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성인에서 비우식성의 치경부치질
결손부의 유병률과 교합양상에
관한 연구

정
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운

성인에서 비우식성의 치경부치질 결손부의 유병률과 교합양상에 관한 연구

조선대학교 대학원

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Noncarious cervical lesions in adults

Prevalence and occlusal wear facets

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ABSTRACT

Noncarious cervical lesions in adults Prevalence and occlusal wear facets

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Background. The factors that induce the formation of noncarious lesions are not understood fully, particularly those that are related to occlusal aspects. This study was evaluated the prevalence of noncarious cervical lesions in adults and their association with occlusal aspects.

Methods. This study examined 70 people (35 men and 35 women) aged 25 to 45 years to determine the presence and type of noncarious cervical lesions, wear facets, tooth contacts in maximal intercuspal position, and lateral and protrusive movements. The assessment involved a questionnaire and clinical examination.

Results. Among the teeth this study evaluated, 17.23 percent had cervical lesions, 80.23 percent of which had wear facet ($P < .01$). This study found a significant difference between the prevalence of noncarious lesions and the presence of wear facets ($P = .0484$).

Conclusion. The study found that cervical lesions were related significantly to wear facets. These findings strengthen evidence for the role of occlusal forces as an etiologic factor for noncarious lesions.

Key words. Abfraction; cervical lesion; wear facet; occlusion

I. Introduction

Noncarious cervical lesion is the loss of tooth structure at the cemento-enamel junction or CEJ, level that is unrelated to dental caries.

These lesions can affect tooth sensitivity, plaque retention, caries incidence, plaque retention, caries incidence, structural integrity and pulpal vitality.

The noncarious cervical lesion is being seen with increasing frequency and presents unique challenges for successful restoration.

The loss of cervical tooth structure, in the absence of caries, has been described by several different terms. Some authors describe these cervical lesions as *abfractions*, *edge-shaped defects*, *noncarious cervical lesions* (NCLs), and *stress-induced cervical lesions*. Many descriptive articles offer opinions as to etiology and treatment modalities. Some authors have implicated oral hygiene practices such as type of dentifrice, site of initial toothbrush/dentifrice application, bristle hardness, frequency of brushing, and pressure applied. Also, some cross-sectional epidemiological studies have proposed toothbrush abrasion, including many variables, as the etiologic agent in the formation of noncarious cervical lesion. Other cross-sectional studies propose chemical erosion as the etiologic agent, citing cofactors including salivary citrate content and occupational acid exposure. While hygiene techniques and erosion may indeed be factors, the presence of such lesions located subgingivally suggests that other factors are involved in the development of noncarious cervical lesion. None of the above-mentioned epidemiological studies reported observations of the subject's occlusal relationships or wear patterns.

In 1991, Grippo² introduced a new category—abfraction—to the classification of noncarious cervical lesions to refer to the pathological loss of dental hard tissue caused by biomechanical forces. He concluded that such lesions occurred owing to flexure of the tooth caused by occlusal forces and the consequent fatigue of enamel and dentin distant from the point of force

application.

Different types of functional and parafunctional activities that occur in the mouth, such as chewing and bruxing, significantly influence the rupture of the tooth structure. When a tooth is loaded in the long axis, the forces are dissipated with minimal stress in the dentin or enamel. If the direction of the force is moved laterally, however, teeth are flexed toward both sides. The stress pattern in the same area is changed continuously from compressive to tensile, especially underneath the enamel, since dentin appears to be substantially stronger than enamel when under lateral forces. Thus, the cyclic occurrence of compression and tension may reach the fatigue limit and lead to rupture of the chemical bonds between the hydroxyapatite crystals.^{6,8,16}

Studies of finite element^{17,18} and photoelastic models¹⁹ have shown that the load applied to the inner buccal and lingual cuspal inclines of a mandibular premolar (similar to the load pattern of a person with bruxism during lateral excursions of the mandible) produced the highest stress in the cervical region-1 to 2 millimeters above the cemento-enamel junction (CEJ)-with a magnitude that could initiate enamel fracture. Despite its fundamental role in the initiation of the process, occlusal loading may not be the primary factor in the formation of noncarious cervical lesions.²⁰⁻²²

Attempts have been made to evaluate the incidence and prevalence of this type of lesion in different populations.^{4,23,24}

The age range of study population samples is a matter of controversy. According to one study, the higher the age range of the group evaluated, the higher the lesion prevalence.⁴ According to these authors, the maxillary teeth most commonly affected are the first premolars, followed by the first molars, second premolars and canines. As for mandibular teeth, the first premolars again are the most frequently affected, followed by the second premolars, first molars and canines.

The characteristics of noncarious cervical lesions, with their sharp angles, wedged shapes and frequent subgingival locations, have not been explained by the proposed theories to date. Yet, occlusal trauma alone cannot fully

explain the phenomenon, since evidence indicates that many teeth show signs of traumatic occlusion but do not develop cervical lesions. Despite the need for scientific confirmation, the occlusal trauma concept is well-accepted, since it may explain the morphology and location of the lesions.^{11,27}

Since the prevalence of cervical lesions is increasing, identification of the risk factors is key for diagnosis, prevention and treatment. Therefore, in an attempt to provide further clarification on this issue, we conducted this study to evaluate the prevalence of noncarious cervical lesions in a patient population aged 25 to 45 years and the lesions' association with occlusal wear facets.

II. SUBJECTS AND METHODS

This study evaluated 70 people (35 men and 35 women) aged 25 to 45 years. This study obtained informed consent from the subjects. The inclusion criteria for our study were the absence of ongoing orthodontic treatment and the presence of all natural teeth in both dental arches and the absence of tooth mobility.

This study first asked the subjects to fill out an eight item questionnaire to provide information that might be related to the type of lesion present in the teeth we evaluated (Table1).

Table 1. Form to fill out questionnaire to provide information

<i>Questionnaire.</i>
1. Do you have any parafunctional habit such as tooth clenching or grinding, tongue biting, lip biting, gum chewing, cheek biting, biting objects or nail biting?
2. Do you chew unilaterally?
3. Have you had orthodontic treatment?
4. Do you drink acidic beverages such as colas or orange juice?
5. Do you have or have you had any regurgitation problem?
6. Do you have any health problems?
7. Have you taken any drug for long periods?
8. Do you regard yourself as a nervous person?

All of the subjects received complete information on how to answer these questions. After they completed the questionnaire, this study examined each subject clinically with the aid of dental probes and mirrors with surface reflection.

This study examined the buccal, lingual and palatal aspects of all of the teeth. Positioned the tip of the probe perpendicular to the tooth surface and inserted it to the bottom of the gingival sulcus, crossing the CEJ up to approximately one-half the height of the corresponding cusp tip. If the probe was retained by some irregularity, considered the irregularity to be a noncarious cervical lesion even if it was located at the CEJ, since clinically detectable irregularities in this area may cause flexure of the tooth.^{3,5,15,27}

This study examined the cervical lesions and verified the occlusal contacts in maximal intercuspal position (MIP) and during lateral and protrusive movements with aid of articulation paper and study cast (Figures 1 and 2).



A



B

Figure 1. A. Clinical view of noncarious cervical lesions on the maxillary left first and second premolars and the first molar. B. The occlusal view of contacts in maximal intercuspal position (MIP) and working movement (lateral movement of the mandible from MIP to the ipsilateral side).

A



B



Figure 2. Buccal and occlusal views of a sample cast.

Note the presence of cervical lesions (A) and wear facets (B).

This study investigated the presence of wear facets in all teeth in MIP and during lateral and protrusive movements. Thus, the presence or absence of wear facets could be related to the presence or absence of noncarious cervical lesions.

This study performed statistical analysis using the t test, Mann-Whitney test and χ^2 test. This study adopted a 5 percent level of significance.

III. RESULTS

A. Evaluation of questionnaire.

This study found that having parafunctional habits ($P = .9347$), chewing unilaterally ($P = .2496$), having had orthodontic treatment ($P = .6980$), experiencing stress ($P = .9163$), drinking acidic beverages ($P = .0517$), having regurgitation problems ($P = .9447$), taking drugs for long periods ($P = .5530$) and having health problems ($P = .8032$) were not associated with the presence of lesions. We also found that sex was not associated with the presence of lesions ($P > .05$).

The group of subjects with lesions had a mean age of 32.5 years ($SD = 5.09$); the group of subjects without lesions had a mean age of 35.1 years ($SD = 5.96$). The difference between the groups was not statistically significant ($P = .213$) according to the Mann-Whitney test.

B. Clinical examination.

Of the 70 subjects examined, 62 had at least one tooth with a noncarious cervical lesion. The number of lesions per subject in the group with noncarious cervical lesions ranged from 1 to 14, with a mean of 5.61 lesions per subject (standard deviation [SD] = 3.34) (Figure 3).

This study found 189 lesions in the maxilla and 166 in the mandible ($P = .073$). Table 1 shows the percentages of lesions according to the type of teeth, as well as groups with the same statistical significance.

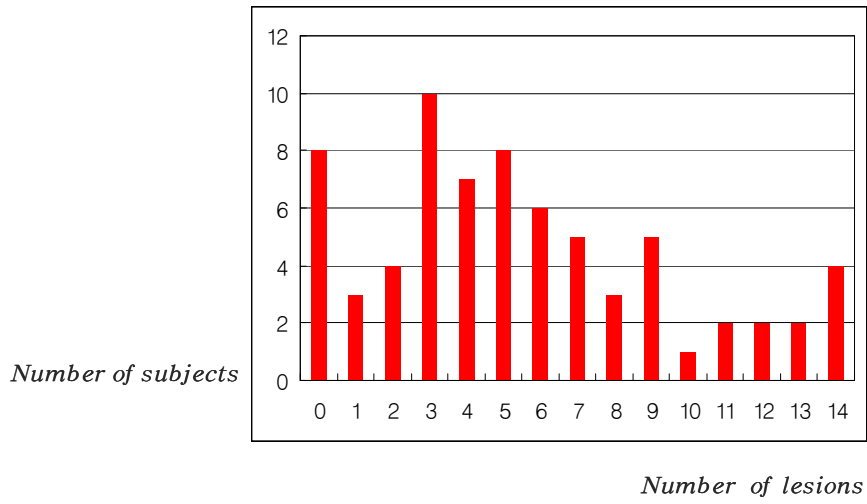


Figure 3. Frequency of lesions per subject.

TABLE 2. Distribution of the lesions according to the each tooth.

<i>TEETH WITH LESIONS</i>	N	<i>percentage</i>
<i>Maxillary First Molar</i>	59	16.6
<i>Mandibular Second Premolar</i>	53	14.9
<i>Mandibular First Molar</i>	49	13.8
<i>Maxillary First Premolar</i>	48	13.5
<i>Mandibular First Premolar</i>	47	13.2
<i>Maxillary Second Premolar</i>	44	12.4
<i>Maxillary Second Molar</i>	20	5.6
<i>Mandibular Second Molar</i>	14	3.9
<i>Maxillary Canine</i>	13	3.7
<i>Maxillary Central Incisor</i>	4	1.1
<i>Mandibular Canine</i>	3	0.8
<i>Maxillary Third Molar</i>	1	0.3
<i>Mandibular Central Incisor</i>	0	0.0
<i>Maxillary Lateral Incisor</i>	0	0.0
<i>Mandibular Lateral Incisor</i>	0	0.0
<i>Mandibular Third Molar</i>	0	0.0
TOTAL	355	99.8

C. Occlusal analysis.

In the group of subjects with lesions, the mean number of teeth per subject was 29.5 (SD = 2.08); the mean number of teeth in the group of subjects without lesions was 28.5 (SD = 2.33). This study found no statistically significant difference between groups ($P = .2074$) when we considered the number of teeth. The group of subjects with lesions, however, had a mean of 10.92 (SD = 4.32) teeth with wear facets, compared with a mean number of 7.75 (SD = 2.96) wear facets for the group of subjects without lesions. The distribution of wear facets per subject can be seen in Figure 4. According to the t test, this difference was statistically significant ($P = .0484$). Of the 355 teeth with lesions, 285 (80.3 percent) exhibited contacts and wear facets distributed in 139 teeth in MIP (48.8 percent), as well as 137 teeth in working lateral (48.1 percent), six teeth in nonworking lateral (2.1 percent) and three teeth in protrusive (1.0 percent) movements. Table 2 shows the relationship between teeth with and without lesions and wear facets. Both characteristics are statistically significant as demonstrated by the χ^2 test ($P < .01$).

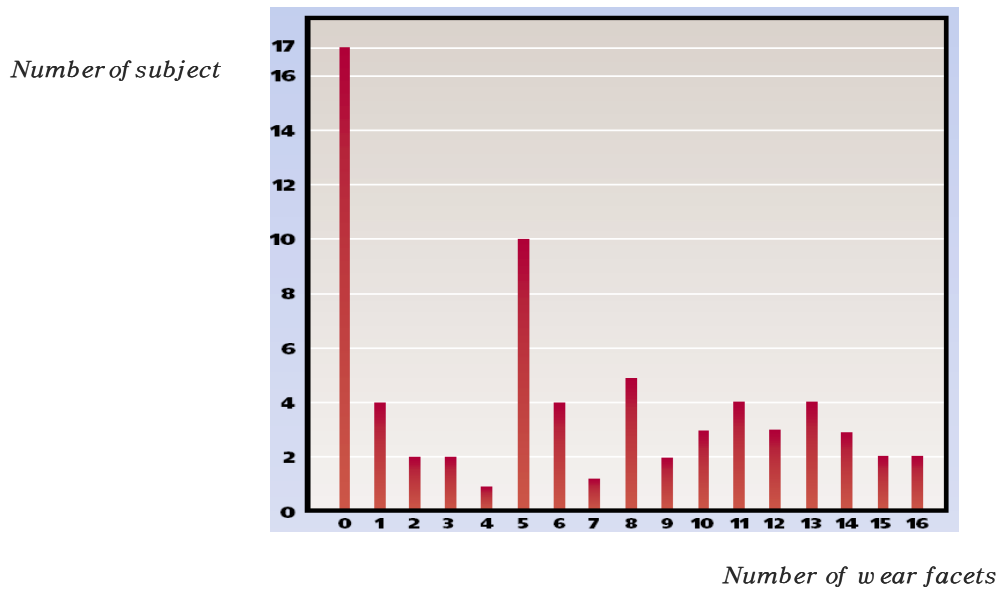


Figure 4. Frequency of wear facets per subject.

Table 3. Relationship between teeth with and without lesions and wear facets.

Teeth	With Wear Facet	Without Wear Facet
With Lesions	285	70
Without Lesions	454	1251

IV. *DISCUSSION*

Because the study focused mainly upon an occlusal aspect, its ability to precisely determine the primary reasons for the development of new lesions was restricted.

The main reason for the disagreements in the literature is the large variability of the age ranges in the study samples. Conflicting data emerge in the analyses of the results of the studies, since the prevalence of noncarious lesions tends to increase with age.^{4,11} This study analyzed a sample population aged 25 to 45 years. The difference in the mean ages of 32.5 years for the group of subjects with lesions and 35.1 years for the group of subjects without lesions was not statistically significant. Within this age range, this study inclusion criterion that the subjects had to possess all of their natural teeth was not difficult to meet.

These results might seem to be in conflict with the fact that the lesions increase with age, as was confirmed by the present investigation, but, certainly, the difference in percentage must have occurred as a result of the variations in the execution technique and variations in the interpretation of the clinical examinations that detected the lesions.

Many authors have associated the presence of lesions with parafunctional habits.^{1,6,8,9,14,23} Nevertheless, in this study the presence of parafunctional habits in the subjects was not correlated with the presence of lesions.

Similarly, unilateral chewing was not correlated with presence of the lesions.

The orthodontic treatment was found that prevalence of lesions compared with subjects who had no lesions. The group of subjects who had undergone orthodontic treatment also had a reduced number of teeth with wear facets compared with subjects who had not undergone orthodontic treatment, regardless of the presence of noncarious cervical lesions.

Stress in subjects in both groups did not influence the presence of lesions. Emotional stress is one of the many etiologic factors involved in

parafunctional habits, and it was not significantly related to the presence of lesions.

The drinking acidic beverages and having regurgitation problems or reflux were not correlated significantly with the presence of lesions. They are related more to dental erosion, which may occur because of extrinsic (acid coming from the external environment) or intrinsic (acidic supply coming from the internal environment—for example, reflux) influences.

Moreover, those types of lesions display characteristic clinical signs as a wide, clean and polished surface with well-defined borders on all sides, in addition to the clinical history of gastric, feeding and psychological issues.²⁹

This study found that general health problems, which may lead to the need for taking drugs for long periods, also were not significant with regard to the presence of noncarious lesions. Some drugs, however, may cause xerostomia, potentiating the destructive effect of erosive processes. In the dental literature, no clinical evidence indicating that drugs or pathological conditions may predispose the occurrence of noncarious lesions has been reported so far.

It was considered the mean of 10.92 teeth with wear facets per subject in the group with lesions to be significantly higher than the mean of 7.75 teeth with wear facets per subject in the group without lesions. These data clearly show the positive correlation between the presence of lesions and the presence of wear facets. Wear facets in 75.7 percent of the subjects (range of wear facets per subject, 1-16) and in 17.23 percent of all teeth evaluated. Considering only teeth with lesions, 80.28 percent had wear facets. Table 2 shows the relationship between the presence of lesions and of wear facets. The χ^2 test revealed a significant relationship between these characteristics.

The lateral forces generated during chewing and bruxism may cause flexure of the teeth. The resulting tensile stress is concentrated in the cervical area close to the tooth fulcrum, thus breaking the chemical bond of the enamel and dentin crystalline structures. This allows penetration of small molecules through the micro fractures and ultimately disrupts the repair of these chemical bonds. The damaged tooth structure subsequently is lost through

the action of factors such as acids and abrasions, which play a secondary role in the development of these lesions.

As mentioned by Grippo and colleagues³⁰ and Litonjua and colleagues,³¹ the complexity of the tensile process generated in the cervical area, the multifactorial etiologic factors and the difficulties of qualifying it in relation to the occlusal patterns make it necessary to have more precise parameters for studying the influence of occlusion on the development of noncarious cervical lesions.

V. Conclusion

Within the limitations of this study, it was concluded that age, sex, para-functional habits, unilateral chewing, orthodontic treatment, stress, intake of drugs for long periods and general health status were not predictors of the presence of noncarious cervical lesions.

In addition, it was concluded that significant correlation between the prevalence of noncarious lesions and the presence of occlusal wear facets.

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저작물 이용 허락서

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논문제목	한글: 성인에서 비우식성의 치경부치질 결손부의 유병률과 교합양상에 관한 연구 영문 : Noncarious cervical lesions in adult -Prevalence and occlusal aspects				

본인이 저작한 위의 저작물에 대하여 다음과 같은 조건아래 조선대학교가 저작물을 이용할 수 있도록 허락하고 동의합니다.

- 다 음 -

1. 저작물의 DB구축 및 인터넷을 포함한 정보통신망에의 공개를 위한 저작물의 복제, 기억장치에의 저장, 전송 등을 허락함
2. 위의 목적을 위하여 필요한 범위 내에서의 편집·형식상의 변경을 허락함. 다만, 저작물의 내용변경은 금지함.
3. 배포·전송된 저작물의 영리적 목적을 위한 복제, 저장, 전송 등은 금지함.
4. 저작물에 대한 이용기간은 5년으로 하고, 기간종료 3개월 이내에 별도의 의사 표시가 없을 경우에는 저작물의 이용기간을 계속 연장함.
5. 해당 저작물의 저작권을 타인에게 양도하거나 또는 출판을 허락을 하였을 경우에는 1개월 이내에 대학에 이를 통보함.
6. 조선대학교는 저작물의 이용허락 이후 해당 저작물로 인하여 발생하는 타인에 의한 권리 침해에 대하여 일체의 법적 책임을 지지 않음
7. 소속대학의 협정기관에 저작물의 제공 및 인터넷 등 정보통신망을 이용한 저작물의 전송·출력을 허락함.

동의여부 : 동의(O) 반대()

2008년 2월 일

저작자: 정 다 운 (서명 또는 인)

조선대학교 총장 귀하