Differences in Gait Mechanics and Clinical Outcomes Between Fixed and Mobile-Bearing Total Ankle Replacements

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Introduction
Total ankle replacement (TAR) continues to grow as an alternative to arthrodesis for patients who suffer from end-stage arthritis. Few published studies have examined the pre- to postoperative gait mechanics changes following TAR and no studies have directly compared the current generation of fixed and mobile-bearing implants. The purpose of this study was to assess the changes in ankle kinetics and kinematics from a pre-operative time point to 1-year post-operative in TAR patients who received either a fixed-bearing or mobile-bearing implant.

Methods
Seventy-six patients who received a primary TAR (35 mobile, 41 fixed-bearing) were included in this study. A motion capture system and four force plates were used to collect three-dimensional joint mechanics and ground reaction forces (GRF) during self-selected speed level walking. Gait mechanics data were collected for each subject pre-operatively and 1-year post-operatively. In addition, patient reported and functional outcomes were collected at the same time points. The data was analyzed using a 2 X 2 mixed model repeated measures ANOVA to determine significant differences between the time points and between implant types (α=0.05).

Results
No statistically significant differences existed for age, height, weight or pre-operative tibiotalar alignment between implant types. In addition, no significant difference was observed in the ankle motion between implant types or across time. However, over the course of the first year there was a greater increase in the peak plantarflexion moment, stride length, and total SF36 in the fixed-bearing implant group when compared to the mobile-bearing. Conversely, Visual Analog Pain Scale (VAS), Sit to Stand, and the Short Musculoskeletal Functional Assessment (SMFA) exhibited greater improvement in the mobile-bearing implant when compared to the fixed-bearing patients, primarily related to higher pre-surgery scores in the mobile-bearing group. Independent of implant type, when comparing baseline to one year, a significant improvement was observed in walking speed, step length, swing time, single limb stance time, AOFAS hindfoot score, and the weight acceptance and propulsion GRF. Over the same time it was observed that a significant decrease existed in double support time, Timed Up and Go, 4 square step test, and the Foot and Ankle Disability Index (FADI).
Conclusion

All of the observed changes suggest improved or maintained functioning in patients who have received a TAR. No differences in ankle mechanics were observed between the implant types or across time. In general, the fixed-bearing implant demonstrated improvements in ankle moment and the SF36, while the mobile-bearing implant demonstrated improvements in patient reported outcomes. In most cases the patient reported outcomes were worse in the mobile-bearing group prior to surgery. The goal of TAR is to decrease pain in patients while hopefully increasing joint range of motion. The results of the study indicate that patients have decreased pain; however, no significant changes were reported in ankle motion across time or between the two implant types.