Diagnosis of Deltoid Ligament Contracture in Varus Ankle Osteoarthritis: Talar tilt could predict the contracture of deltoid ligament.

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**Category:** Ankle Arthritis

**Keywords:** deltoid ligament ankle arthritis total ankle arthroplasty

**Introduction/Purpose:** In total ankle replacement arthroplasty, ligament balancing is important to obtain a stable ankle joint and to prevent edge loading which would lead to asymmetric accelerated polyethylene wear and component loosening. Deltoid ligament release is recognized as an essential step in surgical technique for correcting varus instability. However, necessity of deltoid ligament release in every ankles with varus deformity is suspected recently because varus deformity could be corrected without deltoid ligament release in several ankles. The aims of this study were to assess the prevalence of deltoid ligament contracture and to identify the radiographic parameters that could predict the deltoid ligament contracture in ankle osteoarthritis which needs total ankle arthroplasty. Deltoid ligament contracture was determined when valgus stress radiograph showed talar tilt ≥ 0.5˚ and medial clear space ≤ 4mm in this study.

**Methods:** The plain weight-bearing radiograph and the valgus stress radiograph of 118 ankles (103 patients) with osteoarthritis were retrospectively evaluated. The 118 ankles were comprised 68 ankles of asymmetric varus-osteoarthritis(OA) group which showed medial joint space obliteration and tibiotalar angle ≥ 10˚, 37 ankles of end-stage neutral-OA group which showed overall superior joint space obliteration and tibiotalar angle ≤ 10˚ and 13 ankles with end-stage varus-OA group which showed overall superior joint space obliteration and tibiotalar angle ≥ 10˚. Various radiographic parameters of plain weight-bearing anteroposterior radiograph – talar tilt, distance from medial malleolus to talar dome (MM-T distance), talus center migration – were investigated. The individual associations between the deltoid ligament contracture and these radiographic parameters and the most important radiographic parameter were determined using logistic regression analysis. The optimal threshold of the most important radiographic parameters for predicting deltoid ligament contracture was determined with use of receiver operating characteristic curve analysis.
Results: Thirty-seven ankles in the asymmetric varus-OA group (54%) had deltoid ligament contracture, while one ankle of the end-stage neutral-OA group (2.7%) and one ankle of the end-stage varus-OA group (7.7%) had deltoid ligament contracture. Among the 118 ankles, the talar tilt (Exp(B): 1.239, P=0.000) and the MM-T distance (Exp(B): 1.141, P=0.016) were significantly associated with the deltoid ligament contracture in the univariate logistic regression analysis. And only the talar tilt (Exp(B): 1.251, P=0.000) was significantly associated with the deltoid ligament contracture between the two significant radiographic parameters in the multivariate logistic regression analysis. The optimal threshold for predicting deltoid ligament contracture was 8.9° of the talar tilt, with a sensitivity of 76.9% and a specificity of 77.2%.

Conclusion: This study showed that half of varus ankle osteoarthritis and most of end-stage ankle osteoarthritis did not have deltoid ligament contracture and the talar tilt could predict the deltoid ligament contracture. During total ankle arthroplasty, clinicians should determine deltoid ligament contracture before deltoid ligament release by using the talar tilt, because there may be a risk of valgus instability when deltoid ligament was released in ankles without deltoid ligament contracture.