

Radiographic Evaluation of the Knee in Community Residents

— Findings from the Odai Cohort Study —

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INTRODUCTION: Various factors have been reported to be associated with the onset of knee osteoarthritis (OA), including age, sex, [1] body weight, [2] ethnicity, occupation [3], and lower-limb muscle strength [4]. Knee alignment plays an important role in the development of knee OA, and multiple alignment parameters are thought to be influential [5]. Using data from a musculoskeletal cohort study, we measured joint line angles on standing anteroposterior knee radiographs to investigate the factors associated with knee OA.

METHODS: The Odai Musculoskeletal Health Examination is a cohort study targeting musculoskeletal health, conducted biennially since 1997, involving residents of Miyagawa Village (now Odai Town), Mie Prefecture. OA was defined as Kellgren-Lawrence (KL) grade 0-1 = normal knee, and KL grade ≥ 2 = OA knee. The study population consisted of 332 participants in the 13th Odai Health Examination, with 655 knees analyzed after excluding post-total knee arthroplasty cases (125 men, 207 women). The parameters measured were:

- MPTA (Medial Proximal Tibial Angle): angle between the tibial mechanical axis and the tibial plateau (Figure 1.a). - aLDFA (anatomical Lateral Distal Femoral Angle): angle between the femoral anatomical axis and the femoral condyles (Figure 1.b). Pearson's correlation coefficients were used to assess the relationships between age and MPTA/aLDFA by sex. In addition, mean values of MPTA and aLDFA were compared across KL grades using t-tests.

RESULTS Of the 655 knees, 433 were normal and 222 had OA. Correlation with age: In women, aLDFA showed a slight decreasing trend with age ($r = -0.15$), but no significant correlation was observed. No significant correlation was found between age and MPTA/aLDFA in men. Comparison by KL grade: In men, no significant differences were found between KL0 and other groups in either MPTA or aLDFA. In women, MPTA was significantly smaller in KL4 knees compared with normal knees. No other significant differences were detected.

DISCUSSION: Factors reported to influence knee joint line alignment include surgical interventions, OA progression, and alignment changes in adjacent joints (hip/ankle). A positive correlation between age and aLDFA has been reported, but no literature exists regarding age and MPTA. Previous studies suggested that MPTA decreases significantly in OA knees, whereas aLDFA does not differ significantly between OA and non-OA groups. In this study, we found that MPTA was significantly reduced in end-stage (KL4) OA knees. aLDFA showed no significant differences between normal and OA groups, consistent with prior studies. No correlations were observed between age and MPTA/aLDFA. These findings suggest an association between reduced MPTA and end-stage OA. However, it remains unclear whether decreased MPTA leads to OA progression, or whether advanced OA causes MPTA reduction. Longitudinal studies are required to clarify this causal relationship.

SIGNIFICANCE: In this cross-sectional study, MPTA was significantly smaller in end-stage OA knees compared with normal knees. Future longitudinal studies are needed to determine whether lower MPTA predisposes to OA progression, or whether OA progression itself results in decreased MPTA.

REFERENCES: [1] D.T Felson et al. Arthritis Rheum.1987, [2] Yoshimura N et al. J Rheumatol.2004, [3] Yosida S et al. J Rheumatol.2002, [4] J Andersson et al. Am J Epidemiol.1988, [5] C Slemenda et al. Arthritis Rheum.1998, [6] Mochizuki T et al. J Exp Orthop.2019

Figure 1.



