Changes in the Ankle Joint and Hindfoot Alignment Following Varus Deformity Correction of the Knee with Total Knee Arthroplasty

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Category: Ankle, Hindfoot

Keywords: varus deformity, total knee arthroplasty, ankle alignment, hindfoot alignment

Introduction/Purpose: Compensatory changes occur in the ankle joint and the subtalar joint of the hindfoot to maintain neutral alignment in coronal plane when varus or valgus deformity is present in the knee joint. The purpose of this study is (1) to analyze how the ankle and hindfoot joint compensate the changes in mechanical axis that occur with varus deformity of the knee, (2) to analyze the changes in ankle and hindfoot joint alignment when mechanical axis alignment is corrected by correction of varus deformity of the knee with total knee arthroplasty (TKA), and (3) to radiographically evaluate the degree of changes in ankle and hindfoot joint alignment according to the degree of varus deformity correction.

Methods: 375 knees that underwent TKA with varus deformity were prospectively studied. The degree of varus deformity of the knee joint was measured in standing long leg anteroposterior views taken before and 6 months after TKA. The angle between the ground surface and the superior dome of the talus, and the talar tilt were measured in standing ankle joint anteroposterior views taken before and 6 months after TKA. Preoperative tibial anterior surface angle and tibial lateral surface angle were measured. Hindfoot alignment was evaluated in hindfoot alignment views taken before and 6 months after operation by measuring the heel ratio, the heel angle, and the heel distance. These measurements were used to analyze the change in ankle joint and hindfoot alignment between before and 6 months after varus deformity correction. The relationship between the degree of varus knee correction and the change in ankle joint and hindfoot alignment was also analyzed.

Results: The mean mechanical angle of the knee changed from varus 10.6±5.1° before operation to varus 0.1±3.2° after operation, which was statistically significant (P<0.001). The mean correction angle was 10.6±4.6°. Before operation, the mean tibial anterior surface angle was 89.9±3.1° and the mean tibial lateral surface angle was 81.5±2.9°. Talar tilt changed significantly from 0.3±2.0° to 0.0±1.6°, implying a varus change of the ankle joint (P=0.002). All of the evaluated hindfoot alignment parameters demonstrated a significant varus change (P<0.001), as the heel ratio changed from 0.2±0.2 preoperatively to 0.3±0.2 postoperatively (P<0.001), the heel angle changed from 11.4±7.0° preoperatively to 5.0±7.4°postoperatively (P<0.001), and the heel distance changed from 10.5±6.6mm preoperatively to 6.4±6.4mm postoperatively (P<0.000).

Conclusion: Varus knee deformity tended to be associated with valgus deformity of the ankle joint and hindfoot alignment. Alignment in the ankle joint and the hindfoot both changed to a varus trend after correction of varus deformity of the knee. Such changes in ankle joint and hindfoot alignment are considered to be due to the compensatory changes following alterations in lower limb alignment. Therefore, it is necessary to perform a meticulous examination of the ankle joint as well as the knee joint and consider subsequent alteration of ankle joint and hindfoot alignment before surgical correction of knee joint alignment.

Foot & Ankle Orthopaedics, 2(3)
DOI: 10.1177/2473011417S000051
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