS is <5 mm, we recommend MRI analysis because of its increased accuracy and decreased false negatives compared to stress test. Understanding and improving our ability to diagnose deltoid ligament ruptures will contribute to effective treatment algorithms for patients with SER ankle fractures.