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Accuracy of panoramic radiography and linear tomography in mandibular canal localization

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Abstract:

Background and Aim: Accurate bone measurements are essential to determine the optimal size and length of dental implants. The magnification factor of radiographic images may vary with the imaging technique used. The purpose of this study was to compare the accuracy of linear tomography and panoramic radiography in vertical measurements, as well as the accuracy of linear tomography in mandibular width estimation.

Materials and Methods: In this test evaluation study, the vertical distances between the crest and the superior border of the inferior alveolar canal, marked with a metal ball, was measured by linear tomography and panoramic radiography in 23 sites of four dry mandible bones. Also the mandibular width was measured at the same sites. Then, the bones were sectioned through the marked spots and the radiographic measurements were compared with actual values.

Results: The vertical magnification factor in tomograms and panoramic radiographs was 1.79 (SD=0.17) and 1.69 (SD=0.23), respectively. The horizontal magnification of tomograms was 1.47 (SD=0.17). A significant correlation was found between the linear tomographic and actual values, regarding vertical dimensions ($p<0.001$, $r=0.968$) and width ($p<0.001$, $r=0.813$). The correlation was significant but lower in panoramic radiographs ($p<0.001$, $r=0.795$). Applying the magnification values suggested by the manufacturer, the mean difference of vertical measurements between the tomographic sections was 2.5 mm (SD=3.4) but 3.8 mm (SD=1.65) in panoramic radiographs. The mean of absolute difference in mandibular width between the tomographic sections and reality was 0.3mm (SD=1.13). In the linear tomograms, 4.3% of vertical and 56.5% of the width measurements were in the ±1mm error limit. Only 4.3% of the vertical measurements were within this range in the panthomographs. The linear regression equation between the actual values and those obtained by radiography in vertical dimensions showed that 87.5% of tomograms and 51.8% of panoramics were located in the ±1 mm error limit.

Conclusion: Based on the results of this study, the linear tomography is more accurate than panoramic radiography in mandibular height estimation. The accuracy of linear tomography in width estimation is within acceptable limits.

Keywords:

Linear tomography ، Panoramic radiography ، Mandibular canal ، Mandibular bone

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