



CFAO GRADUATE STUDENT POSTERBOARD ABSTRACTS

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Diagnostic Ultrasound in the Measurement of Cortical Bone Thickness in Porcine Mandibular Specimens: A Pilot Study

Dr. Diego Diaz¹, Dr. Bartosz Slak², Eugene Malyarenko², Dr. Roman Maev², Dr. Ali Tassi¹

Abstract

Introduction: Ultrasonography (US) is a safe, non-invasive diagnostic method that has been used in various capacities in medicine and dentistry. Periodontal bone loss and bony dehiscence have been reported as potential risks of orthodontic treatment in patients who have decreased buccal/labial bone thickness and who might undergo rapid palatal expansion or excessive proclination of teeth. US has the potential to aid in the diagnosis of patients at risk for these possible complications of orthodontic treatment.

Purpose: To validate the use of a novel US device in the measurement of buccal cortical bone (BCB) thickness in porcine mandibles. To qualitatively assess the effectiveness of the US device in the detection of roots in these specimens.

Materials and Methods: Three porcine hemi-mandibles were scanned with Micro-CT (μ -CT). BCB thickness was measured with Microview (Parallax Innovations) at 12 locations per specimen ($n=36$). BCB thickness at these locations was then assessed using a 19MHz pulse-echo US transducer and images were reconstructed using custom software developed in Matlab (Mathworks, USA). Bone thickness was determined by assessing US wave time of flight using speed of sound through cortical bone. Statistical analysis was done with a Bland-Altman plot with Microsoft Excel.

Results: Mean bone thickness from μ -CT was 2.06 +/- 0.76mm and was 1.61 +/-0.46mm from US. μ -CT and US measurements were significantly different as the Line of Equality was not within the 95% confidence interval of the bias. There was generally a higher difference between the measurements when the cortical bone thickness was greater than 2.25mm.

Conclusion: The handheld US device showed promise in measuring cortical bone thickness but a high degree of variability existed especially when measuring thicker bone. Improvements in the device and the algorithm used are needed to be able to accurately measure bone thickness and detect roots.

¹ Department of Graduate Orthodontics, Schulich School of Medicine & Dentistry, Western University London, ON, Canada

² Institute for Diagnostic Imaging Research, University of Windsor, Windsor, ON, Canada