Deep Learning-Aided Diagnosis of Furcation and Intrabony Defects in CBCT

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Objectives: Because of the ability to analyze objects in 3-D, cone beam computed tomography (CBCT) is superior to any 2-D radiograph when it comes to identifying furcation involvement or intrabony defects in patients with periodontitis. To make the process more efficient, an artificial intelligence (AI) system can be used to identify these defects instantaneously on a CBCT image. This study focused on annotating furcation involvement and intrabony defects on CBCT images to train a deep learning model identifying these defects.

Experimental Methods: CBCT images and intraoral radiographs of periodontitis patients with potential bony defects were extracted from electronic health records for annotations. Before reviewing CBCT, intraoral radiographs were examined to determine areas of potential defects. Annotations of the defects were done using a 3-D imaging software, ITK-SNAP (version 3.8.0). Four calibrated examiners reviewed the CBCT images in the axial, sagittal, and coronal views to annotate two types of defects with specific labels. These annotations were further confirmed by an independent examiner not involved in annotations. The annotated images will be processed to increase image quality for the model training.

Results: A total of 85 cases with 118 furcation involvements and 27 intrabony defects were annotated. A deep learning model will be developed in the future.

Conclusion: The development of the deep learning model can assist clinicians in diagnosing furcation and intrabony defects in CBCT. The model can be transformed into a clinical tool to help clinicians with limited experience in interpreting CBCT. More images will be annotated to improve the model's robustness.

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