Preoperative CT Scan for Posterior Malleolar Ankle Fractures: An Institutional Protocol Influences Surgical Decision Making

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Introduction/ Purpose: Controversy exists regarding operative indications, surgical approach, and optimal fixation construct for the posterior malleolar (PM) component of ankle fractures. Surgical decision making is often based upon the fragment size measured on the lateral ankle radiograph. CT imaging provides further detail and fracture characterization but is not routinely obtained for standard ankle fractures. The purpose of this study is to evaluate the role of preoperative CT scans in evaluating and treating PM fractures.

Methods: A protocol was initiated at the authors' institution to obtain preoperative CT scans for all ankle fractures with an associated PM fragment. The CT scans were reviewed to characterize the PM fracture. Primary characteristics recorded were single fragment or multifragmentary PM, loose intra-articular fragments, impacted articular fragments, and percentage of the articular surface involved. The involvement of the articular surface was measured as the maximum percent noted on axial, sagittal, or coronal images. Details obtained from the CT scans were compared to the lateral projection on preoperative plain radiographs. This information was then compared to pre-protocol ankle fractures with a PM component. The surgical approach, fixation technique, and quality of reduction were recorded for all pre- and postprotocol patients. Surgical decisions and quality of PM reduction were compared between the two cohorts.

Results: From 2012-2015, preoperative CT scans were obtained for 72 ankle fractures with PM components according to an institutional protocol. The average size of the PM fracture measured on lateral radiographs was 24.1% of the total plafond compared to 26.9% ($P = 0.13$) measured on CT scan. Preoperative CT scans noted loose or impacted intra-articular fragments in 25/72 cases (34.7%) that were not seen on plain radiographs. 5/72 patients (6.9%) sustained multifragmentary (≥2 fragments) PM fractures appreciated on radiographs. An additional 26 patients (36.1%) had multifragmentary PM fractures that were not appreciated on plain radiographs. A total of 30 (41.7%) fractures were approached using posterior-based surgical exposures. PM fractures treated with direct reduction had significantly less residual displacement than those treated through indirect reduction techniques (0.4 mm vs 1.0 mm; $P = 0.01$). A cohort of 46 ankle fractures with a PM component was analyzed from 2010-2011 prior to the institutional CT scan protocol. In this cohort, a posterior-based surgical exposure was employed in 3 of 46 cases (6.5%) with a residual displacement of 0.7 mm. Approaches that utilized a direct lateral approach had a residual displacement of 1.2 mm.

Conclusion: An institutional protocol to obtain CT scans for all ankle fractures with a PM component resulted in significantly more posterior-based surgical exposures and direct reductions as compared to pre-protocol cases. This resulted in an improvement in the qual-

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ity of PM fragment reduction. Ankle fractures with a PM component can have complex, multifragmentary patterns. While the measured size of the posterior fragment was similar on all imaging techniques, CT scans demonstrated significantly more fracture detail including impacted articular surface, loose fragments, and multifragmentary PM fractures not appreciated on plain radiographs.