INTRODUCTION: Many patients having total knee arthroplasty (TKA) without scar pain and back-related problem avoid kneeling for fear of harming the prosthesis and lack of information (2). However, kneeling is required for many activities of daily living and several jobs. More than 50% of patients with TKA consider kneeling as important (1). We concern about the effect of the load, which is exerted on the patellofemoral joint and the retained posterior cruciate ligament (PCL), or the post-cam mechanism during kneeling. In this study, we evaluated the 3-D position and orientation of the TKA components during kneeling in cruciate retaining (CR) and posterior stabilized (PS) TKAs using image-matching method.

METHODS: Between January 2001 and December 2003, 84 CR TKAs (Encore, Foundation knee) and 102 PS TKAs (Zimmer, Nexgen LPS) were performed at our hospital. 20 TKAs comprised the study group. 10 TKAs in 8 patients received CR TKA and 10 TKAs in 6 patients received PS TKA. There were 2 men and 12 women with an average follow-up of 16.7 months. The average age at the time of surgery was 72.0 years. The diagnoses were osteoarthritis in 16 knees and rheumatoid arthritis in 4 knees. The maximum knee extension / flexion (medial = 5.47mm, lateral = 6.64mm) were longer than in CR TKA (medial = 2.78mm, lateral = -7.52mm) with both condyles (medial = -4.38mm, lateral = -9.31mm) were more posterior than in CR TKA and -3.15° of flexion in PS TKA. Post-cam contact position translated downward (1.37mm) and medial (2.36mm) from 90° to 120° of flexion in PS TKA. The condylar lift-off (> 1.0mm) was recognized at both CR and PS TKAs and both medial and lateral sides. Post-cam contact position translated downward (1.37mm) and medial (2.36mm) from 90° to 120° of flexion (Fig. 3).

DISCUSSION: During kneeling the ground reaction force on the tibial tuberosity causes a posterior shear of the tibia. Without the retained PCL and the post-cam mechanism, the femoral component would not translate posterior. In this study, kneeling at > 90° of flexion produced a posterior femoral rollback at both designs. It could be assumed that the retained PCL and the post-cam mechanism were functional. In PS TKA, contact positions at 90° of flexion were more posterior, and distance of rollback with both condyles was longer compared to CR TKA. Result of tibiofemoral AP contact positions during kneeling was similar to a previously published study (3). The PS TKA was much preferable to the CR TKA because the patellofemoral contact force decreased. Frequently performances of kneeling may cause dysfunction of the retained PCL and the post-cam mechanism with time because the retained PCL and the post-cam mechanism receive the significant load.

In PS TKA, the ML contact positions of both condyles were medial. The post-cam mechanism with an external femoral rotation produced a medial femoral sliding motion. Excessive sliding motion might occur an impingement of the internal surface of the femoral condyle against the side of the post. Due to posterior rollback, external rotation, and medial sliding motion of a femoral component contact area at 120° of flexion in PS TKA was restricted (Fig. 2). In addition to this, lift-off was recognized. However, load on polyethylene insert is smaller during kneeling compared to gait and step-up activities. There have not been any in vivo studies that focus attention on post-cam contact position in PS TKA. Post-cam contact position during kneeling translated downward and medial. External femoral rotation from 90° to 120° of flexion made medial translation of the post-cam contact position. We should care about the severe wear of posterior medial corner of the post because of the edge loading. Posterior dislocation of the tibial component and breakage of the post was low potential because of the downward translation.

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