Weight Bearing Line Analysis in Supramalleolar Osteotomy for Varus-type Osteoarthritis of the Ankle

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Summary:
We determined the passing points of the weight-bearing line at the level of the tibial plafond and correlated them to the clinical results of supramalleolar osteotomy for varus-type osteoarthritis of the ankle. The group with preoperative weight-bearing point \( \leq 0\% \) had worse clinical outcome than the group with preoperative weight-bearing point > 0%. Our results show modification of the procedure to shift the weight-bearing line more laterally is required for patients with preoperative weight-bearing point \( \leq 0\% \).

Introduction:
Supramalleolar tibial osteotomy is an effective procedure for the treatment of ankle osteoarthritis; however, for some patients, the results have proved unsatisfactory. The purpose of supramalleolar osteotomy for varus-type osteoarthritis of the ankle is to transfer the weight-bearing line from the medial to the lateral side of the ankle joint where articular cartilage is relatively intact. No studies have analyzed the weight-bearing line preoperatively and postoperatively. We have developed a standing posteroanterior radiograph which shows the whole lower limb including the calcaneus (the hip to calcaneus view) to assess the weight-bearing line of the lower limb and hindfoot alignment. We determined the passing points of the weight-bearing line at the level of the tibial plafond and correlated them to the clinical results of supramalleolar osteotomy for varus-type osteoarthritis of the ankle.

Methods:
Supramalleolar tibial osteotomy was performed in 26 ankles (23 patients) to treat moderate varus-type osteoarthritis of the ankle. The mean duration of follow-up was 2.2 years (1 to 4.6 years). Two joints were at stage 2, 22 at stage 3a, and 2 at stage 3b (Takakura-Tanaka classification system). Clinical assessment was performed using the American Orthopaedic Foot & Ankle Society (AOFAS) scale. The weight-bearing point at the plafond was expressed as the proportion into which the weight-bearing line divides the coronal length of the plafond and the distance of the weight-bearing point from the medial corner of the plafond. The medial and lateral edges of the tibial plafond were considered to be 0% and 100%, respectively.

Results:
The mean preoperative tibial-ankle surface (TAS) angle was 85.0°, and the mean postoperative TAS angle was 98.1°. The mean preoperative weight-bearing point was 16.9%, and the mean postoperative weight-bearing point was 69.5%. The preoperative weight-bearing point was correlated with the postoperative weight-bearing point \((r=0.59, p=0.002)\). The mean postoperative weight-bearing point was 50% (12%-70%) in patients whose preoperative weight-bearing points were less than 0%, whereas the mean postoperative weight-bearing point was 81% (48%-113%) in patients whose preoperative weight-bearing points were more than 0%. The mean postoperative AOFAS score of the former group was 83.9 and that of the latter group was 91.8. The difference was statistically significant \((p=0.037)\).

Conclusion:
Locations of the postoperative weight-bearing point were highly variable despite the mean postoperative TAS angle being similar to that of previous studies, which suggests that TAS angle is not a reliable index for determining the correction angle of the tibia. The group with preoperative weight-bearing point \( \leq 0\% \) had worse clinical outcome than the group with preoperative weight-bearing point > 0%. Our results show modification of the procedure to shift the weight-bearing line more laterally is required for patients with preoperative weight-bearing point \( \leq 0\% \).