

Effects of calcaneo-stop arthroereisis on joint kinematics during simulated walking: a cadaver study

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Introduction: The calcaneo-stop procedure is a form of arthroereisis designed to limit valgus motion at the subtalar joint in progressive collapsing foot deformity. Although more frequently used in pediatric patients, it has also been performed in adults despite limited biomechanical evidence. This study evaluated the effect of the calcaneo-stop procedure on hindfoot kinematics during simulated level walking in a cadaveric deformity model. We hypothesized that the procedure would restore subtalar and talonavicular motion toward intact patterns.

Methods: Eight cadaveric distal tibia and foot specimens were mounted in a six-degree-of-freedom robotic system that simulated the stance phase of gait. Four conditions were tested: intact, simulated deformity, calcaneo-stop with the screw head at the subtalar joint line, and calcaneo-stop with the screw head positioned above the joint line. Reflective markers placed in the talus, calcaneus, and navicular were tracked by infrared cameras to calculate subtalar and talonavicular rotational kinematics. Bias-corrected bootstrapped 95% confidence intervals were used for comparisons.

Results: The simulated deformity increased subtalar eversion and talonavicular abduction. With the screw at the joint line, subtalar eversion decreased by 3.8° in early stance, resulting in a 1.5° undercorrection relative to intact. Talonavicular abduction decreased by 4.9°, with a 1.4° undercorrection. When the screw was positioned above the joint line, eversion decreased by 6.2°, producing a 2.4° overcorrection, and talonavicular abduction decreased by 6.9°, with a 2.5° overcorrection.

Conclusion: The procedure shifted kinematics toward intact values, but superior screw placement led to overcorrection. Accurate intraoperative positioning appears essential, and further clinical studies are necessary to confirm these findings and evaluate complications.

Keywords: Flatfoot; Subtalar joint; Foot deformities.

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