

Position Of Medial Femoral Condyle Related To PCL Tightness In Knee Osteoarthritis

Orthopaedics / Knee & Lower Leg / Joint Replacement - Primary

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Background

In the normal knee, the medial pivot pattern is observed, where the medial femoral condyle remains relatively fixed during flexion from 90° to 120°, and begins to roll back after 130° of flexion. At 90° of flexion, the medial tibiofemoral contact point (CP) is located around the midpoint of the ACL insertion, or approximately $68 \pm 6\%$ from the anterior tibial plateau. When the knee flexes to 120°, the CP moves posteriorly by about 1.4 ± 2.3 mm.

The posterior cruciate ligament (PCL) is nearly isometric below 135° of flexion, with tension beginning at 90° and reaching a maximum at 120°. The femoral attachment of the PCL plays a key role in determining CP translation.

Knee osteoarthritis (OA) is a whole-joint disease involving degenerative changes in the cartilage, meniscus, and ligaments. The PCL shows degeneration starting from its proximal portion, leading to reduced elasticity and functional tightness, which alters knee biomechanics. Consequently, in OA knees, the CP may shift more posteriorly during flexion between 90° and 120°.

However, evidence regarding PCL tightness in knee OA remains limited. Therefore, this study aims to evaluate the classification of PCL tightness and its related factors.

Objectives

This study aims to classify PCL tightness in knee osteoarthritis based on the translation of the medial tibiofemoral contact point during 90–120° of knee flexion.

Study Design & Methods

This prospective study included patients with knee osteoarthritis who underwent total knee arthroplasty at the department of orthopedics, Phramongkutklo hospital. Demographic data, including sex, age, Kellgren–Lawrence grade, and range of motion, were collected. After performing medial parapatellar approach, the medial tibiofemoral contact point during 90°–120° of knee flexion was identified and classified according to the degree of PCL tightness by two senior staff hip & knee arthroplasty and one hip & knee arthroplasty fellow.

Results

A total of 168 patients with knee osteoarthritis who underwent total knee arthroplasty between October 2025, and September 2026 were included in this study. The distribution of PCL stations –1, 0, 1, 2, and 3 was 0.60%, 14.29%, 30.36%, 35.71%, and 19.05%, respectively. Accordingly, PCL station 2 represented the most prevalent classification of PCL tightness. One-way analysis of variance (ANOVA) revealed a statistically significant association between PCL station and range of motion ($p < 0.05$). Moreover, Spearman's rho correlation analysis demonstrated a negative correlation between PCL station and flexion contracture.

Conclusions

This study classified PCL tightness in patients with knee osteoarthritis and found that the most common classification was PCL station 2. Furthermore, one-way ANOVA revealed a statistically significant difference between PCL station and range of motion ($p < 0.05$), while Spearman's rho correlation analysis demonstrated a negative correlation between PCL station and flexion contracture. In the future, the PCL tightness classification may help improve intraoperative evaluation during total knee arthroplasty and provide insights into the related clinical factors identified in this study.

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