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ORIGINAL ARTICLE

Relationship between presence of abfractions and premature contacts

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ABSTRACT

Abfractions (AFs) are non-carious cervical lesions considered of multifactorial etiology by several authors. **Objective:** Relate the presence of premature contacts and AFs. **Materials & Methods:** The original number of students to be analyzed were 117, 36 of whom (equal amount of women and men) were finally chosen for presenting premature contacts. 19 of them presented abfractions. A survey was conducted with questions on issues like toothbrushing habits, diet and some gastric disorders; besides the participants had to take the Hamilton Anxiety Rating Scale. Then, stone models were obtained and mounted for further occlusal analysis with WCM ® semi-adjustable articulator searching the abfractions and their coincidence with premature contacts. Fisher's exact test (p<0,05) was used to associate AF with toothbrushing habits, diet, burning symptoms and gastroesophageal reflux. Chi-square test (p<0,05) was used to associate AFs and premature contacts. Student's t-distribution was used to associate AFs with anxiety. **Results:** There was a significant relationship between AFs presence and premature contacts (p=0,00). There was not a significant relationship between presence of AFs and toothbrushing habits and diet. There was not a significant relationship between presence of AFs and anxiety. **Conclusions:** AF presence do associate with premature contacts in the same affected tooth.

KEY WORDS
Non-carious cervical lesions; Abfraction; Premature contacts; Dental occlusion; occlusal analysis.

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INTRODUCTION

Currently, the oral pathologies in Chile that prevail the most are the tooth decay, gingival periodontal diseases and dento maxillary abnormalities. These, start from the first years of life and present an increase with age[1].

There are other dental injuries, to those that have not been under preventive dental procedures, such as Non-Carious Cervical Injuries (NCCI) that we can observe in patients with a wide age range, however the evidence is not yet conclusive in its etiology and treatment.

The NCCI, are defined as the loss of dental structure in the Cemento-Enamel junction (CEJ) without a bacterial etiology[2]. The vestibular cervical area is more sensitive to abrasive, erosive, and occlusal overload because it is smaller and the junction between enamel and dentin is weaker[3]. NCCIs can be classified as: Biocorrosion or chemical, biochemical and electrochemical action of the tooth caused by endogenous and exogenous acids[5]; Abrasion or wear of the structure through an abnormal mechanical process[6] and Abfraction (AF) or loss dental tissue caused by dental flexion, mainly occlusal overload and/ or eccentric occlusal forces, in the cervical region[3]. Lesions caused by abfraction due to abnormal occlusal loading are usually wedge-shaped, with internal margins and angles of the external line and an apical extension concerning the CEJ[4].

Current evidence is not categorical regarding a single etiology for these lesions, rather it defines them as multifactorial[7], however there are studies whose results reaffirm occlusal trauma as the primary etiological factor of AFs[3]. It has been described while a supracontact tooth transmits energy to its cervical portion[8].

That is the reason why based on current knowledge, we believe it is important to study the influence of premature occlusal contacts and the need for studies that relate these factors to the appearance of AFs in the same tooth. Establishing as hypothesis that there is a relationship between the presence of AFs and presence of premature contacts. Other objectives of this study are to describe the prevalence of AFs based on gender in the study population, to establish the teeth that have higher prevalence of AFs to establish if there is a relationship between brushing habits and the presence of AFs, determining the relationship between acidic diet and/or other gastric alterations, relating the presence of AFs with variables such as anxiety.

Due to this, it has been decided to carry out an evaluation by means of a survey of oral hygiene habits, food and the performance of an anxiety test (Hamilton), as well as an occlusal analysis to third year dentistry students from University Andrés Bello, 2015. This was applied on people between 20 and 23 years, since they are a younger population which gives us the possibility to see the formation of AFs from the initial states.

MATERIALS AND METHOD

In this research study, the facilities of the Dr. Felipe Stanke Celis Dentistry School of the Andrés Bello University, Santiago were used, in the period from March-October 2015, prior authorization of the head of clinics and approval of the committee of ethics.

This research corresponds to a descriptive, cross-sectional and correlational study.

I. Sample selection:

To carry out this study, students of third year at a dental career were selected as participants, they were at that time taking the occlusion course, with a total universe of 130 students that worked in pairs. As a practical activity they had to make a pilot of their models in a centric relation. The information obtained at first was:

1. If they presented or not coincidence between centric relation (CR) and maximum intercuspation (MIC)
2. if they had premature contacts.
3. Last, if they presented injuries type Abfractions[4].

They were submitted as the only inclusion criteria: the presence of premature contacts; and the following exclusion criteria: Some systemic disease, loss of teeth, open bite, cross bite, inverted bite, temporomandibular disorders (articular and/or muscular), presence of cervical caries, and/or cervical restorations, which left us with 88 possible candidates to participate in this study.

20 participants were randomly selected with premature contacts and injuries type Abfractions and another 20 participants with premature contacts and without AFs, who were invited to participate in this study anonymously and after signing an informed consent.

Once they accepted to be part of the study, Impressions and records

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were taken to assemble again.

II. Obtaining models:

Impressions were obtained with Jeltrate Chromatic Alginate® (Dentsply), and Rim Lock type cuvettes. These were emptied in extra hard plaster.

4 of the participants were discarded, 1 for having made class V restorations in the period covered by the selection, 1 for starting operatory treatment, 1 for making a temporary quit from the career and the last one who declared it impossible to continue participating. Therefore, the models obtained were 36 pairs, corresponding to the final total of participants.

III. Survey application:

The 36 participants were asked to answer a habits survey, which contained closed selection questions, about: gender, brush type, brushing frequency, brushing time, brush duration before to replacement, acidic food or liquids consumption and its daily frequency, and some disease or gastric alteration. These questions should be answered according to the closest option to the participant's daily behavior.

In addition to the habits survey, the Hamilton anxiety test was conducted, this doesn´t serve as a diagnostic method, but provides us with valuable information related to psychic and somatic anxiety through 14 statements that were answered the same way as the survey, according to the option that most represented the participant[9].

IV. Articulator assemblies:

For the assemblies, the WCM® Articulator was used, which corresponds to a semi-adjustable articulator, of the Arcón type and quick assembly.

1. Mounting the upper model:

First, the upper model was assembled through the face bow which allows us to determine the position of the upper model in space, through the axio-orbital plane. Once the register was obtained, it was transferred to the articulator, with the sagittal condylar guide at 30°, the lateral condyle guide at 0°, the upper plate installed, the CR lock placed and the mounting support installed on the lower branch to ensure the correct position of the top model. Type II or orthopedic plaster was prepared to join the model to the top plate through a first plaster increase, once set plaster, was prepared more to form the mounting cup.

2. Assembly of the lower model:

For the assembly of the lower model, the preparation of a bite record in wax that contained a lead sheet to confer greater rigidity was first required, this record had an extension from the canine distal to the last molar of the participant, and that was indented in the upper model that is used as a guide and that identifies the record of the physiological Centric Relationship.

All participants had a deprogrammer, in this case the Lucia Jig, which was used 1 hour before registration. Once the record was placed in the mouth, the guides and the teeth were matched, and then with a gentle manipulation using the "chin manipulation" technique by exerting a slight thumb pressure on the chin down and back, it was requested to patient who closed softly on both softened sides of bite record until contact jig.

Once this record was obtained, it was transferred to the articulator where, with the upper model already mounted and the bite record interposed, the mm thickness of the wax was measured and compensated with the spike, sufficient orthopedic plaster was added to contact the model and the lower plate and it was regulated with the plaster anti-expansion lock until it was produced the final setting (Figure 1). This procedure was repeated with the 36 models of the participants.

Figure 1.

V. Occlusal analysis:

To perform the occlusal analysis, it was used a Arti-Fol metallic® joint tape, blue-red, Bausch brand of 12 microns and Miller clamps, the CR models were evaluated and then the lock was released in the search for the MIC. Premature contacts were identified in all models and in the group that presented an injury, the teeth that presented the AF were recorded (figure 2).

Figure 2.

RESULTS

The analysis of the variables to be evaluated was performed using the STATA computer program, v14.0. Frequency results and results for each variable individually were established. A significant difference (p <0.05) was determined using Fisher's Exact Test and Chi square, for the analysis of associated variables, depending on their distribution. Brush type, Brushing frequency, Brushing time, brush replacement, acidic diet, acidic diet frequency, bulimia, morning burning sensation and / or consumption of omeprazole-type drugs, G-E reflux diagnosis. (Table 1), these were evaluated with Fisher's exact test, while for the coincidence of the tooth with premature contact and AF, Chi square was used (Table 2). For the association between Anxiety (Psychic, Somatic and Total) the unpaired student t test was used (Table 3).

In relation to the teeth that presented the highest frequency, the results are detailed in (Figure 3 and table 4)

Table 1: Results of variables associated with AF by Fisher's exact test P <0.05

Variable	Fisher exact test result
Gender	p=0,505
Toothbrush Type	p=0,848
Brushing frequency	p=0,859
Brushing time	p=0,950
Brush replacement	p=0,891
Acidic food or liquids in the diet	p=1
Acid feed frequency	p=1.
Bulimia	does not allow analysis
Burning sensation/consumption of Omeprazole drugs	p=1
Diagnosis of Reflux G.E	p=0,445

Table 2: Results of association of pieces with AF and premature contacts using Chi square p <0.05

AFs	It does not match	match	Total
Does not presents	17 100.00%	0 0.00%	17 100.00%
presents	5 26.32%	14 73.68%	19 100,00%
Total	22 61,11%	14 38,89%	36 100,00%
Chi square	p=0.000		

Table 3: Anxiety and AFs association results p <0.05

AF	Psychic Anxiety	Somatic Anxiety	Total anxiety
Average for Presents	8.470588	4.941176	13.41176
Average for does not Presents	6	3.157895	9.210526
Student T	p=0.0977	p=0.1182	p=0.0751
Confidence interval	-.478132 / 5.419308	-.4773315 / 4.043895	-.4490128 / 8.85149

Legend: ● 1.4 ● 2.4 ● 3.4 ● 4.4 ● 3.5 ● 4.5

7,41%
3,70%
14,81%
18,52%
25,93%
29,63%
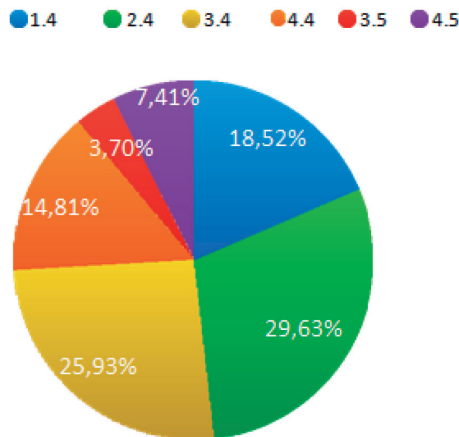
Figure 3.

Table 4: Prevalence of AF by tooth.

1.4	5
2.4	8
3.4	7
4.4	4
1.5	0
2.5	0
3.5	1
4.5	2

DISCUSSION

AFs are injuries located in the cervical area of the teeth without a single known etiology and that we find more and more frequently in our patients, sometimes even accompanied by discomfort according by them.

It is important to understand the etiology of these since there is still no categorical evidence in our country, which could influence the choice and prognosis of the treatment.

This research study of descriptive, transversal and correlational type sought to relate the presence of abfractions with variables described in the literature among others by Grippo JO, Simring M, Schreiner S. (2004) and that could have influence with the development of these injuries[10].

The initial number of participants considered for this study, was N = 40, of which 4 abandoned their participation for academic, personal reasons or having started dental surgery treatment; This resulted in a final number of N = 36 participants, who were made impressions to obtain models and a re-assembly of them, as a way to standardize and ensure a single operator and criteria when evaluating the models.

The participants, all young third-year dentistry students, with approximate ages between 20 and 23 years presented AFs of different amounts of wear according to the Smith and Knight classification (1984), considering from slight changes in the cervical region to deeper defects[8].

There was a low prevalence of abstractions considering the total universe of models previously analyzed (N = 109), this could be due to

the age of the participants since according to authors such as Bernhardt (2006) they determined that there is a higher prevalence in people of 45 at 65 years, which does not mean that they do not appear in another age group[11].

Jakupovic (2010) also established that the incidence of abfractions increase with the patient's age, and mentions that a longer period of time (age) contributes to tissue fatigue[12]. However, this does not mean that people may not form injuries in the future.

Regarding the relationship between AF and gender, a similar number of men and women were chosen. The results obtained did not show to be significant when associating these variables; This matches with results obtained by Redentz (1976) and Sangmes (1986) authors who state that gender does not influence the prevalence of these injuries[13]. The variables associated with brushing considered: brush type, brushing frequency, brushing time and brush duration time prior to replacement, did not show significant results when associated with the presence of AFs as a dependent variable using Fisher's exact test for both groups, with and without AFs. This result could be explained by the level of knowledge of the participants, since they are all third-year students of the dental career, who have more instruction about brushing habits and mostly privileged according to the results: the soft brush, frequency of brushing 2 times a day, average brushing time of 1-2 minutes, brush replacement at 2 months, it is at this last point that there could be biases given that the reason for replacement is not determined, that is if it occurs when the toothbrush bristles are bent or not. The knowledge of the participants is beneficial when analyzing the results, since it allows us to control the variables associated with brushing.

Another aspect that was not considered in this study, it was the use of toothpaste that for authors like Abrahamsen, is abrasive enough to cause this type of damage if the patient is too aggressive when brushing their teeth in a way too strong, vigorous and horizontally[8]. Sarode G. (2013) states that there is little or no evidence of these injuries (AF) in prehistoric skeletons, since Cervical Injuries were only observed in historical skulls of the seventeenth century, after the invention of toothbrushes and brushes[8].

Regarding the inclusion of acidic foods or liquids and their daily frequency, significant results were not obtained, however, all participants consumed acidic foods, but their frequency throughout the day was low, this probably to the knowledge of the participants about the effects of these acids on the dental structure, which for the purposes of this study is beneficial since, like brushing, it is a variable that has been linked to the formation of injuries.

The presence of bulimia is a variable that could not be analyzed in this study, since no participant presented this condition or did not recognize having suffered it.

Regarding the association of AFs and burning sensation and / or consumption of drugs of the Omeprazole type (proton pump inhibitor), analyzed with Fisher's exact test, they also did not show significant results. However, of the total of participants with AFs, 42.11%, described presenting a morning burning sensation, so it would be wise to analyze this variable again but as a larger sample, and see if it is possible to establish a significant relationship between these 2 variables. Similar is the case with the correlation between gastroesophageal reflux and AFs that is not significant either, but 10% of the participants mention that they had been diagnosed with this disease; it should not be set aside participants who have not been diagnosed, but that present symptoms highly associated with reflux such as morning burning.

When we perform the analysis of association between Anxiety (Psychic, Somatic and total) and AFs, we use student's T p <0.05. The results were not significant in any of the 3 categories, however, the total anxiety was close (p = 0.0751), but contrary to what is expected, since the greatest anxiety was seen in patients or participants who did not present AFs (X = 13,411) and lower total anxiety in the participants who presented AF (X = 9,210), which could mean that greater anxiety has no association with the presence of AFs. It would be advisable to analyze these variables with a larger sample and evaluate if the results of the means are similar and if they are significant or not.

When analyzing the teeth that had AFs, the most frequently affected were the premolars, of these 48.15% for the upper premolars, with 29.63% the first upper left premolar and 18.52% for the right, the lower premolars with 51.85% the first lower left premolar with 25.93%, the first lower right premolar 14.81%, the second lower premolars 7.41% and 3.70% for the right and left respectively. This coincides with those reported by Grippo (2012) and Tomasik (2006) who observed a higher prevalence in premolars[14,5]. Jakupović (2014) also concluded a higher frequency of AF in lower premolars[15]. Telles D., (2000) conducted a live study with 72 permanent teeth with patients of both genders, whose ages ranged from 20 to 60 years; found that 41.7% had wedge-shaped defects

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in premolars[16].

The presence of premature contacts was the variable that was present in the 36 participants of this study, of which 19 (53, 78%) presented AF and 17 (47.22%) did not present the injury.

The relation of the tooth with the injury (AF) and the premature contact piece was associated, through Chi squared $p < 0.05$, and a $p = 0.00$ was found which is statistically significant, this means that there is an association between the presence of AF and the presence of premature contact in the same tooth, thus checking the initial hypothesis of this study. This result differs from that concluded by Oliveira RL (2011), who evaluated 50 students randomly and of which exaggerated contacts were found in 27.6% of teeth with non-carious cervical lesions, not finding significant differences in the pieces who had premature contact or not and AF.[17] Reyes et al. (2009) also did not establish a relationship between the presence of premature contacts and the loss of insertion or presence of AF, the limitation of this study according to the authors was the sample analyzed, and not having independent examiners for injuries and occlusal conditions. However Madani and Ahmadian-Yazdi (2005) in Iran evaluated 77 patients and 1974 teeth and it was found that premature contacts are more prevalent in pieces with AF. Piotrowski et al. found wedge-shape injuries in all specimens of a sample (N = 10) associated with premature contacts[6].

One of the limitations of this study may be how sensitive the assembly process is and its subsequent analysis, since small variations could deliver wrong results, to control this possible deviation it would be a good option to use two independent examiners for the participants' analysis, for both, premature contacts and AFs, this would ensure control between examiners.

CONCLUSIONS:

In relation to gender, no statistically significant differences were observed when this variable was related to the presence of AFs.

When analyzing the association between the variables: type of brush, frequency of brushing, time of brushing and replacement with the presence of lesions type AF, a significant relationship of the variables was not observed.

When evaluating the relationship between acidic diet (food and liquids) and its frequency, no significant results were found with AFs. Burning sensation and/or use of drugs type Omeprazole also did not show a significant result.

The anxiety measured through the Hamilton test and in association with AFs as a dependent variable, through student T, was not significant, but a greater relationship was found among participants who did not have AFs than those who did.

The highest number of injuries was recorded in lower and upper premolars.

A significant relationship $p = 0.00$ and dependent between the variables AF and premature contact was determined.

One of the limitations of this study was that it was limited to a small number of dental students.

SUGGESTIONS

It is suggested to re-evaluate this same group of participants in 1-2 years to see if there are new injuries, if everything remains the same or if the habits of the participants have changed; with 2 independent examiners.

It is suggested to include toothpaste as a variable, since it was not considered in this study. Another aspect to consider could be the same study, but in a more adult population and as a result they were exposed to these stimuli for a longer time.

In an upcoming study, use a larger sample for correlational analysis.

INTEREST CONFLICT

Authors declare no conflict of interest

FINANCING

CLINICAL RELEVANCE

Abfraction(AF) is loss dental tissue caused by dental flexion, mainly occlusal overload and/or eccentric occlusal forces, in the cervical region. Current evidence is not categorical regarding a single etiology for these lesions, rather it defines them as multifactorial, however there are studies whose results reaffirm occlusal trauma as the primary etiological factor of AFs. It has been described while a supracontact tooth transmits energy to its cervical portion. That is why, based on current knowledge, we believe it is important to study the influence of premature occlusal contacts and the need for studies that relate these factors to the appearance of AFs in the same piece. Establishing as hypothesis that there is a relationship between the presence of AFs and presence of premature contacts

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