

Accepted Manuscript

Ultrasound propagation in trabecular bone: a numerical study of the influence of microcracks

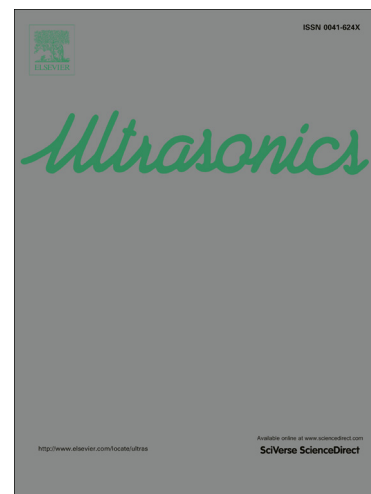
Samuel Callé, Hélène Moreschi, Guillaume Renaud, Marielle Defontaine

PII: S0041-624X(13)00225-4

DOI: <http://dx.doi.org/10.1016/j.ultras.2013.08.003>

Reference: ULTRAS 4651

To appear in: *Ultrasonics*



Please cite this article as: S. Callé, H. Moreschi, G. Renaud, M. Defontaine, Ultrasound propagation in trabecular bone: a numerical study of the influence of microcracks, *Ultrasonics* (2013), doi: <http://dx.doi.org/10.1016/j.ultras.2013.08.003>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Ultrasound propagation in trabecular bone: a numerical study of the influence of microcracks

Samuel Callé¹, Hélène Moreschi¹, Guillaume Renaud², Marielle Defontaine¹

¹ *Université François-Rabelais de Tours, UMR INSERM U930, 10 boulevard Tonnellé, 37032
Tours Cedex, France.*

² *Department of Biomedical Engineering, Thoraxcenter, Erasmus MC, P.O. Box 2040, 3000
CA Rotterdam, The Netherlands*

Abstract: The accumulation of microdamage in trabecular bone tissue is suspected of being a predictive indicator of osteoporosis diagnosis. To quantify this microdamage, the Dynamic AcoustoElastic Testing (DAET) method measures the time of flight (TOF) and amplitude variations of transmitted ultrasound (US) pulses, while the bone sample is submitted to a low frequency sinusoidal hydrostatic pressure (opening/closing of microcracks). However, DAET is both sensitive to viscoelastic properties changes and microcracks density. To verify the microcracks density contribution on DAET results, a numerical approach is proposed. Multiple configurations of microdamaged trabecular bone-tissue-like mesh have been simulated. A 2D pseudo-spectral time domain numerical model was then developed to simulate linear wave propagation in heterogeneous solids. The influence of the microcracks number and orientation on the US TOF was particularly investigated. Results are discussed and compared with experimental data obtained from DAET measurements in trabecular bone samples.

Keywords: pseudo-spectral time-domain (PSTD) method; trabecular bone; dynamic acoustoelasticity; microcracks.

Download English Version:

<https://daneshyari.com/en/article/10690530>

Download Persian Version:

<https://daneshyari.com/article/10690530>

[Daneshyari.com](https://daneshyari.com)