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Paper Title: Biomechanical evaluation of extra-articular distal humeral fracture treatments using finite element analysis: A preliminary study

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Abstract

Various surgical treatment options have been documented for the management of extra-articular distal humerus fractures. However, the optimal approach remains a subject of controversy, primarily due to the variability in individual fracture characteristics. In this context, the present study aims to investigate the influence of implants on the stability of extra-articular distal humerus fracture fixation and the associated failure mechanism through computational simulations. In this study, three-dimensional models of a locking compression plate (LCP) fixation and an intramedullary nail fixation for extra-articular distal humerus fracture were generated and finite element analysis was performed to compare the effectiveness of these fixations under loading conditions mimicking daily activities. The study focused on evaluating von-Mises stress and displacement on both the implants and bone fragments. The results revealed high-risk regions due to exceeded von-Mises stress, shedding light on the failure mechanism of fixation. To conclude, the results highlighted the superior overall performance of intramedullary nail fixation, particularly under shear force conditions. These findings and the ensuing discussion provide valuable insights and considerations for the further development of a novel fixation system.