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**Mechanical stimuli of trabecular bone in osteoporosis: a numerical simulation by
finite element analysis of microarchitecture**

Clara Sandino^{1,2}, David D. McErlain^{1,2}, John Schipilow^{1,3}, and Steven K. Boyd^{1,2,3,4}

¹McCaig Institute for Bone and Joint Health, University of Calgary, Canada

²Department of Radiology, Faculty of Medicine, University of Calgary, Canada

³Roger Jackson Centre for Health and Wellness Research, University of Calgary,
Canada

⁴Schulich School of Engineering, University of Calgary, Canada

Corresponding author:

Steven K. Boyd

McCaig Institute for Bone and Joint Health,

University of Calgary

3280 Hospital Drive NW, Room HRIC 3AC64

Calgary, Alberta, T2N 4Z6

tel. +1 (403) 220-3664,

e-mail. skboyd@ucalgary.ca

fax: +1 (403) 210-9573

Abstract

Mechanical stimuli are one of the factors that influence bone cell activity and therefore the remodeling of bone. These stimuli are dependent on the microarchitecture of the tissue and can be altered by changes in the bone that occur typically with osteoporosis. The objective of this study was to quantify the variation in the mechanical stimuli of trabecular bone due to changes in the microarchitecture. The morphology of 76 cubes of trabecular bone from human tibia were obtained from microcomputed tomography images and estimated possibilities for mechanical stimuli were determined using poro-viscoelastic finite element models based on the three-dimensional images. The distributions of Von Mises stress, octahedral strain, strain energy density, fluid velocity and pore pressure were predicted for the solid and the marrow phases of bone. We predicted that with variations in the morphology of the trabecular bone, such as an

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