Alignment Changes after Open-Wedge High Tibial Osteotomy May Yield the Offloading in the Patellofemoral Joint: A SPECT/CT Analysis

Byung Hoon Lee[1], Jaeang Sim[2], Jungmin Shin[3]
[1]Gachon University, Gil Medical Center, [2]Gachon University Gil Med Center, [3]Rheumatology

INTRODUCTION:
The patellofemoral (PF) joint might be adversely affected by medial open-wedge high tibial osteotomy (OWHTO). This study aimed to evaluate PF compartmental changes using combined single-photon emission computed tomography and conventional computed tomography (SPECT/CT) after OWHTO, a technique that provides clinical guidance about PF joint pressure and force.
METHODS:
Fifty-three consecutive patients (56 knees) with medial osteoarthritis and varus malalignment >5° were treated using OWHTO. Patients with a minimum of 2-year follow-up period were eligible for inclusion. Radiographic parameters presenting patellar positions were evaluated. Chondral lesion changes in a second-look arthroscopic examination were evaluated, and arthritic grading of the PF joint was also recorded on patellar Merchant radiography using the Kellgren-Lawrence classification. The PF compartmental changes in SPECT/CT after OWHTO were evaluated in all patients. Scintigraphic uptakes were graded on four scales. Patients were divided into the improved and unimproved groups according to the PF compartmental grade using the SPECT/CT uptake grading system.
RESULTS:
At a mean follow-up period of 47.0 months (range, 25–74 months), the mean mechanical femorotibial angle changed significantly from varus 6.3° (range, 5–12°) to valgus 2.6° (range, 0–8°) ($p < 0.001$). Radiological parameters presenting patellar positions including tibial slope, patellar convergence angle, and lateral tilt angle did not show significant changes at preoperative versus 2-year follow-up. However, patellar height was significantly decreased (mean difference, 0.07 ± 0.14, $P = 0.001$ in the Blackburn–Peel index; 0.32 ± 0.23, $P < 0.001$ in the modified Insall-*Salvati* ratio). The average tibial tubercle to trochlear groove (TT-TG) distance was significantly decreased from 14.1 mm to 12.2 mm ($p < 0.001$). Q angle also was significantly decreased from 9.8° to 7.7° ($p = 0.008$). Chondral lesions of the patella and trochlear groove revealed significant deterioration; at 2 years after OWHTO, radiographically arthritic grades of the PF joints worsened significantly ($p = 0.007$). Meanwhile, scintigraphic uptake in the PF joint was significantly lower at 2 years postoperative than after the index operation (from 2 to 1) ($p < 0.001$). Only four of 56 patients (7.1%) showed increased uptakes. Comparing between the improved and unimproved groups classified by scintigraphic uptake changes, changes in the cartilage status on the patellar undersurface and TT-TG distance were the most significant predictive factors of increased scintigraphic uptake in the PF joint after OWHTO.
DISCUSSION AND CONCLUSION:
Alignment correction by OWHTO may yield the offloading in the PF compartment and should be considered in the determinations of surgical indications of OWHTO.