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ASSOCIATION BETWEEN MASTICATORY DYSFUNCTION AND CARDIOVASCULAR DISEASES

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Abstract: Dental arch defects are common especially in subjects over 40 years. The problem is getting more serious in Bulgaria in the last 25 years. Mastication is neuromotor activity. Its primary function is to prepare the food for swallowing and digestion. Fractioning of food particles is due to the compression between the occlusal surfaces of molars and premolars from upper and lower dental arch . This increases their surface and makes it accessible for the different biologically active agents. The main chewing movements are the up and down movements of mandibula and the movements of tongue. The degree of food chewing is variable. The number of masticatory cycles, needed for preparation of different food types for swallowing are relatively constant in a single patient group, independently of individual characteristics.The degree of chewing depends of the ability to form a bolus.
Keywords: mastication, food, teeth, blood pressure, heart rate

INTRODUCTION

Dental arch defects are common especially in subjects over 40 years [22]. The problem is getting more serious in Bulgaria in the last 25 years. The age of patients with missing teeth and masticatory dysfunction decreases. Chewing is important for food intake and digestion and influences the general health [23]. Disorders, related to this process lead to change in the physical and mental status and are associated with a number of diseases [24].
The aim of the study is using the available literature to find the mechanisms that link the mastication disorders with common cardiovascular diseases.

RESULTS AND DISCUSSION

Mastication is neuromotor activity. Its primary function is to prepare the food for swallowing and digestion [1]. Fractioning of food particles is due to the compression between the occlusal surfaces of molars and premolars from upper and lower dental arch [2]. This increases their surface and makes it accessible for the different biologically active agents [3]. The main chewing movements are the up and down movements of mandibula and the movements of tongue. These movements are already present during the embryonal development and take part in the sucking reflex as one of the most important newborn reflexes [4]. The true masticatory movements form gradually with milk-teeth eruption [2]. Fractioning and grinding of food is achieved with coordinated contraction of masticatory musculature. The muscles of tongue and cheeks also take part in this process. The force of these muscles depends of irritation of mechanoreceptors in the oral mucosa and especially in the periodont [2]. The two dental arches compress to overcome the food resistance and perform multidirectional sliding movements [3]. Masticatory function is a physical work for food processing [5]. The energy released by the muscle contraction moves the jaw and determines the contact between the dental arches. This energy is called masticatory muscle force. Already in 1893 Black [6] found that this masticatory muscle force depends of some individual characteristics – age, sex, parafunctions, presence of prosthesis and of the food type. A number of studies found differences in maximal mastication forces in accordance to the food and the type of the teeth. Anderson and Lasserre, cited from Chakalov [7] show that by maximal axial load between 100-150N, masticatory forces do not exceed 10N. Kohyama [8] measured forces when chewing different types of food and reports values between 20 and 200 N, but emphasized that the force impulse over every particular tooth is 20-30N for molars and 6-11 N for incisors. Gibbs and Lundeen [8,9] consider that masticatory forces vary according to the type of consumed food and demonstrate that by eating biscuits, carrots and heat-processed meat they are between 70 and 150N. Anderson [11] measuring forces from whole masticatory area concluded they are 190-260 N. A number of other researchers tried to found the precise value of masticatory forces. Wood and Williams [12] defined maximal chewing force as 500-700 N. Helkimo et Ingervall [13] found that the bite force measured in incisors region is 40% lower than in molar region.
Starting from minimal mouth opening the normal masticatory cycle uncludes four main phases [2]: slow mouth opening, rapid opening, rapid closing and slow closing. The duration of chewing depends of the neuro-regulatory activity and is usually 38-51 sec (from the moment of food taking till swallowing reflex occurs). Mastication process increases the cerebral blood flow, affects the sympathetic and vagus nervous activity and induces changes in the

general circulation. Hasegawa et all investigated circulatory response and autonomic nervouos activity during gum chewing and found that it suppresses cardiac vagus nervous activity and activated cardiac sympathetic nervous activity without significant changes in vasomotor sympathetic nerve activity [24]. Gum chewing resembles mild to moderate exercise, so masticatory movements could be considered as a low isotonic exercise. Farella et al demonstrate that gum chewing affects systolic, diastolic blood pressure and heart rate. The changes are proportional to the bolus resistance [26].Takeuchi et al [25] found association between chewing and indices of heart rate variability (HRV) and consider impaired mastication as a risk factor for sympathetical hyperactivity because of attenuated HRV. Vedin et al [30] measured prognostic biomarkers (high-sensitivity C-reactive protein, lipoprotein-associated phospholipase A2 activity, growth differentiation factor 15 and N-terminal pro-B-type natriuretic peptide (NT-proBNP)) in patients with stable CHD and demonstrated influence of teeth loss on cardiovascular mortality and stroke.

CONCLUSION

The degree of food chewing is variable [14-19]. The number of masticatory cycles, needed for preparation of different food types for swallowing are relatively constant in a single patient group, independently of individual characteristics [20].The degree of chewing depends of the ability to form a bolus [21,22]. Although the dry and hard food requires more masticatory cycles than soft and tender, some authors [19] demonstrate that the size of particles from chewed raw vegetables are bigger than the particles from chewed nuts, right after swallowing in same patients. Mastication process is associated with general circulatory effects. This is very important for subjects, suffering from cardiovascular diseases, in which sympathetical hyperactivity may be a trigger for ventricular tachycardia, sudden cardiac death and other life-threatening complications.

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