Session A – 12:30 – 12:37 pm

Improvement in Ankle Kinetics and Kinematics after Total Ankle Replacement in Patients with Hindfoot Deformity

Presenting:

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Summary:
This study examines changes in lower extremity motion between a pre-operative and post-operative time point in patients who have received a total ankle replacement. These patients were divided into a group with and a group without a varus hindfoot deformity

Introduction:
Surgical reconstruction of the ankle is often necessary to eliminate ankle pain from arthrosis. This can be achieved either by fusing the ankle or by performing a total ankle replacement (TAR). There is, however some debate regarding the use of TAR in patients with hindfoot deformity. Therefore, the purpose of this study was to examine the changes in ankle and knee motion, walking speed, and vertical ground reaction forces (GRF) before and one year after TAR in patients with and without a pre-operatively defined varus coronal plane hindfoot deformity.

Methods:
Fifteen patients who underwent TAR were divided into two groups; 9 with clinically documented varus coronal plane hindfoot deformity and 6 without varus coronal plane hindfoot deformity. Lower extremity kinetics and kinematics were determined using 3-D motion capture. Each subject completed 5 barefoot walking trials at a self-selected pace before (PRE) and one year after (POST) TAR. The vertical GRF was obtained for all trials and was normalized to the subject’s body weight. While walking speed could influence joint position, speed was not used as a covariate in order to examine the changes in joint position independent of walking speed. The data was analyzed using a 2 (group) x 2 (time) repeated measures ANOVA (α = 0.05).

Results:
Subjects had a mean height of 1.65 ± 0.09 m, weight of 75.3 ± 14.9 kg, and were 65.1 ± 10.2 years old with no group differences. The hindfoot deformity patients demonstrated a significant improvement in walking speed (+55.5%; p=0.014), while the no deformity group failed to increase walking speed. Independent of the test group, the vertical GRF at heel strike (+25.6%; p=0.001), the peak vertical GRF (+3.86%; p=0.004), and the peak knee flexion angle (+2.28%; p=0.015) were significantly increased POST. However, there were significant decreases in peak dorsiflexion angle (-19.3%; p=0.04) and the peak knee extension angle (-76.8%; p=0.04). The ankle inversion/eversion, plantar flexion/dorsiflexion and knee flexion/extension angles at heel strike were not significantly different between groups or time.

Discussion:
Walking speed improved in patients with varus coronal plane hindfoot deformity after TAR surgery indicating an improvement in function in this population. However, significant differences between PRE and POST indicate that total ankle replacement improves function following surgery in both hindfoot deformity and non hindfoot deformity patients.
Addendum:
Over 100 patients have been tested pre-operatively and by the time of the summer meeting we estimate that a total of 45 patients will have completed their post-operative visits.