Heterotopic Ossification Following Total Ankle Replacement: Clinical Significance and Factors Affecting Its Formation

Presenting Author:
Chayanin Anghong, MD (Durham, North Carolina)

Additional Authors:
Samuel B. Adams, Jr, MD; Mark E. Easley, MD; James A. Nunley, MD

Summary:
The incidence of heterotopic ossification following primary total ankle replacement, in our series, was higher than previously reported. Our findings suggest that surgeons should specially focus on the component coverage and appropriate implant size should be meticulously selected, in order to decrease the risk of heterotopic ossification and subsequent limitation in ankle range of motion.

Introduction:
Little is known about heterotopic ossification (HO) after total ankle replacement (TAR): what is the incidence and how does HO affect the clinical outcome. To answer these questions, we assessed the incidence and contributory factors leading to the development of HO after TAR, specifically the technical aspects of surgery and prosthetic design. Finally we related HO to the clinical outcome.

Methods:
Ninety three ankles in 90 patients (mean age: 67 years (37 to 85)) who underwent a primary total ankle arthroplasty were followed for a mean of 32.8 months (10 to 71). Scandinavian Total Ankle Replacement (STAR; Small Bone Innovations, Inc.), Salto-Talaris (Tornier, Inc.), and INBONE (Wright Medical Technologies) total ankle systems were used in this patient population at the discretion of the attending surgeon. Heterotopic ossification was classified using previously described methods for total hip replacement. The Incidence and location of heterotopic ossification, predisposing factors, and outcomes were also analyzed. Correlations between degree of component coverage and severity of heterotopic ossification were determined using Spearman’s correlation coefficient.

Results:
Of 93 ankles, 74 (79.6%), 89 (95.7%), and 91 (97.8%) showed radiological evidence of heterotopic ossification on AP, lateral, and either on AP or lateral radiographs, respectively. Most common grades of heterotopic ossification on AP and lateral radiographs were grade 4 (40.9%) and grade 3 (37.6%), respectively. In AP radiographs, the ossification was mostly located at medial gutter (33.3%). On lateral radiographs, the ossification was mostly located posterior to the tibial component (54.8%). None of pre-operative variables were associated with development of heterotopic ossification. The presence of heterotopic ossification on lateral radiograph was significantly associated with a lack of full coverage of tibial or talar component (from ≥ 0.1 mm) (p = 0.002). Higher grades of heterotopic ossification in each zone were significantly associated with increasing degree of improper component coverage in each corresponding area (correlation coefficient = 0.430; p = 0.01). There was no significant relationship between heterotopic ossification and the persistence of bone debris within the ankle joint on initial post op x-rays, additional procedures, implant design, or operative time (p > 0.05). Symptomatic heterotopic ossification (resulting in VAS-pain, swelling, and stiffness) was not significantly different between patients with and without heterotopic ossification (p > 0.05). The mean ankle range of motion was significantly lower in patients with heterotopic ossification than patients without heterotopic ossification: total motion, p = 0.027; and plantar flexion, p = 0.042. Only three ankles (3.3%) required resection of heterotopic ossification because of recalcitrant pain symptoms.

Conclusion:
The incidence of heterotopic ossification following primary TAR, in our series, was higher than previously reported. Our findings suggest that surgeons should specially focus on the component coverage and appropriate implant size should be meticulously selected, in order to decrease the risk of heterotopic ossification and subsequent limitation in ankle range of motion.