Biomechanical study of screw fixation and plate fixation of a posterior malleolar fracture in a simulation of the normal gait cycle
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Category: Ankle

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Introduction/Purpose: Fixation of the posterior malleolar fracture with plate or screws is under debating. A fatigue loading system and a spatial motion capture system will provide a theoretical basis for the selection.

Methods: Thirty-six below-knee specimens with Haraguchi I type posterior malleolar fracture model was obtained. The specimens were randomly divided into two groups. Group A used two parallel-placed 3.5 mm semi-threaded hollow titanium alloy screws to fix the fracture from back to front; group B used an anatomical plate to fix the posterior malleolus. According to the ratio S of the area of the sagittal fracture over the total area of the distal tibial articular surface, each group was subdivided into three groups recorded as A1, B1; A2, B2; and A3, B3. In group A1 and B1, S=1/4; in A2 and B2, S=1/3; in A3 and B3, S=1/2. In the simulations of gait cycle, 4 kinds of ankle joints were subjected to mechanical loading. A fatigue loading system was used for repeated loading. The spatial motion capture system was used to measure the displacement X (mm) in the final stage of loading.

Results: At different locations and different loading conditions, the posterior malleolar fracture displacement X in the three groups of posterior malleolar fracture showed no statistically significant difference.

Conclusion: here is no biomechanical difference between the internal fixation of two parallel 3.5-mm hollow screws and anatomical plate for Haraguchi I type posterior malleolar fractures with an average fracture block height of 19.27mm.

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