Abstract. – Aim: To determine the relationship between bruxism and cardiovascular diseases.

Materials and Methods: 120 patients who referred to the Dentistry Faculty with the complaint of bruxism were selected. All patients gave informed consent for participation in the study. All of the patients were examined and bruxism was classified. And also these were examined by B-mode ultrasound to measure the Intima Media Thickness (IMT) at the far wall of the common carotid artery. A wide range of vascular risk factors including age, gender, body mass index, and previous history were surveyed. Spearman correlation analysis was performed to ascertain quantitative comparison, Mann-Whitney U and Kruskal-Wallis test were used for comparison of means.

Results: There were 66 (55%) male and 54 (45%) female patients, with a female to male ratio of 1:1.2. The mean age was 35.6 ± 1.25 years (range 18-65 years). In the analysis of bruxism classification and IMT there was a statistical significance between bruxism classification subgroups 1, 2, 3 and IMT. There was no statistical significance between bruxism classification subgroup 4 and IMT due to the small number of the patients (n=12).

Conclusions: Stressful situations can cause both bruxism and cardiovascular disease such as coronary artery diseases, hypertension, arrhythmias, cardiomyopathy. The statistical analysis supported this hypothesis. However, we need to new studies with large number of samples to confirm this hypothesis. Clearly, future studies in this field will need to take into consideration the influence of the following variables: age, use of medication or drugs, smoking habits, and other sleep disorders.

Key Words: Bruxism, Cardiovascular diseases, Stress, Anxiety.

Introduction

Bruxism (from the Greek βρυγμός (brugmos), “gnashing of teeth”) is characterized by the grinding of the teeth and is typically accompanied by the clenching of the jaw. It is an oral parafunctional activity that occurs in most humans at some time in their lives. In most people, bruxism is mild enough not to be a health problem. While bruxism may be a diurnal or nocturnal activity, it is bruxism during sleep that causes the majority of health issues and can even occur during short naps. Bruxism is one of the most common sleep disorders. The origin of bruxism has not been fully clear or explained. It seems that it obeys to multiple etiopathogenical factors. Among them, there are two which outstanding above the others: mental factor, occlusal interferences. Psychical or mental factors work as potentiators of the symptoms (contributing factors). They are: anxiety and stress. Stressful situations can potentiate this habit in a specific manner and also relaxing situations can reduce such habit in an occasional manner. Coronary artery disease, which progresses gradually and leads to coronary heart disease, is still the leading cause of illness and death in some countries. Mortality has decreased during the last decades although morbidity has not. However, overall mortality remains high, because coronary artery disease mortality has increased in the world. The pathological process responsible for coronary artery disease is atherosclerosis. Atherosclerosis develops slowly and gradually, and various genetic, environmental, and life style risk factors may contribute to its progression. The introduction of the ultrasound technique has made it possible...
sible to estimate early asymptomatic atherosclerosis by way of the intima media thickness (IMT). The method is accepted as a valid and precise measure of early nonsymptomatic atherosclerosis, although small changes in the IMT can be an expression of changes in the muscles in the vessel wall rather than of atherosclerosis.\(^8\)\(^-\)\(^10\) Numerous studies have shown a connection between IMT measured on the arteria carotidis communis and manifest ischemic heart disease as well as an association with risk factors for ischemic heart disease.\(^11\)\(^-\)\(^14\) A given IMT is an expression of the total effect of all the risk factors that a person has been exposed to until the time of examination. Stress is one of the fundamental factors in the pathogenesis of the atherosclerosis. Both acute and chronic stress have been shown to be associated with atherosclerosis.\(^15\) Stress and anxiety are etiological factor of both cardiovascular disease and bruxism. As a result of the stress level bruxism and cardiovascular diseases can occur at the same time. We hypothesized that the bruxism classification may point out cardiovascular disease.

### Materials and Methods

The study protocol was approved by the Dicle University Institutional Review Board, and written informed consent was obtained from all subjects. This study was performed between November 2009 and August 2010. 120 patients who referred to the Dentistry Faculty with the complaint of bruxism were selected. All of the patients were examined and bruxism was classified.

### Bruxism Classification

Wearing away of the tooth surface is generally regarded as the most important clinical sign of bruxism. Although there is no universally accepted scale for measuring the degree of tooth wear, a Dutch study\(^16\) reported on a five-point scale that appears to be a reliable instrument for diagnosing bruxism. The five points are as follows:

- 0 = No wear.
- 1 = Visible wear within the tooth enamel.
- 2 = Visible wear with dentine exposure and loss of crown height.
- 3 = Loss of crown height between 1/3 and 2/3.
- 4 = Loss of crown height greater than 2/3.

And also these were examined by B-mode ultrasound to measure the Intima Media Thickness (IMT) at the far wall of the common carotid artery (CCA). A wide range of vascular risk factors including age, gender, body mass index, and previous history were surveyed.

### Carotid B-mode Ultrasonography and Intima-Media Thickness Assessment

Intima-media thickness of the bilateral common carotid arteries was performed on Toshiba Applio (Toshiba, Tokyo, Japan) ultrasonography machine with using 7-10 mHz multifrequency linear array transducers. Subjects were studied in the supine position. Each common carotid artery was evaluated with the subject’s head turned slightly to the contralateral side. The field depth, gain, and near and far field gain controls were optimized to enable visualization of the far wall of the common carotid artery. All images were interpreted real time and cine-loop recording by a 9 years experienced radiologist. Images were also visually inspected for plaque, defined as a focal area of arterial wall thickening >1.5 times that of the surrounding arterial wall. Mean CIMT (average of the right and left common carotid artery CIMT) was assessed.

### Statistical Analysis

Spearman correlation analysis was performed to ascertain quantitative comparison, Mann-Whitney U and Kruskal-Wallis test were used for comparison of means (Statistical Package for Social Sciences, Version 11.5, SPSS Inc., Chicago, IL, USA).

### Results

There were 66 (55%) male and 54 (45%) female patients, with a female to male ratio of 1:1.2. The mean age was 35.6 ± 1.25 years (range 18-65 years) (Table I). Bruxism classification group’s demographic data are summarized in Table I.

All comparison samples are shown in Table II. In the analysis of bruxism classification and IMT there was a statistical significance between bruxism classification subgroup 1, 2, 3 and IMT. There was no statistical significance between bruxism classification subgroup 4 and IMT due to the small number of the patients (n=12).
Table I. Sample demographic data of subgroups.

<table>
<thead>
<tr>
<th>Demographic data</th>
<th>Bruxism Classification 1</th>
<th>Bruxism Classification 2</th>
<th>Bruxism Classification 3</th>
<th>Bruxism Classification 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>30.9 ± 7.6</td>
<td>34.9 ± 25.1</td>
<td>39.52 ± 25.1</td>
<td>41.2 ± 27.4</td>
<td>35.6 ± 24.9</td>
</tr>
<tr>
<td>Women n (%)</td>
<td>17 (54.8%)</td>
<td>17 (35.4%)</td>
<td>15 (51.7%)</td>
<td>5 (41.7%)</td>
<td>54 (45%)</td>
</tr>
<tr>
<td>Men n (%)</td>
<td>14 (35.2%)</td>
<td>31 (64.6%)</td>
<td>14 (48.3%)</td>
<td>7 (58.3%)</td>
<td>66 (55%)</td>
</tr>
</tbody>
</table>

Table II. The comparison between BMI and IMT.

<table>
<thead>
<tr>
<th>BMI classification</th>
<th>Means of IMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (n = 31)</td>
<td>25.12 ± 3.98</td>
</tr>
<tr>
<td>2 (n = 48)</td>
<td>25.01 ± 3.70</td>
</tr>
<tr>
<td>3 (n = 29)</td>
<td>27.41 ± 5.01</td>
</tr>
<tr>
<td>4 (n = 12)</td>
<td>.021</td>
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</tbody>
</table>

Discussion

During the past 50 years, cardiovascular disease has become one of the greatest killers in the developed countries. Morbidity and mortality due to cardiovascular disease are still high, and also the medical cost of cardiovascular disease treatment continues to rise steadily (e.g. a coronary-artery bypass graft procedure costs $ 50,000).

The best and safest way to ensure a “disease-free world” is by preventing diseases. It is always good to diagnose a disease in its early stage rather than to let it advanced stages, where it becomes very difficult to cure them. The first clinical manifestation of cardiovascular disease often arises in a stage of well-advanced atherosclerosis. However, arterial vessel wall changes occur during a presumably long subclinical lap phase characterized by endothelial dysfunction and gradual thickening of intima. Coronary artery disease, the most common form of cardiovascular disease, is the leading cause of death in all over the world. Researchers have found certain factors that play an important role in a person’s chances of developing heart disease. These are called risk factors.

Risk factors have two categories: major and contributing. Major risk factors are those that have been proven to increase your risk of heart disease. Contributing risk factors are those that doctors think can lead to an increased risk of heart disease, but their exact role has not been cleared.

Stress is considered a contributing risk factor for heart disease because its effects on the heart are not completely understood. Also, the effects of emotional stress, behavior habits, and socioeconomic status on the risk of heart disease and heart attack have not been proven. That is because we all deal with stress differently; how much and in what way stress affects us varies from person to person.
Carotid artery intima-media thickness (IMT) is a widely accepted index for assessing atherosclerosis, and is known to be a risk indicator for cardiovascular and cerebro-vascular events\textsuperscript{22}. In healthy adults, IMT ranges from 0.25 to 1.5 mm, and values \textasciitilde1.0 mm are often regarded as abnormal\textsuperscript{23-25}. However, the “normal” range and “abnormal” value and even the risk factors associated with abnormal IMT might vary considerably between different populations\textsuperscript{25,26}. Ultrasoundographic diagnosis of increased IMT in one individual at risk of atherosclerosis might help to stratify the risk factor, to better justify the decision to treat and to follow the efficacy of preventive therapy such as that involving the use of antihypertensive, antiplatelet, or lipid-lowering drugs\textsuperscript{27,28}. As it known, bruxism is the habit of clenching and grinding the teeth. It most often occurs at night during sleep, but may also occur during the day. Bruxing when awake, along with other oral habits such as jaw or mouth posturing, cheek biting, and nail biting, often occurs without cognitive awareness, especially during periods of concentration, or stressful situations. Awake bruxism can be associated with tics (medical definition), or with a “parafuction” that is believed to be associated with life stress caused by familial responsibilities or work pressure\textsuperscript{29}. Awake bruxism is mainly associated with nervous tic and reactions to stress. The physiology and pathology of awake bruxism is unknown, although stress and anxiety are considered to be risk factors\textsuperscript{29}. Bruxism during sleep is distinct from bruxism when awake and occurs in relationship to arousals. Most sleep bruxism episodes are under the transient influence of cardiac sympathetic activity (as a promoter of arousal), as shown in a rapid rise in heart rate at the onset of rhythmic masticatory muscle activity (time domain estimate of heart rate acceleration (i.e. tachycardia) or deceleration (i.e. bradycardia) during recurrent sleep arousal\textsuperscript{30-32}. Whether bruxism occurs during the day when awake or at night during sleep, the occasional outcomes of tooth wear and jaw pain are familiar to most dentists and also many dentists.
share the opinion that bruxism, either clenching while awake or grinding during sleep, is associated with stress and anxiety. Concomitant anxiety and hyperactivity have also been described as causes of bruxism. Moreover, two studies showed that patients with bruxism had elevated levels of catecholamines in their urine in comparison to nonbruxism subjects; such findings support a link between emotional stress and bruxism. The literature demonstrates that self-report and clinical observation of tooth wear is one means of assessing bruxism in relation to the role of anxiety and stress. However, such methods have several limitations. Tooth wear has been described as a weak indicator of current bruxism and does not discriminate clenching from grinding bruxism. But tooth wear level is an indispensable method to evaluate bruxism level. Stress and anxiety are the same etiological factor of both cardiovascular disease and bruxism. So the same stressful situations can cause bruxism and cardiovascular disease such as coronary artery diseases (ischemic heart disease, acute myocardial infarction), hypertension, arrhythmias, cardiomyopathy. The statistical analysis supported this hypothesis. However, we need to new studies with large number of samples to confirm this hypothesis.

Conclusions

Clearly, future studies in this field will need to take into consideration the influence of the following variables: age, anxiety, use of medication or drugs (central nervous system stimulant), smoking habits, and other sleep disorders. To prove the hypothesis, we recognize that it is very difficult to isolate the role of stress and anxiety from concomitant changes in autonomic and motor excitability and a state of altered physiological vigilance. Heterogeneity in psychosocial and biological markers may concur to prevent a clear, simple and valid description of the causative relationship among stress, anxiety, bruxism and cardiovascular disease.

References


