

# The Influence of Oral Hygienic Habits on Non-Carious Cervical Lesion Development

Josipa Borčić<sup>1</sup>  
Robert Antonic<sup>1</sup>  
Miranda Muhvić-Urek<sup>1</sup>  
Davor Dorčić<sup>1</sup>  
Jelena Horvat<sup>2</sup>

<sup>1</sup>Department of Dental Prosthodontics  
Medical Faculty of Rijeka  
Study of Dentistry, Croatia  
<sup>2</sup>Department of Dental Pathology  
Medical Faculty of Rijeka  
School of Dentistry, Croatia

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## Summary

*The aim of this study was to assess the influence of certain oral hygienic habits (such as general hygiene of the mouth, frequency of toothbrushing, toothbrush hardness) on non-cariou lesion development. The study was conducted on 873 subjects, aged 10 yrs or older. Results showed that there is a statistically significant difference regarding oral hygiene between subjects with cervical lesions and those without them. Furthermore, there is no statistically significant difference in non-cariou cervical lesion development regarding frequency of toothbrushing and toothbrush hardness.*

**Key words:** hygiene, habits, non-cariou cervical lesion.

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Acta Stomat Croat  
2004; 167-170

ORIGINAL SCIENTIFIC  
PAPER  
Received: April 19, 2004

Address for correspondence:

Mr. sc. Josipa Borčić, dr. stom.  
Medical Faculty of Rijeka  
Krešimirova 40, 51000 Rijeka  
phone: +385 51 213255  
e-mail:  
josipa.borcic@ri.htnet.hr

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## Introduction

Non-cariou cervical lesion (NCCL) is defined as loss of mineralized tooth tissue on enamel-cemental junction which is not of carious origin, can be caused by a number of various factors, and is most frequently found on plaque-free surfaces. Such physical and chemical loss of sound tooth structure can cause painful hypersensitivity, painful sensations, pathological pulp changes, and finally tooth loss (1). Commonly literature offers descriptions of all non-cariou lesions as if they were one entity; usually they begin with a description of "tooth substance loss" (2). Following caries as the main cause of such changes, cervical lesions are thought

to be the second major cause regarding frequency. It has been quoted that as many as 25% of pathological destructions are caused by non-cariou processes (3). Such processes include attrition, abrasion, erosion, localized non-hereditary enamel hypocalcification, localized non-hereditary dentinal hypocalcification, localized non-hereditary dentinal hypoplasia, discolorations, malformations, amelogenesis imperfecta, dentinogenesis imperfecta, and tooth trauma.

Because of its morphology the cervical part of the tooth is considered a plaque-retaining spot since it is the narrowest part of the tooth, and also because it is in the proximity of the gingival margin which makes physiological saliva washing and mechani-

cal cleaning difficult (4). Such morphology facilitates plaque and calculus accumulation, which can lead to inflammation, gingival recession, and a change in the physiological root - to - crown ratio. Literature offers confusing statements as to whether the method of brushing can cause such abrasion. Some studies confirm this hypothesis, some reject it (5).

The aim of this study was to evaluate the effect of certain hygienic habits (such as general hygienic status of the mouth, frequency of toothbrushing, toothbrush hardness) on NCCL development.

## Materials and Methods

873 subjects were included in this study, aged 10 yrs or older, randomly selected in dental practices where the study was conducted. Of those tested, 435 were men and 567 women.

First all relevant general data on patients were collected: first and last name, sex, year of birth, phone number, degree, and details of clinical examination. Oral and dental hygiene were graded on the subjective basis, in terms of good, average, and poor. Teeth with no plaque were graded as hygienically good. Teeth with plaque covering up to 1/3 of posterior teeth surfaces were graded as hygienically average, and teeth with plaque covering anterior teeth as well as posterior were graded as hygienically poor. Examinations were performed by one investigator only. Teeth with non-carious cervical lesions were marked with "+", while teeth without such lesions were marked with "-".

In the next phase original anamnestic charts were completed, which consisted of 3 questions. Patients were asked to choose one of the answers offered. Questions regarded frequency of toothbrushing and the type of toothbrush used.

## Results

### 1. The relationship between oral hygiene and non-carious lesion development

The relationship between oral hygiene and a finding of non-carious cervical lesions was established

for all the subjects. Oral hygiene was denoted as good, average or poor, while subjects were divided into groups depending on sex and non-carious lesion occurrence.

Of the 873 subjects tested, 276 were men and 342 women with non-carious cervical lesions, while 117 men and 138 women had no such lesions. Of the 276 men with NCCL, 105 (38%) had good oral hygiene, 91 (33%) average, and 80 (29%) poor oral hygiene. Of the men without NCCL, 63 (53.9%) had good hygiene, 17 (14.5%) average, and 37 (31.6%) poor oral hygiene. Of the 342 women with NCCL, 147 (43%) had good oral hygiene, 129 (37.7%) average, and 66 (19.3%) poor oral hygiene. Of the 138 women without NCCL, 102 (73.9%) had good hygiene, 24 (17.4%) average, and 12 (8.7%) poor oral hygiene.

Using  $\chi^2$  test for statistical analysis at  $df = 2$ , and  $p < 0.05$ , the value of  $\chi^2$  was 46.22. We concluded that there was statistically significant difference regarding oral hygiene between the subjects with NCCL's and those without such lesions. It can be stated that subjects without NCCL's had better oral hygiene in comparison to those with NCCL's.

### 2. The relationship between frequency of toothbrushing and NCCL development

All the subjects (873) were divided into two groups: those with NCCL's and those without NCCL's. Frequency of toothbrushing was noted in both groups. The following results were obtained: 21 subjects brushed their teeth less than once a day, 243 subjects brushed once a day, 438 brushed twice a day, and 171 brushed three or more times a day. Of the 618 subjects with NCCL's, 12 (1.94%) brushed their teeth less than once a day, 180 (29.13%) brushed once a day, 312 (50.49%) brushed twice a day, and 114 (17.96%) brushed three or more times a day. Of those subjects negative for NCCL's (255), 9 (3.53%) brushed their teeth less than once a day, 63 (24.71%) brushed once a day, 126 (49.41%) brushed twice a day, and 57 (22.35%) brushed three or more times a day.

The value of  $\chi^2$  calculated was 4.6 ( $df = 3$ ,  $p < 0.05$ ) which confirms that there were no statistically significant differences in NCCL development depending on the frequency of toothbrushing.

### 3. The relationship between toothbrush hardness and NCCL development

The number of subjects who did not brush their teeth (e.g. who brushed less than once a day) was deducted from the total number of subjects. Thus the relevant number of subjects was 852. Of those, 119 used a hard toothbrush, 688 used a toothbrush of medium hardness, and 45 used a soft toothbrush. Of the 606 subjects with NCCL, 80 (13.2%) used a hard toothbrush, 493 (81.35%) used a toothbrush of medium hardness, and 33 (5.45%) used a soft toothbrush. Among the 246 subjects without NCCL, 39 (15.85%) used a hard toothbrush, 195 (79.27%) used a medium-hard toothbrush, and 12 (4.88%) used a soft toothbrush.

Statistical analysis using  $\chi^2$  test showed that the value of  $\chi^2$  was 2.14 (df = 2,  $p < 0.05$ ), which shows no statistically significant difference in NCCL development regarding toothbrush hardness. It can be stated that toothbrush hardness does not influence NCCL development.

### Discussion

NCCL pathogenesis was a "hot topic" for all of the last century, and still some contradictions and incoherences remain. Beside epidemiological studies, some investigations have focussed on the best therapy for such disease (6-8), or the influence of various etiological factors (9-11). Data that emerged from such investigations are in agreement with those by Lussi and Schaffner (12) who observed that 60.8% of the population in Switzerland are affected by cuneiform defects. These values are similar to those obtained by Bergström and Eliasson (13) who found that 67% of people aged 21-30 yrs had tooth abrasion, while 90% of those aged 31-60 yrs had the same defects. Järvinen (14) found dental erosions in only 5% of Finnish population, which could be caused by higher inclusion criteria applied and exclusion of types of cervical lesions not caused by erosive factors. Kitchin found in his investigation of 1941 that the occurrence of abrasion was 42% in people aged 20-39 yrs, and 76% in people aged 40-59 yrs (15). Ervin and Bucher published their results in 1952 stating that such lesions occur in 45-87% of the population, depending on age (16). Zipkin and

McClure found in 1949 that 27% of the subjects were affected (17), while Bergström and Lavstedt published their finding that cervical abrasion occurred in 31% of the population (18). The data listed agree with our findings to a certain point, where the incidence of NCCL occurrence is 35.6% in the first age group, 73.9% in the second, 94.6% in the third, 78.8% in the fourth, 66.7% in the fifth, and 78.6% in the sixth age group. Such variation, e.g. smaller percentage of the people affected after 46 yrs of age could be explained by the loss of teeth in older age groups, particularly those that are most commonly affected by the described lesions. According to Graehn, 23% of the patients subjected to a dental examination had cuneiform defects (19). He also had six age groups, although in his first age group consisted of patients of 14 yrs or younger, who had no NCCL. In the second age group were patients aged 15-19 yrs and 3.1% of them had cuneiform defects. In the third age group (20-27 yrs of age) the occurrence of NCCL's was 17.5%, while in the fourth group (30-44 yrs) it was 22.7%. The fifth age group consisted of patients aged 45-64 yrs and 50.5% of those had NCCL's. Finally, in the sixth age group (65 and older) only 6.2% of the patients had NCCL's. It can be observed that, as in our investigation, the percentage of patients affected diminished in the older age groups. Donachie (20) did not give such information, although he stated that there is a significant increase in cervical region substance loss with age, additionally noting that men were more affected than women.

It is a common belief that NCCL's occur more often in patients with good oral hygiene, which can be caused by toothbrush hardness or toothpaste abrasiveness. However, the results obtained do not sustain this theory since we found that people with poor oral hygiene had a lower occurrence of NCCL's. Expressed in percentages, men without NCCL's had good oral hygiene in 53.9% of cases, average hygiene in 14.5%, and poor hygiene in 31.6%. Men with NCCL's had good oral hygiene in 38% of the cases, average in 33%, and poor hygiene in 29%. Among the women those differences were even more pronounced: 73.9% of the women without NCCL's had good oral hygiene, 17.4% average, and 8.7% poor oral hygiene. Of the women with NCCL's, 43% had good oral hygiene, 37.7% average, and 19.3% poor

hygiene. We can observe that differences are smaller in those patients with poor oral hygiene, e.g. percentages are similar, which is probably caused by greater plaque index in the population with poor oral hygiene, leading to greater tooth loss. Sorvari (21) experimentally proved that fluoridated tooth surface is significantly more resistant to the detrimental effects of acids. Topical application of fluorides can inhibit initial erosion. This mechanism explains the results we obtained, that good oral hygiene means less frequent NCCL's, since most of today's toothpastes are fluoridated. Kuroiwa (22) suggests that brushing should be performed without using toothpaste because the tooth surface is protected by organic pellicule which is a reservoir for minerals that incorporate into enamel. If toothpaste is used, abrasive particles create microdamage that serves as a nidus for plaque accumulation or cause microcracks of enamel prisms. According to our results frequency of brushing and toothbrush hardness do not affect

NCCL development. Van der Mei (9) proved that abrasion can lead to NCCL development *in vitro*. Bergström and Lavstedt (18) found a statistically significant difference in cervical lesion frequency between those patients who brushed twice a day and those who brushed less frequently. The same authors published in one of their earlier studies that toothbrush hardness did not significantly affect cervical lesion development (23).

Considering the large number of studies in which authors claim that the toothbrush causes NCCL development, and others that claim the opposite, we cannot completely exclude the role of the toothbrush as one of the etiological factors. However, Floyd found cervical lesions in cats (24) which eliminates the role of toothbrushing as an etiological factor. However, as we know, NCCL's can be caused by a number of various factors, and mechanical irritation is probably one of the components in this complex system of cervical lesion development.