

BIOMECHANICAL COMPARISON OF TWO 2-MM HEADLESS CANNULATED SCREWS VERSUS A SINGLE 3-MM SCREW IN CAPITELLAR HUMERUS FRACTURE FIXATION

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Introduction

Dubberley Type IA fractures of the capitellum are the most common distal humerus fractures without condyle-epicondyle involvement. Their intraarticular pattern require mandatory operative treatment to achieve absolute stability. The aim of this study was to investigate the biomechanical performance of two methods for screw fixation of capitellum humeri fractures.

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Methods

Capitellar fractures Dubberley IA (AO/OTA 13-B3) were reproduced in sixteen paired human cadaveric humeri with 76 years average age of the donors (range 66–92 years), pairwise assigned to two groups for fixation with either two 2-mm anteroposterior headless cannulated screws (group 1) or a single 3-mm anteroposterior headless cannulated screw (group 2). Biomechanical testing was performed in a setup simulating 20° elbow flexion (Fig.1). Progressively increasing cyclic loading was applied at 2 Hz until failure of the bone-implant constructs. Interfragmentary movements were captured by means of motion tracking.

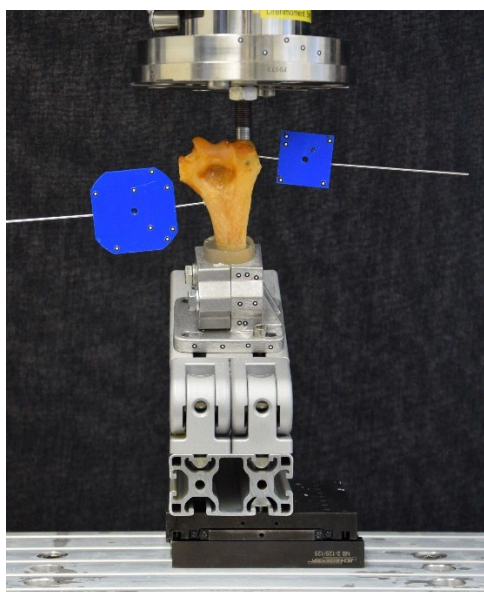


Figure 1: Test setup with a specimen mounted for biomechanical testing.

Results

Initial stiffness was not significantly different between the groups, $p = 0.33$. Both axial displacement (Fig.2a) and flexion deformation (Fig.2b) at the fracture site after 500, 1000, 1500, 2000, 2500 and 3000 cycles were significantly smaller in group 1, $p < 0.01$. Number of cycles until 2 mm fracture displacement was significantly higher in group 1, $p = 0.04$.

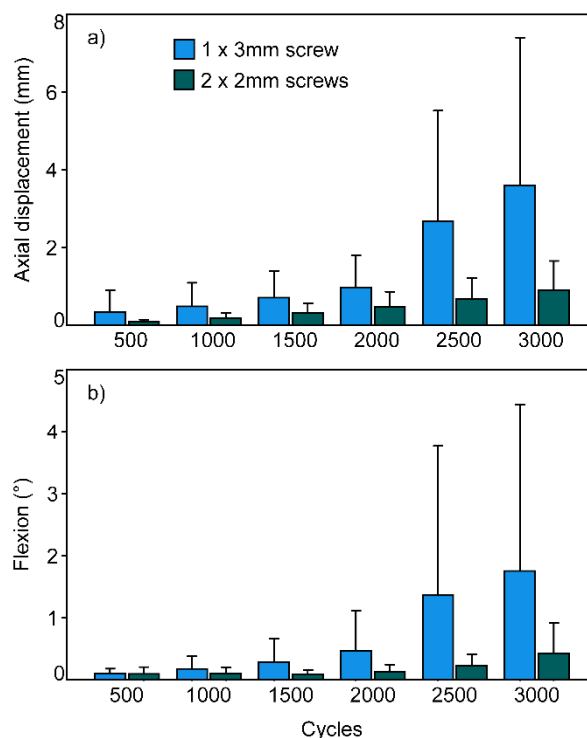


Figure 2: Axial displacement (a) and flexion deformation (b) at the fracture site shown over the first 3000 cycles in equidistant steps every 500 cycles for the two fixation techniques separately in terms of mean and standard deviation values.

Discussion

From a biomechanical perspective, fixation of Dubberley IA capitellar humerus fractures with two 2-mm anteroposterior headless cannulated screws is advantageous versus single 3-mm anteroposterior headless cannulated screw fixation and can favor early postoperative rehabilitation with reduced risk of biomechanically-related complications.

