

Etiological Aspects of Noncarious Dental Lesions

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ABSTRACT: Purpose: The aim of the present study was to correlate etiological factors with noncarious cervical lesions in a group of patients from Craiova. Material and Methods: The study was conducted between November 2015 and May 2016 on 50 patients, aged 18-56 years, who addressed to the Oral Rehabilitation Clinic, from the University of Medicine and Pharmacy of Craiova. Patients were divided into two groups: the study group consists of patients who had noncarious cervical dental lesions (NCCLs) and the control group with patients who did not have noncarious cervical lesions. Each patient underwent a clinical examination and completed a questionnaire, referring to eating habits, oral hygiene, vicious habits and personal impressions about the appearance and functionality of his teeth, highlighting the factors involved in the noncarious dental lesions etiology. Results: The study group consisted of 64% women and 36% men. Noncarious cervical lesions were higher in men (72.22%) compared to women (56.25%). Regarding on the tooth brushing method, it has been noted that 34% of patients used a vertical tooth brushing method, 52% were using a circular brushing method, while 14% were practicing a horizontal tooth brushing method. Cervical sensitivity has been detected in 48% of the patients, against 52% who showed no sensitivity. 62% of the participants did not have bruxism, while nighttime/daytime bruxism was found in 38% of the patients. Conclusions: There are several etiological factors correlated with noncarious cervical lesions, among which are: tooth brushing method, bruxism, eating behaviors.

KEYWORDS: Noncarious dental lesions, etiology, cervical lesions, abfraction, erosive tooth wear.

Introduction

Noncarious cervical lesions (NCCLs) develop following normal and/or pathological function in time, and manifest as abfraction, abrasion, erosion or structural and composition degradation of teeth tissues [1]. Clinical appearance of NCCLs can vary depending on the type and severity of the etiological factors involved [2]. Published data supports the fact that abfraction, such as any NCCLs, have a complex etiology. Of the many possible etiological factors associated with NCCLs, occlusal stress forces have mostly studied during the recent years [1]. The interaction between chemical, biological, and behavioral factors is critical and helps to explain why some individuals exhibit more than one type of

cervical lesional mechanism compared to others [1].

ETW (erosive tooth wear) occurs as a loss of the normal tooth surface structure and morphology. Typical changes of ETW on occlusal surfaces are represented by cupping of the cusps and flattening of the occlusal planes. With the advance of ETW, all the occlusal normal morphology can disappear leading sometimes to the formation of hollowed out surfaces [3]. Typical signs of ETW on smooth surfaces are flattening of the surface, and an intact rim along the gingival margin may be present. Concavities may become present, which are normally more wide than deep [3].

In a study published in 2016, Nascimento et al [1] shows the scheme of pathodynamic mechanisms of tooth surface lesions, as proposed by Grippo (Fig. 1):

Schema of pathodynamic mechanisms of tooth surface lesions

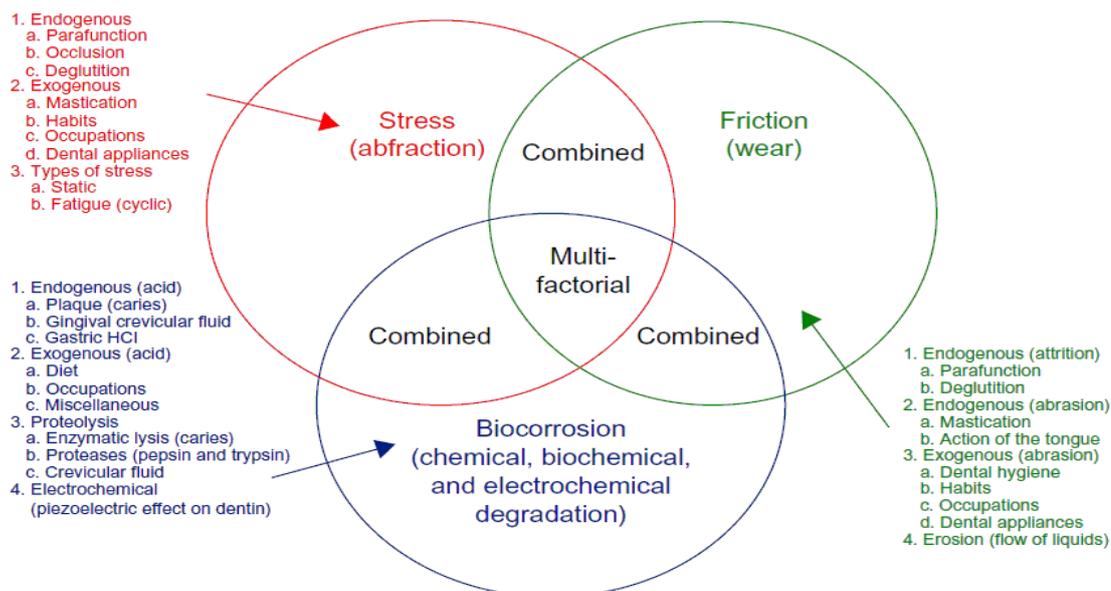


Fig. 1. Scheme of pathodynamic mechanisms involved in NCCLs as proposed by Grippo et al. [1,12]

NCCLs are relatively common clinical conditions that can adversely affect structural integrity, retention of the dental plaque, pulpal vitality, tooth sensitivity, and overall morphology [1,6,7,8]. A dental practice-based study revealed that NCCLs are the main reason besides than caries that lead to placement of restorations on previously unrestored permanent tooth surfaces [9].

The aim of the present study was to correlate etiological factors to noncarious cervical lesions (NCCL) in a group of patients from Craiova.

Material and Methods

The study was conducted between November 2015 and May 2016 on a 50 patients study group, aged 18-56 years, who addressed to the Oral Rehabilitation Clinic, from the UMF Craiova and it was approved by the Ethics Committee of UMF Craiova. Patients were divided into two groups: the study group consists of patients who had noncarious cervical dental lesions (NCCLs) and the control group with patients who did not have noncarious cervical lesions. Each patient underwent an endooral and exooral clinical examination and completed a questionnaire, referring to eating habits, oral hygiene, vicious habits and personal impressions about the appearance and functionality of his teeth, highlighting the factors involved in the noncarious dental lesions etiology.

A database was created using Microsoft Office Word 2007 software, and the results have been processed using the same program.

Results and Discussions

The subjects studied (50 patients), were divided into two groups: the study group, which gathered the patients with noncarious cervical dental lesion (62% of the participants) and the control group, that of the patients without noncarious lesions (38% of participants). According to the patients age, 40% of the participants were aged 18-30 years (65% of them had noncarious cervical dental lesions) and 60% of the participants were aged 31-56 years (60% patients among them had noncarious cervical dental lesions) (Table 1).

Table 1. Patients distribution according to the their age

Age (18-56 years)	Study Group	Control Group	Total
18-30 years	13	7	20
31-56 years	18	12	30
Total	31	19	50

Literature shows that NCCLs are more prevalent in the adult population, with the incidence increasing from 3% to 17% between 20 years and 70 years of age [1,10,7,11].

64% of study participants were women, and 36% were men. Noncarious cervical dental lesion frequency was greater in males (72.22%) compared to women (56.25%) (Table 2).

Table 2. Patients distribution according to sex

Sex	Study Group	Control Group	Total
Men	13	5	18
Women	18	14	32
Total	31	19	50

Depending on the patients origin, 80% of the patients from this study came from the urban areas, while 20% came from rural areas (Table 3).

Table 3. Patients distribution depending on their origin area

Origin area	Study Group	Control Group	Total
Urban	23	17	40
Rural	8	2	10
Total	31	19	50

Erosive tooth wear prevalence has been studied all over the world and the results varied widely [3]. In many regions, including Europe, the prevalence of the condition is high [4]. For instance, a recent European study indicated that around 30% of the population attending general practices, aged 18-35 years, has at least one tooth with advanced erosive tooth wear [5].

One of the causes of ETW (erosive tooth wear) is regurgitation of stomach contents into the mouth, but for the risk to be significant, frequent regurgitation over an extended period of time is needed. The term biocorrosion has also been proposed to include all forms of chemical, biochemical, and electrochemical degradation [1,12]. Vomiting due to occasional stomach disorders or to morning sickness in pregnancy is not considered a cause for concern. A high prevalence of ETW has been identified in groups of people in which frequent and persistent regurgitation is a symptom of an underlying medical condition such as gastro-esophageal reflux disorder, rumination,

and eating disorders with frequent vomiting (e.g., bulimia nervosa) [1].

Some medications (e.g., acidic saliva stimulants or preparations containing acetylsalicylic acid) and dietary supplements (e.g., vitamin C tablets) are potentially erosive if they are in the form of chewable tablets or effervescent drinks. Other medications have the side effect of reducing salivary flow, which could indirectly enhance ETW from other agents [1].

Data obtained from the patients enrolled in this study supports data from the literature, considering that a small percentage of patients (21%) of those with noncarious dental lesions said they had gastroesophageal reflux or sometimes took potential erosive medication.

ETW (erosive tooth wear) lesions occur on both permanent and deciduous teeth, can extend into dentine and must be distinguished mainly from attrition, which is caused by the action of antagonistic teeth (e.g., grinding) and leads to matching facets; lesions are typically flat, sharp bordered, and glossy [3].

Smooth surface lesions must be mainly distinguished from abrasion, which is predominantly caused by traumatic oral hygiene habits and may vary in appearance depending on the causative impact. The main difficulty in the clinical assessment is the interaction of the various causative factors, especially when the respective injuries act for a long time [3]. Fig.no 1 demonstrates that 10% of the study patients used to consume candies or soft drinks once a week, 14% were eating sweets twice a week, 6% of them were eating candies 4 times a week and only 2% of the participants were using carbonated drinks or sweets four times a week. We noticed that most of the patients in the study are eating sweets at least 2-3 times a day (36%), while 30% only one once a day. 2% of the patients specified that they never use sweets or soft drinks (Fig.2).

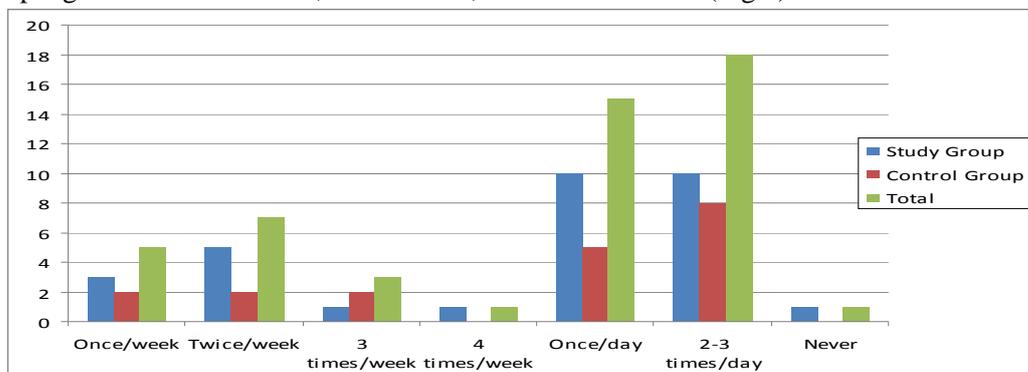


Fig.2. Sweets and carbonated drinks consumption frequency

Patients with high risk of tooth erosive lesions are recommended moderate consumption and reduced frequency of beverages and harmful foods intake, which should be consumed only during main meals. Their contact with the teeth surface should be reduced as much as possible. The acids from our diet act by the contact time with the oral cavity, while teeth are subjected to acid challenge, as well as by their clearance possibilities [14,15].

Drinking habits such as sucking small and rare sips or keeping the drink inside the oral cavity for a few seconds should be discouraged [16]. Using a straw is indicated since it avoids anterior teeth direct contact with the beverage, which can leak directly to the pharynx [14,15]. The temperature of the fizzy drinks also influences the erosive potential [16] because, cold as ice' drinks intake (4°C) reduce its erosive effect.

Foods and beverages composition determines how erosive they are. Analyses of many

products have identified a low pH and a high buffer capacity as the major risk factors, and the calcium concentration as the major protective factor in determining the erosive potential. For instance, the pH of yoghurts is about 4.0, yet they are not erosive because they have high calcium concentrations [3]. The buffer capacity of the product (determined by the type of acid and the pH) affects the resistance of the product to being neutralized by saliva. If the product contains substances, such as gums, which adhere to tooth surfaces, they may retain the product at the tooth surface and hence prolong the erosive challenge [3]. Studies have shown that milk and yoghurt consumption is related to a lower prevalence of ETW [13].

As for the teethbrushing, 34% of the studied patients used a vertical brushing method, 52% used circular brushing method, while 14% use a type of horizontal toothbrushing (Fig.3).

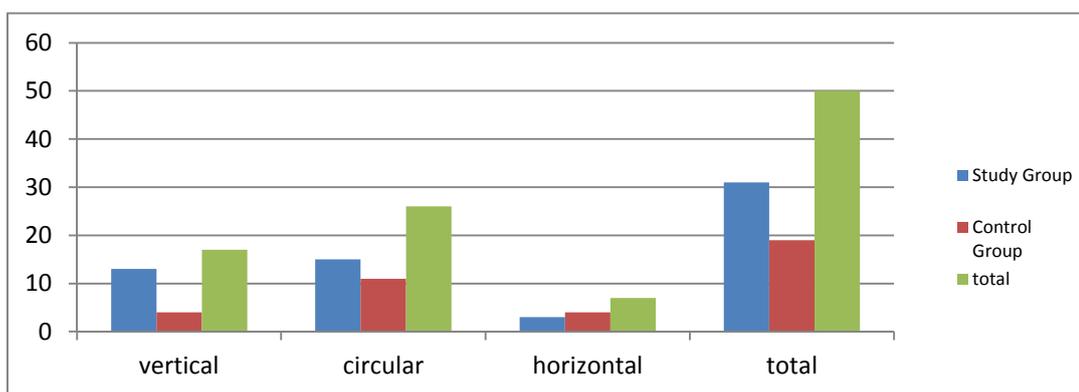


Fig.3 Patients distribution depending on the toothbrushing method

As for the western population, the main abrasive agent is the toothpaste, which affects far more the dentine than the enamel. Clinical data from several in vitro studies [17,18,19] support the affirmation that tooth brushing with toothpaste is the main agent for dentin abrasion. The brush itself is only a transport vehicle since teethbrushing without toothpaste has no effect on the tooth enamel and a tiny effect on dentin [20]. However, the toothbrush design and in particular the arrangement of the filaments, the density and texture, can influence the abrasion degree [21]. Tissue loss caused by toothbrushing is time dependent and it seems to depend on many factors, including frequency, action time and the brushing force [19,22]. Dentine damage predilection areas seem to be correlated with the toothbrushing habits: the most affected tooth

surfaces are the ones receiving the most attention during toothbrushing.

Nighttime/ daytime bruxism was found in 38% of the patients, while 62% of the participants had no bruxism. As for the study group, bruxism has been found in 45% of the cases; the control group showed that 26% of the participants had bruxism (Table 4).

Table 4. Patients distribution by the presence or absence of the bruxism

Daytime / nighttime bruxism	Study Group	Control Group	Total
Present	14	5	19
Absent	17	14	31
Total	31	19	50

The few clinical studies available were not able to confirm a positive association between occlusal loading and abfraction lesions [1,23,24,25]. The role of occlusal loading in NCCLs appears to be part of a multifactorial event that may not necessarily follow the proposed, classic abfraction mechanism [12,26]. Overall, there is a weak association between NCCLs and occlusal factors (interference in excursive movements, force, premature contacts, type of guidance, and slide of centric occlusion to maximum intercuspation) and it has been argued that an occlusal load that is far from the cervical defect site cannot be considered as the cause of abfraction lesions [27].

Optical coherence tomography studies suggest that dentin demineralization promotes the formation of NCCLs from an early stage, whereas occlusal stress is an etiological factor that contributes to the progression of these lesions [28].

For the prevention and progression of the initial abfraction lesions, use of occlusal night guards has been recommended, which reduce nocturnal bruxism and axial forces acting on the teeth. However, the use of these occlusal night guards to reduce bruxism is still controversial, even if there were studies supporting their effectiveness [29]. When performed correctly, they have the potential to reduce nonaxial tooth loading. Although they provide a conservative treatment for the abfraction lesions, some authors cannot find a clear demonstration of the effectiveness of their use [30,31]. Regarding the abfraction lesions development mechanism, occlusal night guards should be considered as a good treatment strategy due to its conservative nature.

Cervical sensitivity (hypersensitivity/hyperesthesia) was detected in 48% of the subjects, against 52% that showed no sensitivity. Among the patients with cervical sensitivity,

79% are in the study group, as opposed to only 21% from the control group. In the study group, most of the patients (61%) showed hypersensitivity or hyperesthesia at the cervical lesions of the teeth affected by abfraction. 39% of the participants did not show any teeth sensitivity (Table 5).

Table 5. Patients distribution by the presence of the cervical sensitivity

Hypersensitivity / hyperesthesia	Study Group	Control Group	Total
absent	12	14	26
present	19	5	24
total	31	19	50

Dental sensitivity issue is frequently related to the noncariogenic dental lesions. Dentinal hypersensitivity is a short, sharp pain response to a stimulus. Tooth sensitivity may be a temporary symptom associated with early stages of abfraction lesions [1]. It is expected that the chronic nature of abfraction, which is accompanied by the natural process of dentinal remineralization, will slowly relieve tooth sensitivity. If sensitivity persists, the exposed dentin may require therapeutic treatment to relieve or eliminate the discomfort [1,32,33]. The various clinical manifestations of abfraction appear to be dependent on the type and severity of the etiological factors involved [1,2].

Regarding the distribution of treated or untreated noncarious cervical lesions, the study group has revealed that 62% of the patients did not have any kind of treatment, and 31.2% of all the cervical lesions had been treated before this study. Depending on the affected areas, 71.5% of the lesions were detected in the anterior teeth, while 28.5% were found in the posterior teeth (Fig.4).

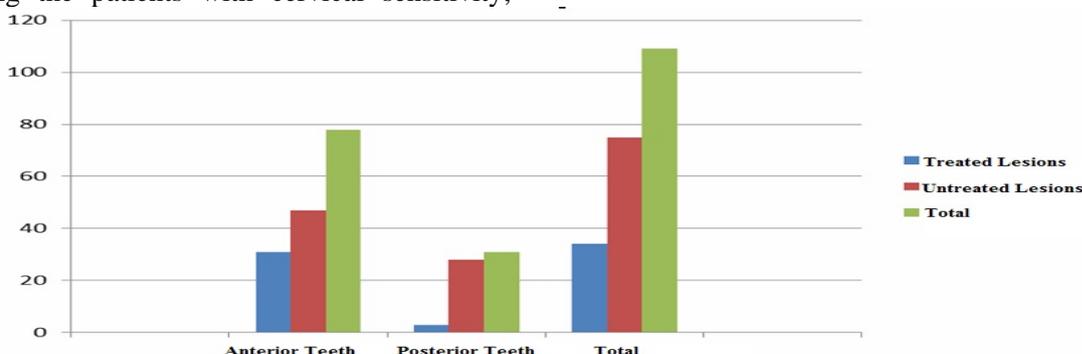


Fig.4. Study group distribution by the presence of treated or untreated noncarious cervical lesions

The prevalence of NCCLs is greater in incisors and premolars than in canines and molars. Mandibular premolars are affected by NCCLs more often and more severely than maxillary premolars. Abfraction lesions and other NCCLs, such as erosion, may also affect the whole dentition in severe cases where aging is associated with other pathological factors [1].

The observation that premolar teeth of patients aged older than 40 years are the most common sites of restorations placed due to NCCLs

highlights the importance of preventive interventions at an earlier age in order to avoid the need for future restorative or any other irreversible treatment [1,9].

72% of the study participants had no fillings or prosthetic restorations, compared to 28% of those who had. 78.5% of the patients with incorrectly adjusted prosthetic restorations or fillings were in the study group and only 21.5% were in the control group (Fig.5)

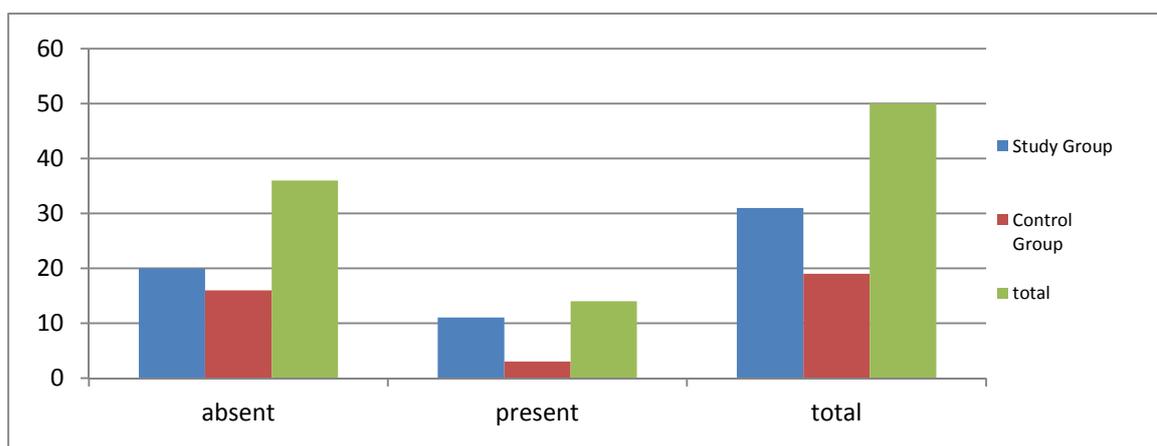


Fig.5. Patients distribution by the presence of prosthetic restorations or fillings

It should be noted that when restoring noncarious cervical lesions, clinicians do not treat their etiology, and they replace the lost dental tissue. Some dentists recommend periodic inspection and expectation, while others recommend early intervention [31,34,35,36,37]. There are no specific generally accepted guidelines stating that all lesions should be restored. A good, logic clinical thinking would suggest that they should be restored when the clinical consequences (ie, dentin hypersensitivity) have developed, or most likely will develop in the future. Patients' aesthetic requirements may also influence the restoration decision and a risk-benefit analysis should be done in these situations. Cervical restorations may increase the plaque amount and may lead to tooth decay and periodontal disease [31,38,39].

Conclusions

1. Noncarious cervical lesions (NCCLs) develop as a result of normal or pathological wear and cause abfraction, abrasion, and erosion or chemical degradation of dental tissues.

2. Noncarious lesions incidence in this study was 62% versus 38% of the patients in the control group. Most patients (61%) from the study group showed hypersensitivity or hyperesthesia of the teeth affected by abfraction lesions and 39% of the participants showed no teeth sensitivity.

3. Evidence supports that NCCLs have a multifactorial etiology involving toothbrushing, erosive food, bruxism.

4. Clinical appearance of NCCLs can vary depending on the type and severity of the etiological factors involved.

5. There are several mechanisms able to compensate the dental tissue loss, among which the most important are: treating digestive disorders, reducing the frequency and action time of acid challenges, emphasizing salivary defense factors, enhancing the effect of the neutralizing acids, using protective dental night guard, improving personal care and hygiene etc.

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