Correlation Between the Lauge-Hansen Classification and Ligament Injury in Ankle Fractures

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Purpose: The Lauge-Hansen classification system was intended to predict mechanisms and ligament injuries based on ankle fracture radiographs. Previous work has suggested that this classification has limitations in its ability to associate ligament injuries with ankle fracture patterns. The purpose of this study was to better define the ability of the Lauge-Hansen classification to predict ligament injury in ankle fractures using MRI and intraoperative findings.

Methods: We reviewed a prospectively collected database of patients who underwent operative treatment for ankle fractures from 2007-2013. All patients had injury radiographs, which were assigned a Lauge-Hansen classification by senior orthopaedic residents using the morphology of the fibula fracture and constellation of other fractures. Included patients all had preoperative MRI, and one of two experienced musculoskeletal MR radiologists evaluated the MR images for the integrity of the syndesmotic, talofibular, and deltoid ligaments. Operative treatment was performed by one senior attending trauma surgeon, who recorded a Lauge-Hansen classification for each patient based on intraoperative findings. The basis for the intraoperative classification included direct visualization of fractures and ligaments and the stability of the tibiotalar joint during intraoperative rotational stress tests. Comparisons were made between the predicted injuries based on the radiographic Lauge-Hansen classifications and the preoperative MRI analyses and intraoperative findings.

Results: 300 patients were included in the study, with an average patient age of 47.8 years (range, 15-88). On the basis of the Lauge-Hansen system, 228 (76%) were classified as supination–external rotation (SER), 42 (14%) were pronation–external rotation (PER), 11 (4%) were supination adduction, 2 (1%) were pronation abduction (PAB), and 17 (6%) were not classifiable. Of the 283 fractures that were classified into Lauge-Hansen categories, 254 (90%) had MRI readings of ligamentous injuries and fracture patterns consistent with the Lauge-Hansen predictions based on the sequential rotational mechanism. Intraoperative findings also highly correlated with the Lauge-Hansen class of ankle fracture, with nearly complete agreement. Comparing MRI and intraoperative findings revealed 37 (13%) of ankle fractures had different classifications by MRI than what was found intraoperatively, with 18 of these being classified as SER intraoperatively but unclassifiable by MRI. The stage of injury within the SER and PER classes had 88% agreement between injuries seen on MRI and findings intraoperatively.

Conclusion: Previous studies have reported mixed results regarding the reliability of the Lauge-Hansen system to predict ligament injuries associated with ankle fractures; however, these studies used limited numbers of patients with varying methods of assessing ligament injuries. In our large cohort of patients, comparing injury radiographs, preoperative MRI, and intraoperative findings suggested that the Lauge-Hansen system is an accurate predictor of ligamentous injuries. The predictions based on the Lauge-Hansen system can be useful for fracture reduction maneuvers as well as fixation planning.