Density and morphology of jaw bone assessed in 2D and 3D imaging methods

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Introduction
Daily interpretation of radiographs by dental professionals remains, to a large extent, subjective and statistically unvalidated. Objective numerical bone assessment would be more suitable for making evidence-based clinical decisions.

Objectives
The aim of this *in vitro* study was to assess clinically applicable methods for objective assessment of bone density and bone morphology on radiographs.

Materials and methods
Twelve dry human bone samples were used. The radiographic methods were periapical radiography (PA RX) and cone beam CT (CBCT), with micro-CT (µCT) as the reference standard. On all images the following parameters were measured: bone (radiographic) density, bone area and fractal dimension.

Results
P was set at 0.05 for statistical significance. Densities for all imaging modalities were significantly correlated with µCT (r=.55 for PA RX and r=.70 for CBCT). Areal measurements on CBCT images were significantly correlated to the areal measurements on µCT (r=.55) and fractal dimension showed a nearly perfect correlation for CBCT and µCT (r=.9). The latter structural measurements showed no significant correlation with PA RX.

Conclusions and discussion
Analysis of three-dimensional images is preferable when information on the structure of the jaw bone is needed. Quantitative methods might be used in the future to assess the jaw bone objectively. For a more generalised bone density evaluation, intra-oral radiographs still provide useful information.

Acknowledgements