

Femoral Trochlear Groove Cartilage Damage after Open-Wedge High Tibial Osteotomy is Associated with Change in Patellar Height Relative to the Femoral Condyle Evaluated with the Modified Blumensaat Method

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INTRODUCTION:

Medial open-wedge high tibial osteotomy (OWHTO) has recently become a widespread treatment option and is performed for isolated medial compartment osteoarthritis or osteonecrosis of the knee and correction of varus deformity of the entire lower extremity. OWHTO may induce sagittal parameter changes, including changes in the tibial posterior slope (TPS) and patellar height. The purpose of this study was to identify radiographic parameters, including patellar height (PH), associated with patellofemoral (PF) cartilage damage after OWHTO.

METHODS:

Nineteen patients (23 knees) who underwent primary OWHTO and subsequent implant removal surgery, including second-look arthroscopy for evaluation of the PF cartilage condition, between 2007 and 2020, were enrolled. Subjects were divided into two groups according to whether PF cartilage damage worsened. TPS and PH parameters, including the Insall–Salvati (ISI), Blackburne–Peel (BPI), Caton–Deschamps (CDI), and modified Blumensaat (MBI) indices, were measured on lateral knee radiographs. The hip-knee-ankle and medial proximal tibial angles were measured using an anteroposterior radiograph of the entire leg. The extent of the change from preoperative to postoperative (Δ) was also calculated for all indices.

RESULTS:

The mean time from OWHTO to removal surgery was 21.1 ± 7.7 months (range: 13–35 months) after primary OWHTO. Eleven knees (47.8%) had worsening cartilage conditions in the femoral trochlear groove, with > 1 -degree change in the International Cartilage Repair Society grade. The independent variable of radiographic measures for predicting PF cartilage deterioration, determined by binomial logistic regression analysis, was Δ MBI (95% confidence interval [CI]: $4.03 \times 10^{-10} - 0.185$, $p=0.022$). According to receiver operating characteristic curve analysis, PF cartilage damage tended to progress in Δ MBI < -0.145 . There were no significant difference in ISI, BPI, and CDI between the groups.

In subanalysis between the groups depending on whether patients with deterioration of PF cartilage damage or without deterioration of PF cartilage damage, Δ MBI in patients with deterioration of PF cartilage damage (-0.17 ± 0.15) was lower than that in patients without deterioration of PF cartilage damage (0.03 ± 0.13) ($p=0.003$). The postoperative TPS in patients with deterioration of PF cartilage damage ($11.45^\circ \pm 2.98$) was greater than that in patients without deterioration of PF cartilage damage ($8.17^\circ \pm 4.02$) ($p=0.025$).

DISCUSSION AND CONCLUSION:

This study showed that cartilage damage in the femoral trochlear groove tended to progress after OWHTO, and a greater descent of the PH relative to the femoral condyle may cause deterioration of the femoral trochlear groove cartilage condition. The association between the change in MBI and worsening ICRS grade in the femoral trochlear groove after OWHTO was revealed.

PF cartilage damage tends to progress after OWHTO. Δ MBI is a significant factor in predicting worsening PF cartilage condition; however, we should pay attention to the excessive high in TPS because intraoperative control of MBI is impossible.