

# Evaluation of response to pulp sensitivity test with cold in teeth with non-carious cervical lesion

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## ABSTRACT

**Objective:** To evaluate the response to cold pulpal sensitivity test in teeth with loss of dentinal structure by non-carious cervical lesion. **Methods:** Eighteen patients from School of Dentistry of University of Passo Fundo were selected for the present study. In these patients, were analyzed forty single-rooted teeth which filled the inclusion criteria, being divided into two groups: G1 = 20 teeth showing non-carious cervical lesions; and G2 (control) = 20 teeth without loss of dentinal structure. The patients were instructed regarding to pain level, through a visual analog scale which classified the painful response in mild, moderate and severe.

From the obtained information, the data were statistically analyzed using nonparametric Kolmogorov-Smirnov test at 5% significance level. **Results:** The results of the present study have not showed statistically significant difference between Group 1 and Group 2, regarding to response to pulp sensitivity test with cold ( $p < 0.05$ ). **Conclusion:** It was concluded that teeth with non-carious cervical lesion can demonstrate different levels of response to cold pulp sensitivity test, suggesting that teeth with loss of dentinal structure can or cannot show a response related to pulp sensitivity.

**Keywords:** Tooth abrasion. Tooth erosion. Dental pulp. Dental pulp test.

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## Introduction

Regarding to global population it is possible to observe an increase of life expectancy as a result of improved quality of life. Thus, it is supposed that the number of people who expose their teeth to etiological factors related to progressive and non-carious loss of dental structures for a higher period of time has also increased.<sup>1</sup>

The non-carious cervical lesions are characterized by irreversible loss of mineralized tissue with no bacterial involvement, located in areas close to cementoenamel junction, resulting in dentin exposure. The exposure of dentinal tubules is, obviously, followed for an episode of hypersensitivity, which becomes the main complaint of patients.<sup>2,3</sup> The hydrodynamic theory proposed by Brännstrom and Aström,<sup>4</sup> is able to explain, in a reasonable way, the painful phenomenon of dentin.

Regarding to incidence of non-carious cervical lesions, it can be more visible on buccal face of teeth from adult patients, knowing that prevalence and severity of these lesions increase over time. The more committed teeth are premolars.<sup>1,5</sup> The most common injuries into the non-carious cervical lesion are dentinal abrasion, abfraction and erosion.

In other hand, not all exposed dentin tissue is sensitive to thermal stimulation, since, with advancing age, there is deposition of reactionary dentin below the affected area and is likely to appear sclerotic dentin, which will create a barrier in these areas.<sup>6</sup> Furthermore, the reduction of pulp chamber volume through physiological deposition of dentin, as well as appearance of acellular and fibrosis zones, decrease the sensitivity of dental element to painful stimulation. For this reason, the incidence of dentinal hypersensitivity decrease in elderly patients.<sup>9</sup>

Nowadays, the thermal tests of pulpal sensitivity represent an important resource which will help in the diagnosis of pulp tissue condition into different clinical situations. The cold tests have been the more used for this finality. Despite to promote a temperature reduction on pulp-dentin interface, the thermal tests by cold have not been deleterious to healthy pulpal tissue.<sup>7</sup>

The thermal stimulation is a standard way of evaluation of pulpal vitality. Several methods of cold application are available, including ice and ethyl chloride. More recently, dichlorodifluoromethane and carbon dioxide snow (CO<sub>2</sub>) have demonstrated to be more reliable than any other method.<sup>8</sup>

The aim of this study is to compare the response to pulpal sensitivity test with cold in teeth with loss of dentinal structure by non-carious cervical lesion and teeth with normal dental structure, identifying a standard response to sensitivity test with cold in patients who have this kind of lesions.

## Material and Methods

This study was approved by Ethics Committee of University of Passo Fundo (064/2012). The patients were selected from School of Dentistry of University of Passo Fundo. The selected patients signed an informed consent term to perform the research.

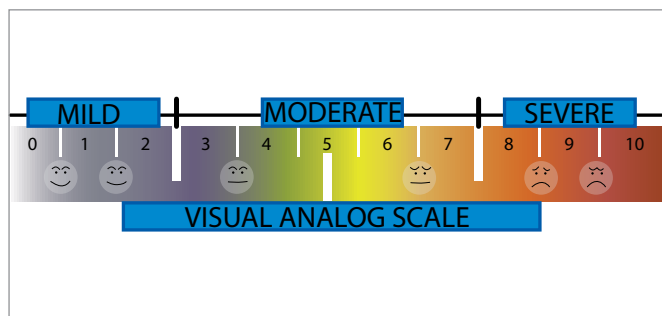
Forty teeth were selected for the present study, being divided into two groups (n = 20), as follow: G1 = teeth with loss of dental structure by non-carious cervical lesions; G2 = teeth with no loss of dental structure (control).

Before the test performing, a visual inspection was promoted in order to evaluate morphological aspect, extension and depth of non-carious cervical lesion, identifying as abrasion, abfraction or erosion. The lesions should demonstrate a wedge aspect, with at least 1 to 3 mm of extension and 1 to 2 mm of depth.

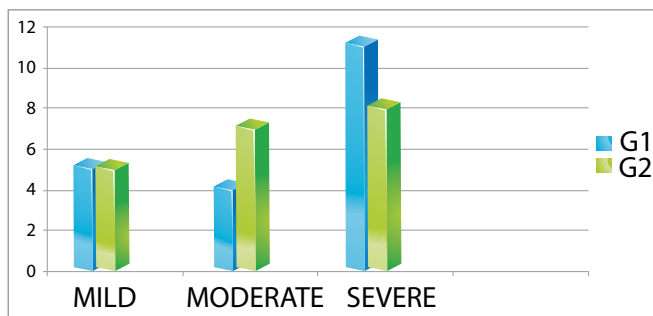
Single-rooted teeth (lower and upper canines and premolars specifically) of patients of both gender (male and female), in adult age and with significant loss of dental structure by non-carious cervical lesions were included into the experimental group of the present study. Teeth with cervical restoration, decay or periodontal disease were excluded from the sample.

The patients were instructed regarding to pain level through a visual analog scale which classified the painful response in mild, moderate and severe (Fig 1). The first tooth to be tested was a dental element which has not showed any change of loss of dental structure. On this way, the tolerance to pain of each patient was recognized.

The pulpal sensitivity test with cold was performed according Soares and Goldberg<sup>9</sup> technique: relative isolation of the region to be tested with cotton rolls; application of refrigerant gas (Endo-Ice – Coltène/Whaledent, Inc., Langenau, Germany) with the help of a cotton pellet which was gently placed on the buccal surface of the dental element crown, above the area of the patient lesion until to have a sensitivity response. Otherwise, the cotton pellet was



**Figure 1.** Visual analog scale classifying the painful response in mild, moderate and severe.



**Figure 2.** Graph showing results of G1 (teeth with non-carious cervical lesion) and G2 (teeth with no non-carious cervical lesion) according to response of sensitivity test.

maintained for until 10 seconds when it was removed. In this moment, the patient was questioned about the sensitivity level filling the visual analog scale.

The data were obtained and statistically analyzed using nonparametric Kolmogorov-Smirnov test at 5% significance level.

## Results

The results of the present study did not show statistically significant difference between Group 1 and Group 2, regarding to response to pulpal sensitivity test with cold ( $p < 0.05$ ). Regarding to group 1 (teeth with non-carious cervical lesion), five<sup>5</sup> teeth showed severe response (25%), four teeth showed moderate response (20%) and eleven teeth showed mild response (55%), according to visual analog scale used to perform this evaluation. Regarding to Group 2 (teeth with no non-carious cervical lesion), five teeth showed severe response (25%), seven<sup>7</sup> teeth showed moderate response (35%) and eight<sup>8</sup> teeth showed mild response (40%), according to visual analog scale used to perform this evaluation. These data can be visualized in Figure 2.

The non-carious cervical lesions were more frequent in people older than fifty years old (77.6%). There was no difference between genders regarding to presence of these lesions. According to the present study could be detected three kinds of non-carious cervical lesions, being abfraction the most common (50%), followed by abrasion (35%) and erosion (15%) respectively. Furthermore, lower premolars (40%) was the most injured dental group, followed by upper canines (30%), upper premolars (25%) and lower canine (5%).

## Discussion

The increase of life expectancy can be observed as result of improved quality of life. Thus, it is supposed that the number of people who expose their teeth to etiological factors related to progressive and non-carious loss of dental structures for a higher period of time has also increased.

According to the present study, it was possible to realize that non-carious cervical lesions are found more frequently in people older than fifty years old. However, this kind of lesion also was found in young patients. According to Negoro et al,<sup>10</sup> the loss of dental structure is higher in patients younger than twenty-six years old, making a comparison with patients ranging between thirty and fifty-five years old. In this context, there are scientific evidences showing that age of patient is not related with the appearance of non-carious cervical lesions.<sup>11</sup>

The lower premolars was the most injured teeth by this kind of lesion, which is in accordance with previous study.<sup>1,5</sup> This result can be explained due its location into the oral arch which induces loss of dental structure by action of acids, traumatic action by tooth brushing, and occlusal interferences.<sup>1,5</sup>

The abfraction was the most common kind of non-carious cervical lesions in the present study (50%), followed by abrasion (35%) and erosion (15%) respectively. These results are not in accordance with Molena et al,<sup>12</sup> who verified that abrasion was the most common kind of non-carious cervical lesions (46%), followed by abfraction (42%) and erosion (12%) respectively.

The abfraction lesions are V-shaped, usually deep, with well-defined edges and sharp angles. These lesions are usually located in the cervical zone

of buccal faces, being more frequent in premolars, followed by molars and canines respectively.<sup>3,13,18</sup> The etiology of these lesions is attributed to occlusal trauma. The occlusal overload and eccentric occlusal forces that generate load in the axial direction lead to tooth flexion.<sup>2,13,19,20</sup>

The abrasion is the pathological attrition of buccal faces on the cervical level, provided by external mechanical process involved in harmful habits like horizontal and aggressive tooth brushing or use of tooth brush with hard bristles and abrasive substances.<sup>3,12-16</sup>

The erosion is known as result of irreversible loss of mineralized tissue by chemical action of acids with no bacterial involvement. This kind of lesion can be distinguished from abfraction and abrasion lesions through the extension of lesion which reach all dental surfaces beyond the cervical area. Clinically, the erosion lesions

are characterized by loss of normal bright of teeth, being the lesion surface very smooth and polished, U-shaped, wide and with no sharp angles.<sup>17</sup>

According to Addy<sup>21</sup> patients who have teeth with non-carious cervical lesion develop painful symptoms of dentinal hypersensitivity due to loss of dental structure and consequently dentinal exposure. However, the results of the present study showed several level of pain after application of sensitivity test with cold. On this way, teeth with this kind of lesion can or cannot demonstrate pulpal sensitivity.

According to limitation of the present study, it was concluded that teeth with non-carious cervical lesion can demonstrate different levels of response to pulp sensitivity test with cold, suggesting that teeth with loss of dentinal structure can or cannot show a response related to pulp sensitivity.

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