Abstract:

Title: Diagnosis accuracy of ultra-low dose protocol in the detection of recurrent caries under composite restorations using Cone-beam computed tomography

Introduction: Many efforts have been made to develop low-dose protocols in Cone-beam computed tomography (CBCT). A new ultra-low dose mode for the ProMax 3D CBCT may allow a dose reduction of about 75%. According to the manufacturer, it can be used for orthodontic treatments, implant planning or follow-up studies. A reduction in dose for the patient could reduce Image quality. The diagnostic ability of CBCT Images acquired with this protocol for common diagnostic tasks in dentistry, including detection of carious lesions, is not evident. This study aimed to assess the diagnostic accuracy of the ultra-low dose scanning protocol of CBCT to detect recurrent caries under composite restoration.

Materials and methods: Class II cavities were prepared on 54 sound extracted premolar teeth. Teeth were divided into three groups, each 18 teeth. In the control group, cavities were restored with composite resin after etching and bonding. In Group 2, artificial caries were created randomly on the buccal or lingual walls. In Group 3 specimens, artificial caries were created on the gingival walls. The cavities were then restored with resin composite. Four CBCT images were acquired for each specimen using ProMax 3D, with two standard (GS-high definition, GS-normal definition) and two ultra-low dose scanning protocols (UL-high definition, UL-normal definition). Three observers examined the images. Kappa Coefficients were calculated. The area under the receiver operating characteristic curve (Az) was used to evaluate the diagnostic accuracy. Az values were compared using bonferroni test with a significance level of α= 0.05.

Results: The diagnostic accuracy of ultra-low dose scanning protocols was significantly lower than that of standard protocols (p<0.05). The mean Az values for Ul-high definition, UL-normal definition, GS-high definition, and GS-normal definition scanning protocols were 0.823, 0.799, 0.640, and 0.626, respectively.

Conclusion: Generally, it can be concluded that the diagnostic accuracy of the ultra-low dose protocol is significantly lower than the standard protocol and contrary to standard protocol, ultra low dose protocol is not reliable for the detection of secondary caries under composite restorations.

Keywords: Cone beam computed tomography, Effective dose, Secondary caries, Composite resin