The Prevalence, Distribution and Expression of Noncarious Cervical Lesions (NCCL) in Permanent Dentition

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ORIGINAL PAPER

SUMMARY

A non-carious cervical lesion (NCCL) is defined as loss of dental hard tissue in the cervical part of the tooth, not caused by caries, multicausal and insufficiently clarified etiology. Identification of specific etiological factors NCCL is a key in making decisions about treatment. The authors conducted a study to evaluate the prevalence and distribution of noncarious cervical lesions in adults.

Material and Methods: The sample of 210 respondents, were divided into three age groups. Clinical inspection has determined the distribution of NCCL within the respondents in relation to their age, teeth groups, vestibular and oral surfaces of the teeth, sides of the jaws and expression of NCCL according to the tooth wear Smith-Knight Index.

Results: This research points to a very common finding NCCL within our respondents. Cervical lesions were diagnosed in 78.6% respondents in the first, 91.4% in the second and 97.2% in the third group. It has been shown that the number and expression of cervical lesions increases with age of respondents. Noncarious cervical lesions are usually the most visible on premolars, furthermore the first molars and canines, the second molars and then incisors. The minimum number of lesions were diagnosed in the third molars.

Conclusion: Given the high prevalence of NCCL’s, there are reasonable grounds for introducing the tooth wear Index to the wider clinical practice, recording noncarious cervical lesions in dental records, creating specific prevention strategies and effective treatments.

Keywords: Noncarious cervical lesion, dental wear

1. INTRODUCTION

Dental hard tissues are exposed to the effects of many physical and chemical factors, which lead to their damage and cause the formation of noncarious lesions. Since it is very difficult to determine their cause from appearance only, these changes are described as “tooth wear”. The wear of dental tissue is a universal phenomenon, progressing slowly and continuously throughout the whole life and it is part of the aging process.

Excessive tooth wear is found more often in elderly people, because their teeth are retained longer in the mouth and the effects of potential causes acting for longer period (1).

Extreme wear of tooth tissue can cause damage to the shape, function and vitality of teeth (2, 3).

Cervical part of the tooth (collum dentis) is a boundary between enamel and dental cement. Because of its specific anatomical and morphological characteristics, cervical part shows great sensitivity to various factors (4, 5, 6, 7, 8, 9).

The term “noncarious cervical lesion” (NCCL) describes lesions located on the cervical part of the tooth, with multicausal and insufficiently clarified etiology, but not caused by caries. This physical and chemical tissue damage can cause cosmetic problems, unpleasant hypersensitivity, painful sensations, pathological changes in the pulp and eventually tooth loss (7).

Their appearance varies from shallow lesions, to deep defects with sharp edges. Bottom lesions can be straight, hollow, or sharp angled, and can be located on vestibular, oral or approximal side of the tooth. Lesions usually occur on the teeth surfaces with no plaque (Figure 1).

Figure 1. Noncarious cervical lesions

In the literature we can find a variety of names, synonyms for NCCL: cervical erosion, erosive-abrasive lesions, toothbrush abrasion, wedge-shaped defects, cervical incisions or idiopathic cervical erosion (6, 9).

Levitch at al. (8) analyzed 15 papers published from 1941 to 1991, in order to examine the prevalence of these changes. They concluded that the prevalence of NCCL has ranged...
from 5% to 85%. This wide range in results is a consequence of the different methodologies and lack of clear diagnostic criteria, showing that it is very difficult to compare the results published by different authors. Otherwise, the authors mostly agree that the number, size, and depth of lesions increase with the age of respondents.

Bergstrom and Eliason (10) examined 250 patients in 1988 and found 67% of cervical abrasion in patients aged from 21 to 30 and 90% in patients aged from 31 to 60 years. Above mentioned indicated a high degree of correlation between the presence of noncarious cervical lesions and age of respondents.

The results of Lussi and Schaffner (11) research showed that teeth of 60.8% of younger and 78.7% of older Swiss population are affected by cervical defects.

The Smith and Robb (12) concluded that cervical enamel wear is so often that it is almost a rule, but the dentine exposure is rare, in range from 2-6%.

According to the findings of Pegorago at al. (13) noncarious cervical lesions were present with 95% of examined respondents. A greater number of lesions were found in the maxilla, especially on the first molars (16.6%) and mandibular second premolars (14.9%).

Extensive research of Borčić et al. (4) with 1002 patients in Croatia, have found the presence of cervical lesions in 60-70% of examined patients, while the dentine exposure was relatively rare from 0.6 to 5.6%. In the same study, higher prevalence of cervical lesions was found in the mandible.

The teeth being most frequently affected were the canines 23-25%, first premolars 23-34% and second premolars 25-31%. In this sample, prevalence and expression of cervical wear also increased with age of respondents.

Most of the studies described cervical wear on the vestibular surfaces of teeth (14, 15).

Kan et al. (16) described cervical lesions on the lingual surfaces of the teeth in 2% of cases. Same authors noticed these changes more often on mandibular teeth, especially premolars and molars.

2. RESEARCH GOALS

Today, noncarious cervical lesions occurrence is increasing, because of improved caries prevention, dietary habits, exposure to stress, and prolonged retention own dentition in the elderly. So far in our country, public health significance of NCCL has been ignored.

Pathogenesis and etiology of noncarious cervical lesions have not been fully clarified and this problem is the subject of debate among researchers.

Therefore we stated our goals:
1. Determine the prevalence of NCCL in permanent dentition in patients according to age groups
2. Determine the distribution of NCCL according to the teeth groups, tooth surfaces (vestibular, oral) and sides of the jaws
3. Determine the expression of the NCCL according to the Smith–Knight tooth wear index (TWI)

3. MATERIAL AND METHODS:

The study treated adult population aged 20-64 years. Patients were examined and divided into three age groups according to the World Health Organization (20-34 years, 35-49 years, 50-64 years). Subjects were patients who were admitted to the Department of Dental Pathology and Endodontics, Faculty of Dentistry, University of Sarajevo.

Criteria for respondent’s inclusion:
- that the respondents have at least 20 natural teeth (teeth under dental crown or bridge supports, were not included in the study)
- do not have extensive caries
- do not have periodontal diseases (mobile teeth) – do not wear mobile dentures — did not bleach their teeth

3.1. Diagnostic Criteria

Clinical examination of the teeth was performed by flat mirror and graduated Williams’s probe. All vestibular and oral sides of teeth were examined. Tip of the probe was slightly exceeded along the tooth surface, going from the bottom of the gingival sulcus. If the probe was retained in the cervical region of teeth because of the existing irregularities (Figure 2), such changes are recorded and evaluated according to Smith–Knight tooth wear index (TWI). Smith–Knight tooth wear index describes all tooth surfaces, and the cervical part defined as a separate anatomical region that has its own scale (Table 1). Authors agree that TWI is satisfactory for the epidemiological investigation, clinical registration and monitoring of lesions over a longer period of time (4).

<table>
<thead>
<tr>
<th>TWI</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>no changes in the contours of the teeth</td>
</tr>
<tr>
<td>1</td>
<td>minimal loss of contour of the enamel</td>
</tr>
<tr>
<td>2</td>
<td>defect area is less than 1 mm</td>
</tr>
<tr>
<td>3</td>
<td>depth of the defect is between 1-2 mm</td>
</tr>
<tr>
<td>4</td>
<td>defect is deeper than 2 mm, exposed pulp or secondary dentine</td>
</tr>
<tr>
<td>M</td>
<td>missing teeth in the dental arch</td>
</tr>
<tr>
<td>R</td>
<td>restaurated or fractured surfaces, area covered by plaque or calculus</td>
</tr>
</tbody>
</table>

Table 1. Smith–Knight tooth wear index (TWI)

Figure 2. Measuring the depth of noncarious cervical lesions with graduated probe (orig. photo)

4. RESULTS AND DISCUSSION

Received data have been processed by statistical software package SPSS 16.0 for Windows (version 13.0, SPSS Inc., Chicago, Illinois, USA) and Microsoft Excel (version 11 Microsoft Corporation, Redmond, WA, USA).
The total number of examined teeth was 5315. The sample consists 210 patients, 55% women and 45% of men.

**Distribution of noncarious cervical lesions**

A large number of authors from different parts of the world studied the prevalence of noncarious cervical lesions and influence of the factors which lead to their creation. The results of this study indicate a very often presence of noncarious cervical lesions in our patients.

Cervical lesions were diagnosed in 78.6% of respondents in the first, 91.4% in the second and 97.2% in the third age group (Chart 1). At least one restored cervical lesion was verified in almost 55% of examined patients (Chart 2). These results correspond with findings of Bergstrom and Eliason (10) who recorded cervical lesions in 67%–90% of the examined subjects, depending on their age. Pegorago at al. (13) recorded cervical lesions in 95% examined Brazilian patients, while Borčić at al. (4) cervical lesions verified in 35.6 to 94.6%, also related with their age. These results confirm earlier findings (4,8,10,13) that noncarious cervical lesions are more common in older people (Chart 8) probably due to the cumulative effect of the large number of etiological factors over a longer time period.

**Percentage of teeth with and without lesions**

In this study half of the examined teeth were affected by some form of noncarious cervical lesion. Cervical lesions were found at 51, 4%, while 4.5% were teeth with existing cervical restorations (Chart 3).

**Distribution of noncarious cervical lesions in the maxilla and mandible**

Statistical analysis pointed to the slightly higher number of these lesions in the mandible (Chart 4), although more restored teeth were recorded in the maxilla. Kan at al. (16) also suggested that cervical lesions are more often diagnosed on the teeth of lower jaw. These findings are in contradiction with the results of the Tar at al. (15), and Zipkin and McLure’s (14), who indicated a higher number of noncarious cervical lesions on the maxillar teeth.

**Distribution of noncarious cervical lesions according to the jaw side**

Although there are some theories that cervical lesions are more expressed on the side opposite of the brush holding side, this study does not confirm that. We can say that our patients had almost equal number of lesions on both sides of the jaws, although the majority of respondents were right handed (Chart 5). Similar results were presented by Zipkin and McLure (14), and Hina at al. (18). In contrast to
this Bergstrom and Eliason (10) diagnosed more lesions on the left, and Radenc at al. (17) on the right side of the jaws.

Distribution of lesions on the vestibular and oral side of the teeth

A common finding of cervical lesions is on the vestibular side of the teeth, while their finding on the oral side is rare. Cervical lesions in our patients were found on 51.4% examined teeth, on the vestibular side 51.1% and on the oral were only 2.4% (Chart 6). Khan at al. (16) also noticed cervical lesions on the oral side at 2% of the examined teeth.

The number and percentage of teeth with and without lesions, grouped by types of teeth (incisors, canines, premolars and molars)

By analyzing the distribution of noncarious cervical lesions we concluded that teeth with the most common exhibiting cervical lesions are premolars: first lower premolars (77.1%), first upper premolars (73.6%), second lower premolars (71.1%), second upper premolars (60.5%). Then followed: first upper molars (61.3%), upper canines (57.9%), first molars (56.3%), lower canines (55.2%), the second upper molars (44.2%) second molars (43.6%). From this we concluded that upper molars are generally more affected than the mandibular.

When it comes to the incisors, cervical lesions were present in the following percentages: the lower central incisor (39.5%), lower lateral incisor (39.1%), upper central incisor (37.3%), upper lateral incisor (36.4%). In our patients more lesions were noticed on the mandibular than maxillary incisors. The minimum number of cervical lesions were recorded on the upper third molar (7.27%) and lower third molar (2.21%) (Tables 2 and 3).

Similar results presented Zipkin and McLure (14). They find that maxillary molar is more affected with cervical lesion than mandibular, and most affected tooth was maxillary first premolar.

Radentz at all. (17) most number of lesions verified on the maxillary first molar, followed by premolars.

Borčić at al. (4) stated first premolars 23-34%, second premolars 25-31% and canines 23-25% as the most affected groups of teeth. In our sample we noticed more cervical lesions, which we explain with the fact that the respondents in our study had to have at least twenty natural teeth, so that the lack of teeth would not significantly affect the final results. Also, there is a possibility that our diagnostic criteria were stricter.

Lesion levels distribution according to the Index of tooth wear

Because of existence different tooth wear levels, which are not of same importance, it is difficult to speak about the prevalence of noncarious cervical lesions. According to the Tooth wear index, lesions rated with number 1, which we found on 34.4% examined teeth, represents the initial loss of enamel and their existence is not of clinical importance. For clinical practice, the most interesting index levels are 2, (13.5%), 3, (3%) and level 4 (0.5%). Lesions with these levels 2,3,4, in our study were diagnosed at 17%
of the examined teeth and represents clearly formed cervical lesions (Chart 7).

Teeth with cervical wear level 1 and 2 should be under the regular control of the dentist. Lesions marked with 3 and 4, represent exposed dentin and require restorative treatment. These changes are recorded at 3.5% of the examined teeth (Chart 8).

Smith and Robb (12) recorded exposed dentine in the 2-6% of the examined teeth, while Borčić at al. (4) dentin exposure noticed in 0.6 -5.6% of cases.

Presence of lesion levels 2, 3 and 4 were found on premolars in the highest percentage (Chart 7).

Levels of tooth wear 3 and 4 were most common in the oldest age group (Chart 8).

Given the high prevalence of all forms dental wear including cervical, it is obvious that this is becoming a widespread health problem, which requires specific preventive measures to be developed.

Successful diagnosis and treatment of cervical lesions need an individual approach to each patient, detailed history of disease, analysis of clinical manifestations, a careful evaluation of all present etiological factors, and monitoring over a longer period of time.

It is very important to recognize dental tissue wear in early stage, because treatment in case of pathological tooth wear usually requires extensive restorations.

5. CONCLUSIONS

- Noncarious cervical lesions were identified in very high percentage of patients aged 20-64 years.
- The number and expression of cervical lesions increase with the age of the subjects.
- Noncarious cervical lesions are most common and most expressed on the premolars, followed by the first molars and canines, second molars, incisors. Minimum number of cervical lesions were recorded on third molars.
- Presence of cervical lesions on the vestibular surfaces is very common (51,1%), while their finding on the oral surfaces is rare (2,4%).
- It is necessary to introduce the Index of tooth wear in general clinical practice and register noncarious cervical lesions in dental records.
- There is a need for designing and implementing specific programs to prevent noncarious cervical lesions, which would help to avoid expensive endodontic and prosthetic treatment.

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