

## Unicompartmental Degenerative Arthrosis of the Knee Associated with Malunions Correlates Closely with Lower Limb Coronal Plane Malalignment

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**Purpose:** Malalignment is believed to influence initiation and progression of knee arthrosis by abnormal joint loading. However, to date there has been no clearly established correlation between severity of malalignment and resultant arthrosis. Fracture malunions provide a unique opportunity to evaluate the long-term effects of malalignment on arthritis, allowing it to be studied independent of other potential etiologies. For this study a highly selected cohort was identified specifically to limit confounding as much as possible.

**Methods:** All 1160 available digital long leg radiographs (over a 10-year period) in adults at a major metropolitan tertiary referral medical center were screened to identify 146 post-traumatic candidates. Intra-articular fractures, bilateral injuries, or those with associated ligamentous instability were excluded, yielding a refined subset of 27 patients. This cohort had isolated femoral/tibial malunions, were at least 10 years post-injury, and where the malalignment was considered of sufficient magnitude (arbitrarily selected mechanical axis deviation [MAD]  $<0$  mm valgus or  $>20$  mm varus). Alignment measurements were recorded by 3 independent reviewers, as well as osteoarthritis grading scores for each tibiofemoral compartment in the affected and contralateral knee. In varus knees the medial compartment was defined as theoretically affected, and opposite for valgus. Unicompartmental arthritis grades were compared via 1-way analysis of variance with Tukey honestly significant difference test. The data were plotted for visualization of trends, and analyzed with linear regression models against time since injury and MAD as covariates.

**Results:** In varus malalignment there was a significantly greater mean arthritis score in the medial compartment compared to the contralateral medial compartment, with Osteoarthritis Research Society International (OARSI) scores 5.69 versus 3.86 (95% confidence interval [CI] for difference 0.32, 3.35;  $P < 0.05$ ) and Kellgren-Lawrence 2.92 versus 1.92 (95% CI 0.38, 1.62;  $P < 0.0005$ ). There was a similar trend in valgus knees, but the results did not achieve statistical significance. In a linear regression model without interaction, OARSI arthritis score was significantly correlated with absolute MAD (0.7 grades per 10-mm MAD,  $P < 0.0005$ ) and time (0.6 OARSI grades per decade,  $P = 0.01$ ). An interaction term between MAD and time together with deformity was significant when included in the linear model.

**Conclusion:** Malalignment consistently results in more advanced arthritis scores in the overloaded compartment, most likely related to abnormal loading across the knee. The degree of malalignment and time with deformity after posttraumatic malunion positively correlates with degree of arthritis using OARSI grading. Varus MAD  $>10$  mm is increasingly more likely to produce clinically significant isolated medial compartment arthritis with additional time.