In-vivo evaluation of multiple factors association with non-carious cervical lesions

Original Article

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Abstract

Aims: In vivo-evaluation of multiple factors associated with non-carious cervical lesions.
Material and Methods: This in vivo study consisted of a clinical survey of NCCL & its relation with oral hygiene practice, tooth brushing habits, parafunctional habits, chewing habits. The subjects were clinically examined to detect presence and location of NCCLS, signs of parafunctional habits and chewing habits. According to the presence and absence of NNCLthe participants were divided into two groups- control group (no NNCL presence) and a test group (NCCL present). After the examination participants were asked to fill an oral hygiene practice self-report questionnaire. To examine the deformation of tooth brush bristles each participant was given a new and identical extra soft tooth brush incombination with a tooth paste. The participants were requested to use the tooth brush andtooth paste for their normal daily tooth brushing for 30 days and were collected to analyze the deformation of bristles.
Statistical analysis: The deformation of tooth brush bristles was statistically associated with Presence of NCCL'S (p <0.01)
Results: In this in vivo study we found that 78% of population of test group with presence of non-carious cervical lesions showed deformation of tooth brush bristles whereas 84% of population of control group showed no deformation of tooth brush bristles with absence of non-carious cervical population. Also 68% of total population showed light to moderate deformation.
Conclusions: This study concluded that there is positive correlation between prevalence of NCCL and tooth brushing habits.
Key-words: Non-carious cervical lesion, Tooth brush bristles, oral hygiene habit

Introduction

A Non-Carious Cervical Lesion (NCCL) is the loss of dental hard tissue near the cementoenamel junction without the development of caries. It is a common pathology that confronts dentists with a complex etiology and treatment plan. NCCLs are often mentioned as the patient's main complaint due to discomfort and sensitivity caused by dentin exposure[1].

Excessive hand force during toothbrushing can cause trauma to the protective periodontium, causing gingival recession. The action of these forces in conjunction with the abrasiveness of toothpaste can cause wear in the cervical region of the teeth, which may contribute to the presence of NCCLs, given that oral hygiene and the number of daily brushings is linked with the frequency of NCCL occurrence[2].

Making a timely diagnosis of NCCLs is of fundamental importance. Non identification of the etiological factors of these lesions can lead to inadequate treatment, decreased success of restorative treatments, and increased clinical complaints. It is important to verify the relation between NCCLs and tooth- brushing in order to create a better understanding of the involved mechanisms and consequently select the appropriate treatment[3].

Materials and Method

Hundred patients (age group- 20-25 years) visiting Ahmedabad dental college and hospital were included in the study. Preceding the research, all interested patients were made aware about the study design and they gave informed consent. Experimental procedures were approved by the Ethical Committee of the Ahmedabad dental college and hospital.

The research was divided into three steps: 1) clinical assessment; 2) oral-hygiene practice self-report questionnaire; and 3) visual analysis of toothbrush bristle deformations.

First of all, clinical examination of all the participants individually with sterile mirror and probe to detect the presence of NCCLs as well as the location of the NCCLs in the teeth was done. Loss of dental tissue near the cementoenamel junction without the development of caries were considered as NCCLs. The clinical selection of

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subjects was based on the criteria of complete dentition, not necessarily with the presence of third molars

After the clinical examination, the participants were divided into two groups according to the presence or absence of a NCCL: a control group (no NCCL present) and a test group (NCCL present).

The participants filled out an oral-hygiene practice self-report questionnaire that included the following questions

ξ About the number of daily tooth-brushings (e.g., "How many times a day do you brush your teeth? One, two, three, four, or more than four times a day),

ξ Characteristics of the bristles of toothbrushes commonly used by the respondent (e.g., "What kind of toothbrush do you use to brush your teeth?" Soft, medium, or hard),

ξ Type of tooth paste (e.g., "What kind of toothpaste do you use regularly for oral hygiene?" With or without abrasive and with or without fluoride)

ξ The intensity of the force applied during toothbrushing (e.g., "Do you think that you brush your teeth with excessive force?" No, a little, or very much).

ξ Frequency of changing the tooth brush (e.g., "How often do you change your tooth brush?" After 1 month, after 3 months, after 6 months, don't change).

ξ About cleaning the tooth brush (e.g., "How do you clean your tooth brush?" In normal water(tap), In chlorhexidine.

ξ Are you left-handed tooth brushes or right-handed tooth brushes?" Right, Left).

ξ Related to tooth sensitivity (e.g., "Do you feel sensitivity in your teeth? Yes frequently, yes sometime, No),

ξ Other oral hygiene practices (e.g., "Do you use any type of mouthwash along with tooth brushing? Yes, No),

ξ About chewing habits and parafunctional habits (e.g., "Do you have any assorted habits chewing tobacco, betel nut or pan Masala? Yes, No).

ξ Presence of parafunctional habits (e.g., "Do you have any signs of parafunctional habit like clenching of teeth, traumatic occlusion or attrition? Yes, No)

To enable analysis of toothbrush bristle deformation, i.e. the collapse under force of bristles on an individual brush head, all participants were provided with new and identical extra soft tooth-brushes. The quality of the toothbrushes and their packaging were verified prior to distribution among participants. Only brushes with uniform tufts, placed perpendicularly to the base of the head, were used. The participants were requested to use the toothbrush and toothpaste for their normal daily toothbrushing for a period of 30 days, keeping the brushes dry during non-use. After this period, the toothbrushes were collected, decontaminated with chlorhexidine gluconate 2% and analysed.

Analysis was conducted by visual observation of the deformation of the bristles. This deformation of bristles was classified according to the following three categories: light, moderate, severe. The result was analyzed based on two classifications-

(a) (b) (c)

Visual examination of tooth brush bristles.

(a)LIGHT (b) MODERATE (c) SEVERE

(I) Deformation and no deformation
(ii) Severity of deformation- light, moderate and severe

Result

In this in vivo study we found that 78% of population of test group with presence of non-carious cervical lesions showed deformation of tooth brush bristles whereas 84% of population of control group showed no deformation of tooth brush bristles with absence of non-carious cervical population. Also 68% of total population showed light to moderate deformation.

The self-report questionnaire concluded that 88% of population has a habit of brushing twice a day. Considering the type of tooth brush used, 67% of cases used soft tooth brushes and only 8% of cases used ultrasoft tooth brushes. Abrasive tooth paste was used by 58% of total young population. 88% of cases from both test group and control group applied little forces during tooth brushing. 90% of population changes their tooth brushes after every 3 months. Hence the result of questionnaire showed no statistical difference between oral hygiene habits and prevalence of non-carious cervical lesions.

	Test group	**Control group**	Chi Square	DF	P Value	Sig/Non Sig
	(Presence of NCCL)	(Absence of NCCL)				
No deformation	12	42	36.23	1	<0.001	Sig
Deformation	38	8				

	Test group	**Control group**	Chi Square	DF	P Value	Sig/Non Sig
	(Presence of NCCL)	(Absence of NCCL)				
No deformation	12	42	37.19	2	<0.001	Sig
Deformation						
light	19	6				
Moderate	15	2				
severe	4	0				

For Calculating Chi Square Moderate and Severe have been clubbed as one of the class had a frequency of Zero

Table 1- Correlation between tooth brush bristles and prevalence of NCCL

Toothbrush practices	Test group	Control group (Absence of NCCLS)	Chi Square	DF	P Value	Sig/Non Sig
A- Frequency of brushing						
Once a day	7	5	0.379	1	0.538	Non Sig
Twice a day	43	45				
B- Type of tooth brush						
Soft	32	35	3.164	3	0.367	Non Sig
Medium	7	10				
Hard	6	2				
Ultrasoft	5	3				
C- Type of tooth paste						
Abrasive	32	26	1.478	1	0.224	Non Sig
Non abrasive	18	24				
D- Force applied						
No force	6	2				Non sign
A little force	42	46				
Very little force	0	2				
Not observed	2	0				
E-How often do you change your tooth brush?						
3 Month	47	43	1.778	1	0.182	Non Sig
6 Month	3	7				
F- Left-handed or right-handed?						
Left	4	3	0.154	1	0.695	Non Sig
Right	46	47				

Table 2- Survey of oral hygiene practice

Discussion

The uncertain etiology and diagnosis of NCCL have led to a confused approach to its clinical management. The prevalence of NCCLs recorded by literature has revealed results as conflicting as 2% to 90%. In this in vivo study we have correlated the prevalence of NCCL, tooth brushing habits and oral hygiene habits in young population. Age is also an important factor to be considered. Age represents cumulative NCCL effects, increasing likelihood of its prevalence and severity with age. Therefore, the prevalence and severity of NCCLs are likely to increase with age. Many studies have also shown a link between NCCL frequency and oral hygiene habits[4].

Statistical analysis of this in vivo study did not reveal a significant relation between tooth brushing and NCCL frequency. These results contradict the findings in literature that relate the frequency of NCCLs to frequency of daily toothbrushing. Though deformation of tooth brush bristles were seen in test group with presence of NCCL. If severity of deformation of bristles was analyzed, majority of population showed light to moderate deformation. Severe deformation of tooth brush bristles was seen in 2-3% of cases. A

significant association was found between NCCL and teeth sensitivity in this study. It is supported by a study done on Swiss adults in which 84.6% patients with NCCL presented with hypersensitivity. These results were in contrast to Hina et al, who found no sensitivity in 71% of patients with NCCL present. The reason for teeth sensitivity is due to enamel loss at cervical area leading to dentin exposure. However long standing NCCL gradually may become less sensitive due to formation of reparative or sclerotic dentine[5].

Use of hard tooth brush and excessive brushing has been found to be associated with NCCL significantly. Our results are similar to John J. Dzakovich who worked on relationship between abrasion and NCCL. His results showed that horizontal brushing method with tooth pastes was capable of tooth loss at cervical areas[6]. Bartlett DW et al. showed greater frequency of NCCL in patients who brushed twice daily, compared with those who brushed less frequently. However, frequency of brushing was not found to be associated with NCCL significantly in this study. Radentz WH et.al showed use of hard tooth brush is incapable of abrading enamel but capable of producing surface roughness in dentine, it indirectly supports the concept that the abrasion and erosion have a secondary role in causing NCCL[7]. Radents WH et.al study showed tooth brush abrasion is strongly suspected as contributing to the formation of the majority of wedge-shaped lesions, whereas the presence or contribution of occlusal stresses in the direct formation of these lesions could not be measured directly[8].

Apart from clinical examination and tooth brush analysis patients were also asked to fill up a self-report questionnaire. Self-report questionnaires have been the most commonly used method in the literature to evaluate clinical parameters such as frequency of daily tooth brushing, characteristics of bristles of toothbrushes used by respondents, type of toothpaste, and applied force during tooth brushing. Other questions related to oral hygiene practices like cleaning of tooth brushes, changing the old tooth brush, and use of mouthwash were also included in the survey. Presence of any chewing habits and parafunctional habits were also asked as they are also contributing factors to development of NCCL. The results of questionnaire showed no relation between daily tooth brushing habits, oral hygiene practices and prevalence of NCCLs. As the survey was done in young population there were very few cases who had tobacco chewing habits and para functional habits like clenching and bruxism[9].

Though David and Winter reported the role of erosion and abrasion in NCCL. That is only one clinical study that has investigated the progression of cervical wear lesion affected by dietary acids and frequency of tooth brushing. However, in this study, acidic drinks are not found to be associated with cervical wear significantly[10].

Recognizing and understanding the etiology of NCCL have effect on prevention and management of such lesions. Due to this, correlation among these factors and NCCL could not be established. Hence this study cannot conclude about chewing habits, parafunctional habits and development of NCCL. Hence Recognizing and understanding the etiology of NCCL may affect on prevention and management of such lesions[11].

These questionnaires might not be an ideal method to collect accurate data, because awareness can affect the quality of answers. However, limitations of this study are- a different brushing technique, different method of toothbrush storage, humidification of the brush prior to brushing, quantity of toothpaste (which can alter deflection and deformation of bristles), and the commitment of participants to use the toothbrush for the duration of the research[12].

Furthermore, the measurement of toothbrush deformation by calculating the superficial area of the bristles is limited by the fact that this method only captures externally directed deformations, whereas inward deformations remained undetected. Hence one isolated factor is not able to cause NCCL development.[13] Traction forces caused by mastication, malocclusion, or parafunctional habits are the primary etiological factors of NCCLS, thus conferring secondary importance to other buccal conditions related to the loss of dental structure[14].

It is up to the practitioner to investigate possible

factors contributing to the development of NCCLs. Awareness and prevention of these factors will enable meeting the needs of patients in a more accurate and assertive way[15].

Conclusion

The conclusion of this in vivo study is the type of toothbrush and tooth brushing habits may affect the development of NCCL. Besides various oral hygiene practices, there are many etiological factors like malocclusion, forces during mastication or parafunctional habits which may affect the prevalence of NCCL. This study was performed in young population so that further preventive measures related to oral hygiene practice and tooth brushing habits can be taken.

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