

Incidence, Location, and Risk Factors for Articular Malreductions of the Tibial Plateau

Brad Meulenkamp, MD; Desy Nicholas, MD; Ryan Martin, MD; Shannon Puloski, MD; Paul Duffy, MD; Rob Korley, MD; Richard Buckley, MD; University of Calgary, Alberta, CANADA

Background/Purpose: Tibial plateau fractures represent 1% of all fractures, with 70% involving the lateral plateau. Anatomic reduction of the articular surface is known to be associated with superior outcomes. The sensitivity of fluoroscopy has been questioned with respect to the accuracy of detecting malreductions, and the articular malreduction rate of these injuries is not well defined. The purpose of this study was to review CT scans following surgical fixation of tibial plateau fractures to define the incidence of articular malreduction and to map the location of the malreductions

Methods: De-identified postoperative CT scans were reviewed to identify tibial plateau malreductions with a step or gap greater than 2 mm, or condylar width greater than 5 mm. Three independent assessors reviewed the scans meeting criteria using Osirix DICOM (Digital Imaging and Communications in Medicine) software. Steps and gaps were mapped onto the axial sequence at the level of the joint line. Images were then matched to side and overlaid as best fit in Photoshop software to create a map of malreductions. A grid was created to divide the medial and lateral plateaus into quadrants to identify the density of malreductions by location. A multivariate regression model was used to assess risk factors for malreduction.

Results: 65 postoperative CT scans were reviewed. 21 reductions had a step or gap more than 2 mm for a malreduction incidence of 32.3%. The incidence in patients undergoing submeniscal arthrotomy or fluoroscopic-assisted reduction was 16.6% and 41.4%, respectively ($P < 0.001$). Side of injury, age, BMI (body mass index), AO fracture type, and use of locking plates were not predictive of malreduction. Malreductions were heavily weighted to the posterolateral tibial plateau.

Conclusion: The incidence of articular malreductions was high at 32.3%. Fluoroscopic reduction alone was a predictor for articular malreduction with most malreductions located in the posterolateral tibial plateau. Single orthogonal fluoroscopic views are likely inadequate to detect all malreductions and further work is needed to define optimal intraoperative imaging and techniques to address this area of the plateau.