Measuring Functional Range of Motion in Patients with Ankle Arthritis

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Introduction/Purpose: Measurement of range of motion is an important outcome measure following ankle surgery. However, there is wide variation in its measurement: from clinical evaluation, to radiographic metrics, and gait analysis. The purpose of this study was to present and validate a simple, standardized technique for measurement of function total range of motion between the tibia and the floor using a digital goniometer.

Methods: Institutional review board approval was obtained. Forty-five ankles from 33 participants were recruited into two groups.

Group 1 (Healthy controls), comprised 20 ankles from 10 participants. None had any musculoskeletal or neurological pathology.

Group 2 (Ankle osteoarthritis), comprised 25 ankles from 23 patients. Ankle pathology had been treated with ankle arthrodesis (n=5), total ankle replacement (n=6), and non-operative treatment (n=14).

Measurement was performed by two testers according to a standardized protocol developed for the Pivotal Total Ankle Replacement Versus Arthrodesis (TARVA) RCT. Intra- and inter-rater reliability was calculated using intra-class correlation coefficients.

Results: Group 1 (Healthy controls). The median difference for all measurements within an observer was 1.5 (IQR 0.7-2.5) degrees. The ICC for inter-rater total ankle range of motion was excellent 0.95 (0.91-0.97, 95% confidence interval, p < 0.001). The ICC for intra-rater total ankle range of motion was excellent 0.942 (0.859-0.977, 95% CI, p < 0.001).
Group 2 (Ankle osteoarthritis). The median difference for all measurements within an observer was 0.6 (IQR 0.2-1.3) degrees. The intra-class coefficient (ICC) for inter-rater total ankle range of motion was excellent 0.99 (0.97-1.0), 95% CI, p < 0.001). The ICC for intra-rater total ankle range of motion was 0.99 (0.96-1.0), 95% CI p < 0.001).

**Conclusion:** This technique provides a reliable, standardized method for measurement of total functional range of motion between the tibia and the floor. The technique requires no specialist equipment or training, and provides a valid functional assessment for patients with and without ankle osteoarthritis and also following treatment even with an ankle arthrodesis.