

Changes in the ankle muscles co-activation pattern after 5 years following total ankle joint replacement

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Abstract

Background

The Hintegra® arthroplasty provides inversion-eversion stability, permits axial rotation, ankle flexion-extension, and improvements of the gait patterns are expected up to 12 months of rehabilitation. However, sensorimotor impairments are observed in ankle flexors/extensors muscles after rehabilitation, with potential negative effects on locomotion. Here we determined the timing and amplitude of co-activation of the tibialis anterior and medial gastrocnemius muscles during gait by assessing non-operated and operated legs of patients with total ankle replacement, 5 years after surgery.

Methods

Twenty-nine patients (age: 58 [5.5] years, height: 156.4 [6.5] cm, body mass: 72.9 [6.5] kg, 10 men, and 19 women) that underwent Hintegra® ankle arthroplasty were included. Inclusion criteria included 5 years prosthesis survivorship. The onset and offset of muscle activation (timing), as well as the amplitude of activation, were determined during barefoot walking at self-selected speed by surface electromyography. The timing, percentage, and index of co-activation between the tibialis anterior and medial gastrocnemius were quantified and compared between non-operated and operated legs.

Findings

The operated leg showed higher co-activation index and temporal overlapping between tibialis anterior and medial gastrocnemius during gait ($p < 0.001$).

Interpretation

The neuromuscular changes developed during the process of degeneration do not appear to be restored 5 years following arthroplasty. The insertion of an ankle implant may restore anatomy and alignment but neuromuscular adaptations to degeneration are not corrected by 5 years following joint replacement.

KEYWORDS:

EMG, Joint stiffness, Total ankle replacement, Walking, Gastrocnemius, Tibialis anterior