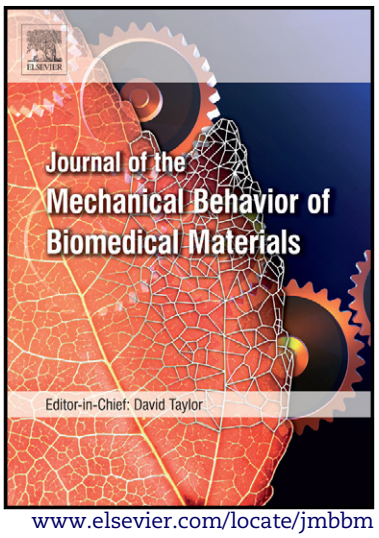

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PII: S1751-6161(14)00342-7
DOI: http://dx.doi.org/10.1016/j.jmbbm.2014.10.017
Reference: JMBBM1306

To appear in: *Journal of the Mechanical Behavior of Biomedical Materials*

Received date: 22 July 2014
Revised date: 29 October 2014
Accepted date:
31 October 2014

Cite this article as: Waqas A Lughmani, Kaddour Bouazza-Marouf, Ian Ashcroft, Drilling in cortical bone: A Finite element model and experimental investigations, *Journal of the Mechanical Behavior of Biomedical Materials*, http://dx.doi.org/10.1016/j.jmbbm.2014.10.017

Drilling in cortical bone: A Finite element model and experimental investigations

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Abstract

Bone drilling is an essential part of many orthopaedic surgery procedures, including those for internal fixation and for attaching prosthetics. Estimation and control of bone drilling forces are critical to prevent drill-bit breakthrough, excessive heat generation, and mechanical damage to the bone. An experimental and computational study of drilling in cortical bone has been conducted. A 3D finite element (FE) model for prediction of thrust forces experienced during bone drillinghas been developed. The model incorporates the dynamic characteristics involved in the process along with geometrical considerations. An elastic-plastic material model is used to predict the behaviour of cortical bone during drilling. The average critical thrust forces and torques obtained using FE analysis are found to be in good agreement with the experimental results.

Keywords: Bone drilling, Orthopaedic surgery, Finite element, Experimental testing, Yield surface