Caries Research

Including the Abstracts of the 52nd Annual ORCA Congress

July 6–9, 2005
Indianapolis, Ind., USA
clinical tutor. On completion of the exercise the teeth were visually determined to be caries free by the student, and then confirmed by the clinical tutor. A fluorescein in alcohol (0.2 g/l) solution was injected into the cavity for 2 min, rinsed and dried before QLF images were captured. The QLF images were collected and visually analysed later by a single examiner for the presence or absence of caries. From 74 images recorded, 17 were excluded owing to exposure of the pulp chamber. The remaining 57 teeth, judged caries free by clinical visual examination, were examined using QLF. Of these 53% were found to be caries free whilst 47% were carious. QLF significantly detected (p < 0.0001) caries in almost half of the teeth examined (Fisher's exact test), which the student and tutor had confirmed visually to be caries free. QLF is a useful, non-invasive, non-destructive technique in the detection of caries and serves as an adjunct to the visual, chair side diagnosis and management of dental caries. In conclusion, QLF may be an objective clinical teaching aid for the assessment of dental caries.

114 Selective Removal of Carious Enamel Fissures Using Bioactive-Glass Air-Abrasion
G. Paolinis*, A. Banerjee, T.F. Watson
* george.paolinis@kcl.ac.uk
King’s College London, London, UK

The aim of this in vitro study was to compare the efficacy of bioactive glass air-abrasion versus alumina air-abrasion in the removal of carious enamel. Extracted human molars were scored according to the Ekstrand criteria, following cleaning of the occlusal surfaces with rotary brush and pumice, and separated into carious (score 1 or 2) and sound (score 0) groups of 20 teeth each. 10 samples in each group were abraded with alumina and 10 with bioactive-glass air-abrasion, creating sub-groups: carious teeth abraded with alumina (CaI) or bioactive glass (Cbg) and sound teeth abraded with alumina (SAI) or bioactive glass (Sbg). Carious samples (Cai, Cbg) were abraded until deemed caries-free using tactile/visual criteria and sound samples (SAI, Sbg) air-abraded for the same time period. Resin replicas of samples, made prior to and after air-abrasion, were examined using scanning electron microscopy and scored as having no surface modification, surface modification or substantial tissue removal. The results showed that bioactive-glass air-abrasion removed enamel from fissures in group Cbg (9/10) but not from Sbg (0/10). Alumina air-abrasion resulted in substantial enamel removal in both groups CAI (10/10) and SAI (7/10). The abraded occlusal surfaces of fissures in all groups had varying evidence of surface modification, the enamel appearing roughened and lacking the smooth surface topography associated with untreated enamel. Bioactive-glass abrasion was therefore shown to cause minimal clinical damage to sound enamel and is capable of selectively removing carious enamel from fissures. Alumina air-abrasion is more aggressive and non-selective, removing enamel from both carious and sound fissures. It is possible that the potentially self-limiting nature of bioactive-glass air-abrasion may be used diagnostically and to treat incipient enamel lesions in the future.

115 Selective Caries Removal by a Fluorescence-Feedback-Controlled Er:YAG Laser in vitro
J. Eberhard*, A.K. Eisenbeiss, J. Hedderich, F. Krause, S. Jepsen
* eberhard@konspar.uni-kiel.de
Departments of *Operative Dentistry and Periodontology, and 5Department of Medical Statistics, University Hospital Schleswig-Holstein, Kiel, 6Department of Operative Dentistry and Periodontology, University Dental Clinic Bonn, Bonn, Germany

The aim was to establish a fluorescence threshold level that could guide a therapeutic Er:YAG laser through a caries lesion to determine a therapeutic endpoint of caries removal. 35 extracted human teeth with dentine caries were used for this study. An Er:YAG laser system that emitted at a wavelength of 2.94 μm was used. The laser was equipped with a laser fluorescence feedback system of 655 nm to control the irradiation of the Er:YAG laser. The evaluated threshold levels of the fluorescence feedback system were 3, 7, 8, 10, 12, 15 and 20. After treatment the teeth were prepared for histological staining by the method of Brown-Brenn for identification of bacteria. The specimens were subjected to a quantitative evaluation of residual bacteria on the treated dentine surface. About 80% of the lased dentine surfaces showed residual bacteria with threshold levels of 20, 15, 12, and 10. Residual bacteria were not found with threshold levels of 7 and 3. The results of this in vitro study indicate that a fluorescence threshold level of ≤ 8 units can guide an Er:YAG laser to a complete removal of infected carious dentine.

116 Assessment of Complete Caries Removal by Laser Fluorescence in vivo
F. Krause*, A. Braun, J. Eberhard, S. Jepsen
* fkrause@uni-bonn.de
5Department of Operative Dentistry and Periodontology, University Dental Clinic Bonn, Bonn, 6Department of Operative Dentistry and Periodontology, University Hospital Schleswig-Holstein, Kiel, Germany

It has been suggested that laser fluorescence (LF) near the dental pulp shows higher values than distant measurements. The aim of the study was to assess the endpoint of complete caries removal by means of laser fluorescence. Values should be correlated to the thickness of the residual dentine. 20 carious lesions were excavated with a bur. The endpoint of caries removal was determined by visual, tactile and auditory means. Laser fluorescence values on the dentine surface were measured with the DIAGNOdent™ device and the fluorescence feedback system of the Key Laser III™. Both a standard calibration and an individual calibration of the DIAGNOdent system were performed; the laser feedback system was calibrated by a standard procedure. The residual dentine thickness was measured by an electrical resistance measurement device. Val-
The Effect of Sealing Approximal Lesions after 18 Months Evaluated by Traditional and Subtraction Radiography

S. Martignon\textsuperscript{a,b,*}, K.R. Ekstrand\textsuperscript{a}, R.P. Ellwood\textsuperscript{d,*}
\textsuperscript{a}University of Copenhagen, Copenhagen, Denmark;
\textsuperscript{b}Universidad El Bosque, Bogotá, Colombia; \textsuperscript{d}Dental Health Unit, Manchester, UK

This study assessed the effect of sealing proximal lesions versus home-based flossing using a split-mouth design. Eighty-four subjects who attended the Dental Faculties in Copenhagen or Bogotá participated. In order to take part subjects were required to have 2 or more proximal lesions in stage 1–3 according to the following radiographic classification system: (1) lesion restricted to enamel outer half; (2) lesion from the inner half of the enamel to the enamel-dentine junction; (3) lesion restricted to outer third of dentine; and (4) lesion in inner two-thirds of dentine or restored. The activity status of selected lesions was assessed by a bleeding index [Ekstrand et al: Caries Res 1998;32:41–45] and caries risk was assessed with the Cariogram [Brathall et al: Eur J Oral Sci 1996;104:486–491]. Standardized geometrically aligned baseline and follow-up radiographs were obtained. 62 test lesions were sealed with Glick-OneBond (Heraeus-Kulzer) and 10 with Concise (3M-ESPE). Patients were instructed to floss all approximal lesions 3 times per week. The difference in caries status between baseline and 18 months was assessed using 3 methods; (1) radiographs were assessed independently; (2) baseline and follow-up radiographs were assessed in pairs, and (3) using subtraction radiography of digitized images. Seventy-two subjects aged 15–39 completed the study (14.6% dropout). Most participants in both groups were classified as having moderate caries risk (62%). The compliance during the study concerning flossing was poor. For repeated examinations of the individual assessment of each radiograph by paired comparison and subtraction methods, the intra-examiner kappa were 0.84, 0.44 and 0.87. At the end of the study, 2 test and 1 control lesions were restored. Test versus Control progression (McNemar’s test): Level 1 \( n_f = 7 - 9.7\%\), \( n_c = 19 - 26.4\%\), \( p = 0.06\); Level 2 \( n_f = 16 - 22.2\%\), \( n_c = 34 - 47.2\%\), \( p < 0.05\). Level 3 \( n_f = 30 - 43.5\%\), \( n_c = 59 - 84.1\%\), \( p < 0.05\). The sealing technique was superior to flossing and subtraction radiography appeared to be the most sensitive method of assessing lesion progression.