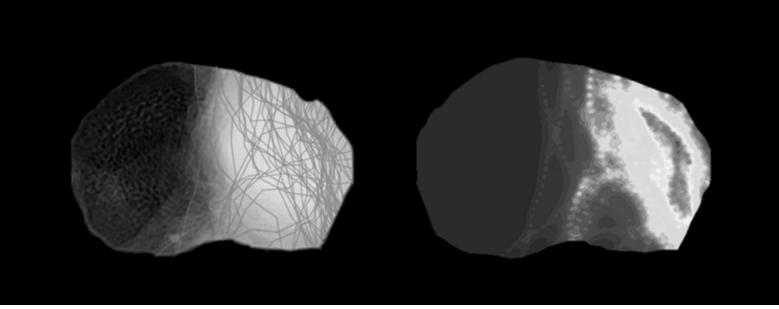


**Fracture Mapping of the Tibial Plateau***Rik J. Molenaars, MSc; Job N. Doornberg, MD, PhD; Jos J. Mellema, MD;**Peter Kloen, MD, PhD;**Department of Orthopaedic Surgery, Academic Medical Center; Orthotrauma Research Center, Amsterdam, The Netherlands*

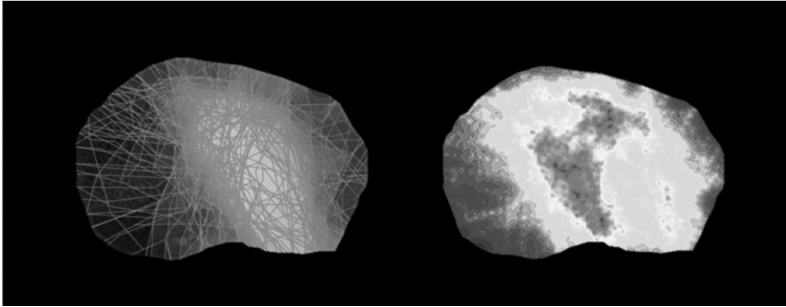
**Background/Purpose:** To date, morphologic characteristics of tibial plateau fractures have been studied using standardized imaging techniques. Two recent studies applied a novel technique of fracture mapping to characterize pilon and scapula fractures with two-dimensional fracture mapping. Using CT, maps of fracture lines and zones of comminution were superimposed to identify major and minor fracture lines and define fracture patterns. In the current study, this novel technique is applied in a large series of tibial plateau fractures, in order to (1) visualize fracture characteristics and morphology, and (2) help define predictable tibial plateau fracture patterns.

**Methods:** A consecutive series of 127 tibial plateau fractures were included in this study. Fractures were classified according to the Schatzker classification (type I to VI) by six observers in consensus agreement. The fracture mapping technique was used to graphically superimpose fracture lines (blue) and zones of comminution (yellow) onto an axial template CT of an intact tibial plateau, resulting in a frequency diagram based on density. First, fracture mapping was applied to well defined simple tibial plateau fracture patterns (Schatzker I to III) to create the "Simple" plateau map. Second, complex tibial plateau fractures (Schatzker IV to VI) were analyzed to create the "Complex" plateau map. MATLAB software was used to convert initial fracture maps into fracture heat maps to enhance visualization of fracture patterns. The analysis was descriptive.

**Results:** We included 64 simple fractures, and 63 complex fractures, in 73 females and 54 males, with an average age of 47 years (ranges, 17-91). Fractures classified as Schatzker I to III included 6 type I (4.7%), 48 type II (37.8%), and 10 type III (7.9%). Complex Schatzker IV to VI fractures included 15 type IV (11.8%), 26 type V (20.5%), and 22 type VI (17.3%). Fracture mapping of Schatzker I, II, and III type fractures resulted in predictable and reproducible patterns of fracture lines and zones of comminution, largely in accordance with Schatzker's original description. The "Complex" plateau map shows a complicated and diverse diagram of fracture lines, and zones of comminution, beyond Schatzker's original description. Descriptive analysis revealed reproducible major components of complex injury: (1) the clustering of posteromedial-oriented oblique fracture lines, supporting the importance of the "posterior column" and posterior-type shearing fractures not included in Schatzker's original classification; (2) lateral-sided depression with split fragments; and (3) clustering of "U-shaped" fracture lines of the anterior tuberosity fragment in between (1) and (2).



“Simple” plateau map (Schatzker I, II, III)



“Complex” plateau map (Schatzker IV, V, VI)

**Conclusion:** The “Simple” plateau map supports our current understanding of patho-anatomy and etiology: knee extension in combination with forced valgus stress results in impression of the lateral convex femur condyle into the lateral convex articular surface of the tibial plateau, leading to the “classic” Schatzker type I, II, or III fractures. The “Complex” plateau map reveals reproducible patterns of fracture lines in which the clustering of posteromedial-oriented oblique fracture lines starting from the posterior eminence is salient. Furthermore, the medial concave articular surface of the tibial plateau seems less frequently involved in complex tibial plateau fractures than the lateral articular surface. In all, the novel “Cole” fracture mapping technique of the tibial plateau offers promising new opportunities to qualify and characterize these challenging fractures.

- The FDA has not cleared this drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off label” use). For full information, refer to page 600.