Caries Assessment in Orthodontic Patients

Akademisk avhandling

som för avläggande av odontologie doktorsexamen vid Sahlgrenska akademin, Göteborgs universitet kommer att offentligen försvaras i föreläsningssal 3, Institutionen för Odontologi, Medicinaregatan 12E, Göteborg, onsdagen den 7 maj 2014, kl. 09.00

av

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Avhandlingen är av sammanläggningstyp och baseras på följande fyra delarbeten:

I. Almosa NA, Al-Mulla AH, Birkhed D. Caries risk profile using the Cariogram in governmental and private orthodontic patients at de-bonding. Angle Orthodontist Journal. 82: 267–274, 2012.

II. Almosa NA, Lundgren T, Aldrees AM, Birkhed D, Kjellberg H. Diagnosing the severity of buccal caries lesions in governmental and private orthodontic patients at de-bonding, using the ICDAS-II and the DIAGNOdent Pen. Angle Orthodontist Journal, online publication, 21 Oct 2013.

III. Almosa NA, Lundgren T, Bresin A, Birkhed D, Kjellberg H. Diagnosing the severity of buccal caries lesions in orthodontic patients at de-bonding using digital photographs. Acta Odontologica Scandinavica, online publication, 9 Dec 2013.

IV. Almosa NA, Lundgren T, Al-Mulla AH, Birkhed D, Kjellberg H. Caries risk profile in orthodontic patients: A 4-year longitudinal study using the Cariogram model in governmental vs. private clinics. Submitted.

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ABSTRACT

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Background and aims: White spot lesions (WSLs) are the most common adverse effect related to orthodontic treatment that may develop into manifest caries lesions if preventive measures are not strictly followed. Caries prevalence has historically been high in the Kingdom of Saudi Arabia (KSA) and the Middle East. Dental caries has previously been evaluated by different techniques. The aims of this thesis were to study: 1) Caries-related factors in orthodontic patients at de-bonding, and compare caries risk profiles between the governmental (G) and private (P) orthodontic patients, 2) The prevalence of buccal caries lesions including WSLs at de-bonding in the G and P orthodontic patients, using the international caries detection and assessment system (ICDAS-II) and the DIAGNOdent Pen, 3) The severity of buccal caries lesions according to ICDAS-II via digital photographs and compare this method with clinical examinations, and 4) Caries-related factors and evaluate caries risks for the G and P orthodontic patients at de-bonding and after four years (longitudinal study).

Methodology: A cross-sectional evaluation was carried out on 89 patients at de-bonding; 45 patients in the G-group and 44 patients in the P-group *(Studies I and II)*. Thirteen postgraduate orthodontic students examined 245 close-up digital photographs *(Study III)*. A longitudinal evaluation was performed on 40 out of the 89 baseline patients; (G=20) (P=20). Investigations included a questionnaire, oral clinical examinations, plaque scoring, saliva sampling, bitewing radiographs, and using the computerized caries risk program "Cariogram" to illustrate the caries risk profiles *(Studies I and IV)*. Assessment of the severity of buccal caries lesions was evaluated by using ICDAS-II, DIAGNOdent Pen *(Study II)*, and digital photographs *(Study III)*.

Results and conclusions: ***Study I,*** the findings revealed that "the chance of avoiding new cavities", according to the Cariogram model, was higher in the P-group compared to the G-group (61% and 28%, respectively) ($P < .001$). Decayed, missing, and filled surfaces (DMFS), plaque index, mutans streptococci and lactobacilli counts were significantly higher in the G-group compared to the P-group ($P < .05$). ***Study II,*** the G-group showed statistically significantly higher prevalence of buccal caries lesions including WSLs compared to the P-group evaluated by ICDAS-II, DIAGNOdent Pen ($P < .0001$). ICDAS-II showed that 43% of the patients in the P-group and 9% in the G-group were free from any WSLs. In the G-group, 22% of the patients versus none in the P-group had 16 lesions or more. The Spearman's correlation coefficient between the two methods was 0.71, which revealed that the clinical index (ICDAS-II) showed a good correlation with the DIAGNOdent Pen. ***Study III,*** intra-examiner reliability and the reliability between each examiner and the clinical examination showed moderate to excellent agreement, with kappa values of 0.52-0.83. The Spearman's correlation coefficient, between scoring buccal caries lesions via clinical examinations and scoring via photographs, was 0.76, which revealed that scoring buccal caries lesions on digital photographs according to ICDAS-II criteria is a reliable and valid method for assessing the severity of buccal caries lesions. ***Study IV,*** the chances to avoid new cavities after four years from de-bonding improved from 31% to 52%, and from 58% to 77% in the G-group and the P-group, respectively. This improvement was also observed for all patients (G+P) from 44% to 64% ($P < .001$). Caries risks according to the Cariogram at de-bonding and after four years is greater in the patients treated at the governmental clinics compared to the private clinics.

Keywords: **buccal caries, Cariogram, digital photographs, fixed appliance, ICDAS, laser fluorescence, orthodontics, risk assessment, Saudi Arabia, white spot lesions.**
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