On Caries Risk Profiles Using Cariogram and Caries Prevention with Fluoride Toothpaste in Orthodontic Patients

Akademisk avhandling

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av

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Avhandlingen är av sammanläggningstyp och baseras på följande fyra delarbeten:

I. Al Mulla A, Kharsa S, Kjellberg H, Birkhed D. Caries risk profiles in orthodontic patients at follow-up using Cariogram. Angle Orthod 2009;79:323- 330.

II. Al Mulla A, Kharsa S, Kjellberg H, Birkhed D. The use of Cariogram to evaluate caries-risk profiles in orthodontic patients. World J Orthod 2010;11:160–167.

III. Al Mulla A, Karlsson L, Kharsa S, Kjellberg H, Birkhed D. Combination of high fluoride toothpaste and no post-brushing water rinsing on enamel demineralisation using an in situ caries model with orthodontic bands. Accepted for publication in Acta Odontol Scand.

IV. Al Mulla A, Kharsa S, Birkhed D. Modified fluoride toothpaste technique reduces caries in orthodontic patients – a longitudinal, randomized clinical trial. Am J Orthod Dentofacial Orthop 2010, in press.

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Abstract

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Objective. The aims of this thesis were to: 1) analyse caries-related factors shortly after orthodontic treatment, 2) demonstrate the usefulness of the Cariogram by presenting orthodontic patients with different caries-risk profiles, 3) compare two different toothpastes with different post brushing techniques using an in situ caries model with orthodontic bands, and 4) test the hypothesis that toothpaste slurry rinsing, combined with some other simple post-brushing advice (in this thesis called the "modified F toothpaste technique, MFTT"), would reduce the number of decayed and filled tooth surfaces (DFS) in a 2-year randomised clinical trial in orthodontic patients. ***Materials and Methods.*** In Study I, a total of 100 patients were divided into two groups (50 in each), based on their pre-bonding DFS. A high- (DFS $\geq$ 5) and a low- (DFS $\leq$ 2) caries group were created. In Study II, three cases were selected to present the three caries risk groups, i.e. high, medium and low. In Study III, 20 orthodontic patients were randomised into two groups: 1) a test group using 5,000 ppm F with no post-brushing water rinsing and 2) a control group using 1,450 ppm F with 3 times post-brushing water rinsing. On the upper first premolars, orthodontic stainless steel bands were applied, leaving 2-3 mm of space away from the exposed buccal surface in order to accumulate plaque and create an area for initial caries development. The teeth were extracted after 8 and 9 weeks and were then analysed using Quantitative Light-induced Fluorescence (QLF). Moreover, the oral F retention was studied using the two brushing techniques. The Study IV population consisted of 100 orthodontic patients randomly divided into two groups. Each patient was examined before the beginning of orthodontic treatment (baseline) and shortly after de- bonding (follow-up) within a 2-year study period. The test group patients were instructed to use the MFTT, in which various behavioural factors were standardised in order to improve the caries preventive effect of F toothpaste. The control group patients were given the routine clinic oral hygiene instructions. ***Results.*** In Study I, the low-caries group displayed lower DFS ($p < 0.001$), lactobacilli ($p < 0.001$) and mutans streptococci ($p < 0.001$) and higher Cariogram values ($p < 0.001$). Study II showed that the Cariogram was a useful tool for distinguishing between low, medium and high caries risk patients. In Study III, in comparison to the control group, the test group regimen resulted in a non- significant smaller QLF lesion area and lower average QLF loss of fluorescence ($p < 0.05$). The highest F concentration under the band was found in the test group ($p < 0.001$). In Study IV, the clinical ($p < 0.001$), radiographic ($p < 0.001$) and clinical + radiographic ($p < 0.001$) ΔDFS (incidences) were significantly reduced in the test group in comparison to the controls, with prevented fractions of 87%, 78% and 83% respectively. ***Conclusions.*** 1) Patients with high DFS before orthodontic treatment ran a higher risk of developing caries. They had significantly higher numbers of mutans streptococci and lactobacilli and had less chance of avoiding new cavities according to the Cariogram. 2) The Cariogram may be a useful pedagogic model for illustrating a patient's caries risk in the orthodontic clinic. 3) The combination of using a 5,000 ppm F toothpaste and no post-brushing water rinsing had better anti-caries potential and resulted in elevated oral F retention, compared with a 1,450 ppm F toothpaste with 3 times post-brushing water rinsing. 4) Compared with routine oral hygiene instructions including F toothpaste, the use of the MFTT significantly reduces the incidence of new caries lesions in orthodontic patients.

Key words: Caries lesions. Caries model. Caries risk. Cariogram. QLF. Orthodontic bands. Saudi Arabia. Slurry rinsing. Toothbrushing. Toothpaste. Toothpaste technique. Water rinsing.

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