Assessment of Varus and Valgus Anatomic Variability and Comparison of Coronal and Sagittal Plane Angles

Background: Prior work has measured coronal and sagittal knee angles, but their relationship remains unclear. We performed a retrospective study of a large non-osteoarthritic cohort to assess correlations between coronal and sagittal angles and demographic variables to improve preoperative planning.

Method: Hip-Knee-Ankle angle (HKA), mechanical lateral distal femoral angle (mLDFA), mechanical median proximal tibial angle (mMPTA), joint line convergence angle (JLCA), posterior distal femoral angle (PDFA), and posterior proximal tibial angle (PPTA) were obtained via CT in 206 patients using two-dimensional analysis of one knee per patient. coronal plane alignment of the knee (CPAK) classification was determined using arithmetic hip-knee-ankle angle (aHKA) and joint line obliquity (JLO). Correlations among angles and demographics were tested with general linear models. CPAK associations with sagittal angles were assessed with a Kruskal-Wallace test. Medial–lateral differences in PDFA and PPTA were evaluated with an unpaired t-test.

Results: Comparison of age, race, height, BMI, PDFA, and PPTA to HKA varus/valgus alignment showed no associations. CPAK classifications were not found to have significant association with median PDFA or PPTA angle values. Controlling demographic variables, patients identifying as white had a lower PPTA lateral value. There was no significant association between lateral PDFA and mLDFA or between medial PDFA and mLDFA. No significant association was found between lateral PPTA and mMPTA or between medial PPTA and mMPTA. There was a significant difference in PPTA angles measured medially or laterally ($p < 0.01$) and a significant difference in PDFA angles measured medially or laterally ($p < 0.01$).

Conclusion: These results demonstrate that coronal plane angles and CPAK classification appear to be independent of sagittal plane angles PPTA and PDFA. By measuring coronal and sagittal plane angles in a large, non-osteoarthritic cohort, we provide essential normative data to guide alignment decisions in TKA.

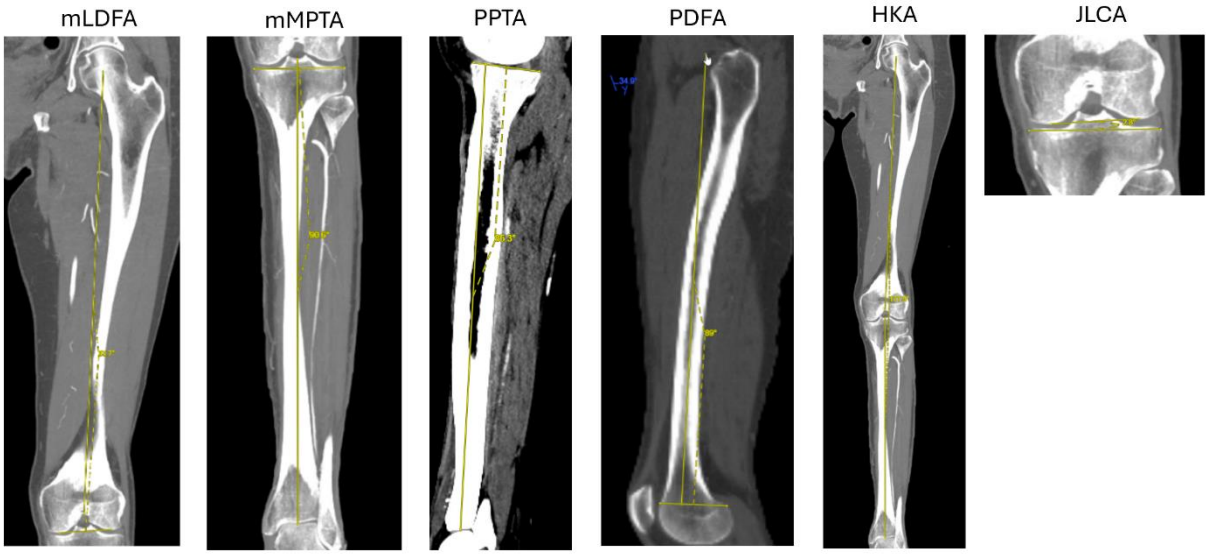

Figure 1: *Examples of each measured angle*