AN IN VITRO STUDY OF ROOT CARIES OF FRONT TEETH

E. Boteva, M. Marinova and D. Karayasheva

Department of Conservative Dentistry,
Faculty of Dental Medicine, Medical University, Sofia

Summary. Root carieses can occur on root surfaces exposed to bacteria. They are typically diagnosed in patients with periodontal diseases and gingival recessions. Frequencies are higher among elderly patients, although root caries can appear in middle-aged and in young patients. The aim of the present study was to investigate the frequency of root caries of front teeth with sound crowns and high resistance, which has overcome the demineralization and the caries and were extracted due to periodontal reasons. All teeth n = 123 were sound and matured, from the same geographical region and dental practice area. After cleaning and draying, they were observed under magnification x5. The incisors and premolars were separated in six groups. Root caries was observed under magnification x5, diagnosed with probe and registered by two examiners. The data was registered according to the criteria: Margins (2/3-1/2) in dentine and cementum and origin of the lesion on root surface. The size of the lesions observed varied from minimum 1 mm² to massive tissue losses on two to three surfaces of the root surface. The general frequency of root caries was 25%, which was symptomatic for all groups of teeth with generalized elderly and pathological periodontal changes. Early prevention of root caries is essential. Dietary restriction of erosive beverages and sticky sweeteners is an essential part of the general treatment and preventive plan. The usual mouthrinsis, electric toothbrushes, vitamin C, intradental brushes included in standard periodontal treatment must be carefully revised in relation to patients DMFT.

Key words: *dental caries, root caries, epidemiology*

Root carieses can occur on root surfaces exposed to bacteria. They are typically diagnosed in patients with periodontal diseases and gingival recessions. Frequencies are higher among elderly patients, although root caries can occur in middle-aged and young patients with periodontal diseases, too.

In 1999, in Reiker's clinical trial, periodontal patients were followed up for 11-12 years and high rates of root caries were registered, with a mean value of 4.3 lesions

per patient. This frequency varies from 17 to 90% among clinical trials [Unuler 2007, Imazato 2006, Hamasha 2005, Fure 2004, Chalmers 2002, Lin 2011, Fadel 2011, Ritter 2010]. Other papers found a relatively high risk of root caries in one of every nine root surfaces [Imazato 2006, Nicolau 2000]. Another found correlation is that between the present teeth in the mouth and the incidence of root caries [Imazato 2006, Nicolau 2000]: some articles found a negative relation [Fure 2004, Phelan 2004], some positive [Joshi 1993, Ravald 1992, Nicolau 2000, Iamazato 2006].

AIM

The aim of the present study was to register the frequency of root caries of extracted front teeth with sound crowns and high resistance.

MATERIALS AND METHODS

All teeth n = 123 with sound crowns were collected from the same geographical region and dental practice area. Exclusion criteria were: teeth with endodontic treatment, fractures of parts of the crown, and non-caries defects like hypoplasia, fluorosis and erosion. After cleaning and draying they were observed under magnification x5 by two independent examiners. The incisors and premolars were separated in six groups: lower and upper teeth, incisors, canines and premolars. Root caries was observed under magnification x5, diagnosed with probe and registered by two examiners and all data was registered after unanimous agreement. The data was registered according to the following criteria:

1. Margins (2/3-1/2) in dentine and cementum and origin of the lesion on root surface.
2. Separately for upper and lower teeth, incisors, canines and premolars.
3. Size of the lesions from minimum 1 mm² to massive tissue losses with pulp chamber involved through the root surface.

RESULTS

Table 1 shows the frequencies of root caries in all six groups as numbers and proportions.

Table 1. Total number of front teeth with sound crowns and root carieses

Numbers inG groups	Upper 67	Lower 56	Total 123
Incisors	-5-22%	16-5-31%	39-10-26%
Canines	13-3-23%	6-3-50%	19-6-32%
Premolars	17-5-29%	16-10-63%	33-15-45%

It was established that the frequency of root caries is higher in lower teeth – 32%, compared with upper teeth – 19%. The total number was 31 teeth, or 25%. Premolars – 45% and canines – 32% were more affected than incisors – 26%. The size of the lesions varied a lot, from 1mm to high tissue loses and only in several cases more than one root surface was involved.



Fig. 1 (a, b, c). Small initial cavitated lesion on a premolar (a), sound surface of an incisor (b) and caries media on a canine (c)

DISCUSSION

In this particular study incisors, canines and premolars of the upper and lower jaw, which had no caries lesions on the clinical crown and were extracted due to periodontal reasons were examined. In most studies, the used extracted teeth have different pathology and information about the reasons for extraction is lacking. When a study is performed due to an advanced periodontal disease, it has been found that the average attachment loss in different groups of teeth is 50% for front teeth, 58% for premolars and 62% for molars [Splieth 2002]. In a similar study this data is found to be 33%, 51% and 51% [Koher 2000]. In both studies the motivation for the extractions was bone loss more than 50%, which in respect to the usual slow progression of chronical periodontal diseases can provide sufficient time for a progression of root caries. When the periodontal changes are related to changes in the relations between the gingiva and enamel-cementum, enamel-dentine border, it is only a matter of time the exposed dentine surface to increase. This surface is more rough enamel and dental plaque accumulation is much easier. The surface layer of cementum is very thin and the root defence is relatively low. Critical pH for demineralisation of root dentine and cementum is higher than for enamel (5.4-5.5), due to the buffer properties of dentine and some authors found it to be 6.2-6.7 [ten Cate 2003]. Apatite crystals of dentine and cementum are smaller in size than enamel and the reactive surface is bigger. All changes in this area are complicated even in teeth with high level of mineralization of enamel and dentine root caries can occur rapidly. This is a possible explanation of the differences in the size and the structure of crystals in exposed and not exposed roots and also gives some explanation to the fact that if root caries does not occur in 2-3 years after exposure of hard dental tissues, it doesn't occur ever [ten Cate 2003].

It has been established before that the subequatorial zone of dental enamel has higher speed of crystal dissolution increasing in dentine and cementum (Dyulgerova). In this study higher frequency of root caries is found in upper molars similar to clinical trials [Kerr 1990, Imazato 2006, Vilstrup 2007].

The data in this study for root caries in sound crowns (32% for lower and 19% for upper teeth), give grounds to expect a higher frequency of root caries in general. Most patients with atrophic inflammatory and elderly changes in the periodontal tissues suffer from root caries in long terms (4.3 mean value per patient, Reiker 1999), which is a risk factor for early loss of teeth.

CONCLUSIONS

1. The frequency of root caries in sound front teeth was 25%, which is symptomatic for early tooth loss of all groups of teeth in patients with generalized elderly and pathological periodontal changes.

2. Early prevention of root caries with gels, varnishes, mouth rinses and sealants is essential. Strict dietary restriction of erosive beverages and sticky sweeteners is a part of the general treatment and preventive plan.

3. Mouthrinsis, electric toothbrushes, vitamin C, intradental brushes and chemical and mechanical abrasive factors included in standard periodontal treatment plans may be carefully revised.

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Address for correspondence:
Dr. E. Boteva
Department of Conservative Dentistry
Faculty of Dental Medicine
Medical University – Sofia
1 G. Sofiiski str.
1000 Sofia, Bulgaria
e-mail: e_boteva@abv.bg