

In Tibial Plateau Fracture Patients, the Contralateral Knee Serves as a Better Anatomical Template to Restore Articular Height and Width than Historical Norms

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Purpose: Restoration of pre-injury knee anatomy, i.e., anatomic reduction, is a goal of tibial plateau fracture management. Condylar width and articular height are anatomic parameters commonly considered. Unscientific historical literature suggests that the lateral articular surface is higher than the medial surface, and tibial condylar width is typically equal to femoral condylar width. However, these anatomic relationships may not be true for all patients. This study assessed variation in articular height and tibial condylar width among patients and determined if the contralateral uninjured knee would be an accurate template for the injured knee.

Methods: Following Institutional Review Board (IRB) approval, calibrated bilateral whole-body standing anteroposterior (AP) radiographs from 2018 to 2022 were retrospectively reviewed. Patients with knee pathology or malrotated images were excluded. Relative heights of medial and lateral articular surfaces and relative width of the tibial plateau and femoral condyles were measured. Both patient-to-patient and side-to-side differences were evaluated.

Results: In total, 206 patients met eligibility. A random sample of 100 patients was analyzed (mean age: 53 years [SD = 16.6, 18–82]; female: 63%). Patient-to-Patient Variation: The lateral tibial articular surface averaged 3.1 mm higher (SD = 1.9 mm) than the ipsilateral medial surface, but there was substantial variability from patient to patient (range from lateral: 1.5 mm lower to 7.7 mm higher). The lateral tibial condyle width averaged 3.2 mm wider (SD = 1.7 mm) than the femoral condyle (range: 1.4 mm narrower to 8.9 mm wider). The medial tibial condyle width averaged 0.9 mm narrower (SD = 1.9 mm) than the femoral condyle (range: 6.8 mm narrower to 3.3 mm wider). Side-to-Side Variation: The lateral tibial articular surface averaged only 0.7 mm different (lower) than the same patient's opposite side (SD = 1.3 mm). The lateral tibial condyle averaged only 0.3 mm different (narrower) than the same patient's opposite side (SD = 1.5 mm). The medial tibial condyle averaged only 0.03 mm different (narrower) than the same patient's opposite side (SD = 1.5 mm).

Conclusion: Substantial patient-to-patient anatomic variation exists in the tibial plateau. The contralateral knee can serve as an accurate anatomic template for articular height and width restoration in patients with tibial plateau fractures.