The Effect of Ankle-Arthrodesis on the Biomechanical Function of the Foot: A Prospective, 3-dimensional Gait Analysis with Clinical Correlation

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INTRODUCTION
Hypermobility of the hindfoot and the development of advanced arthritis have been reported after ankle arthrodesis. However, it remains unknown whether the postoperative biomechanical abnormalities are the result of arthrodesis, or of the arthritis necessitating fusion. Furthermore, the effect of ankle arthrodesis on biomechanical function and clinical outcomes is not completely understood.

MATERIALS AND METHODS
Twenty-six consecutive patients were prospectively studied, pre- and post-operatively, compiling demographics, patient-reported outcomes (SF-36, VAS, AOFAS scores) and multi-segment gait analysis.

RESULTS
Demographics: mean age 56 (19 – 80) years, BMI 29.7 (18.6 - 45.6), follow-up 21.9 (12 - 69) months. Patient reported outcomes: SF-36P increased from 33.4 to 50.5; VAS pain declined from 6.98 to 0.94; AOFAS Ankle/Hindfoot score increased from 40.9 to 82.6 (p<0.05).

Temporal-spatial parameters: Improvements in walking speed, and cadence were detected. Improvements in step length (Fig. 2), single limb support time, and double limb support time were detected for the operative extremity. Improvement in step length, double limb support time, and total support time were detected for the contralateral extremity (Fig. 1).

Kinematic parameters: For the operative extremity, there were improvements in initial contact angle, maximum plantarflexion, hip range of motion. There was an increase in hindfoot sagittal plane motion and decrease in maximum dorsiflexion (Fig. 3). Total sagittal range of motion was not diminished.

For the contralateral extremity, improvements in maximum dorsiflexion, total range of motion, knee range of motion, and hip range of motion were detected as well as an increase in hindfoot sagittal plane motion.

Kinetic parameters: Improvement in ankle moment and hip power were detected for the operative extremity (p<0.05).

DISCUSSION
This study showed marked improvement in gait after ankle arthrodesis. Additionally, increased sagittal range motion in the hindfoot was noted postoperatively but the total arc of motion was not diminished with arthrodesis. This suggests that most of the gait abnormalities in patients who undergo ankle arthrodesis are also present pre-operatively, and are likely the result of the underlying pre-operative arthritis and deformity.

REFERENCES
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