

FEA of a proximal humerus fracture with a fixation plate

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Abstract: The fracture of the proximal humerus is the second most common injury to the upper extremity. In severe fractures, surgery may be necessary which can be in the form of a locking plate holding the bones in place. This study examines the effect of including a bonegraft alongside the locking plate. ScanIP and +ScanCAD (Simpleware Ltd) were used to segment the proximal humerus from a CT scan, and to introduce CAD data of the fixation plate and bonegraft. The combined model of image data (proximal humerus) and CAD data (fixation plate, bonegraft) was then meshed in +ScanFE (Simpleware Ltd) where materials and contacts were defined. The materials for the bonegraft and locking plate were linear elastic. The bone material was based on the greyscale values adjusting the material with pixel intensity. Contacts were defined between the bones and from the locking plate to the bones enabling the plate and bones to move or slide. The bonegraft was fixed to the locking plate and bone. In Abaqus/Standard, the distal part of the model was fixed and load was applied on the proximal end of the bone where the body weight was likely to be transmitted. The results showed that the presence of bone graft gave a 60% reduction in pressures at the screw tips, a 150% reduction in pressures along lateral cortex, and was in agreement with the in vitro experimental testing. In conclusion, the locking plate with the bone graft provides a more stable construction.

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