High tibiofemoral rotations: Why the popliteus may be an important consideration

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INTRODUCTION: High tibiofemoral rotation is a central cause of lateral patellar instability, but the source of this rotation is unknown. The popliteus is known to resist external tibial rotation, however its impact on the high rotation seen in patellar unstable patients has yet to be explored in the literature. This study evaluates the relationship between tibiofemoral rotation and the stretch of the popliteus to assess how the popliteus behaves in response to and is affected by tibiofemoral rotation.

METHODS: MRIs taken between the years 2015 to 2024 were analyzed from two matched cohorts: patellofemoral instability (PFI) patients and controls. Tibiofemoral rotation was measured by recording the angle between the femoral and tibial condylar lines. The popliteus stretch was measured by subtracting the distance from the popliteus sulcus to the femoral condyle and the sulcus to the posterior tibia on sagittal slices. Interrater reliability was calculated using interclass correlation coefficients (ICC), a regression analysis was used to describe relationships between the metrics, and a Mann-Whitney U test was used to compare median differences. A significance level of 0.05 was used for all analyses.

RESULTS: Seventy total knees were included, 35 PFI patients and 35 controls. The ICC for the rotation and stretch were 0.87 (CI: 0.77 - 0.93) and 0.94 (CI: 0.89 - 0.97) respectively. There was a significant difference between the PFI and control group for the rotation (p<0.001) and stretch (p=0.002). There were statistically significant positive relationships between rotation and stretch overall (r2=0.50, p<0.001) for the PFI patient group (r2 =0.37, p<0.001) and for the control group (r2 =.52, p<.001).

DISCUSSION AND CONCLUSION: There is a lack of understanding of the source of high external tibiofemoral rotation in patellar instability and a need for reliable treatment options. This study found a significant relationship between popliteus stretch and tibiofemoral rotation. Thus, clinicians should further research the popliteus and explore the possibility of surgical popliteus advancement to treat patellar instability with high rotation.







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