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## Bone tissue mineral density of the alveolar sprouts in persons of young age with crowded teeth on the background of chronic catarrhal gingivitis

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### Abstract

It is known that among the abnormalities of maxillo dental system a leading place takes crowded position of teeth. The article presents a study of bone tissue mineral density (BTMD) using a computed tomography in young patients with crowded teeth on the background of chronic catarrhal gingivitis. For today, in the study of bone tissue mineral density the method of computed tomography is wide use. At the quantitative computed tomography get an image of thin slice of the body of bone, which allows to determine the bulk density of mineral substances in bone tissue, regardless of surrounding cortical layer. That's why it was studied the state of bone tissue mineral density of the alveolar sprouts in persons of young age with crowded teeth on the background of chronic catarrhal gingivitis. It is proved that for this contingent of patients bone tissue mineral density of the upper jaw was on average in 1.9 times and the lower jaw in 1.7 times below than in practically healthy individuals. Thus, it was found that in people with crowded teeth without concomitant periodontal pathology the results of the measurement of bone tissue mineral density was higher than in patients with combined dental pathology.

**Keywords:** Bone tissue mineral density, crowded teeth, chronic catarrhal gingivitis, periodontal pathology, computed tomography

### 1. Introduction

It is known that one of the most common pathologies among children and adults are the abnormalities of maxillo dental system and leading place among them has crowded position of teeth [1, 3, 4]. It is established that the close position of teeth, in most cases, is accompanied by periodontal diseases, lesions of the hard dental tissues, functional disorders of maxillo dental system and psycho-emotional disorders of patients [2, 4]. On the other side, orthodontic treatment of close position of teeth using orthodontic appliances can have a negative impact on periodontal tissues, affect the hygiene of oral cavity in this group of patients [3, 5]. The possibility of organism adaptation to long-term impact of such negative factors depends on the functional state of stress implementing processes that provide nonspecific resistance of the organism [4, 5]. It is obvious that in such circumstances is important the knowledge of the functional state of these systems, in particular bone remodelling, the choice of the methods of general and local therapeutic effects and orthodontic treatment to develop a plan an individual approach, considering the state of stress implementing systems [1, 2, 6].

For today, the method of computed tomography gets wide use in the study of bone tissue mineral density [2, 5]. At the quantitative computed tomography get an image of a thin slice of the body of bone, which allows to determine the bulk density of mineral substances in bone tissue, regardless of surrounding cortical layer. Using the quantitative computed tomography we can to determine the density of spongy bone tissue, which is more sensitive to the effects of pathogenic factors and the first responds to changes in homeostasis of the organism in general. The purpose of our research was to study the state of bone tissue mineral density of the alveolar sprouts in persons of young age with crowded teeth on the background of chronic catarrhal gingivitis.

### 2. Materials and methods

The study of bone tissue density (BTD) of the alveolar sprouts was carried out with the consent of patients using spiral computer tomograph Emotion „Siemens” (Netherlands) in axial projection in terms of V= 130 kV, mAS – 80, layer thickness 2 mm, 13-15 slices. The bone density was assessed in units of Hounsfield (HU).

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The method allows to assess the state of BT and to study its change under the effect of treatment. The system returns in a circle during the study, the procedure lasts for 20 min, is not accompanied by complications and has no contraindications. A dose radiation exposure is 50 mk3v (0.05 x-ray) at an annual rate of 2 x-rays (Order of MH of Ukraine № 294 dated 04.06.2007). The number of slices and their thickness choose as needed. Thin sections (2 mm) give higher spatial resolution and accordingly allow you to conduct a detailed analysis and reconstruction of image in other projections.

The study was carried out left and right in the area of incisors, canines and premolars on the upper and lower jaws. Reference indices of bone tissue mineral density (BTMD) of the body of the alveolar sprouts of both jaws in 30 clinically healthy persons aged 20-25 years (control group) considered data from 1329.7±37.80 HU to 1092.50±18.80 HU. The obtained data were compared with the data of 32 patients with crowded teeth on the background of chronic catarrhal gingivitis and 30 individuals with crowded teeth without periodontal pathology. The obtained data were worked out statistically.

**3. Results and their discussion.**

With the purpose of study the depth of structural-functional changes of bone tissue (BT) of the alveolar sprouts in 32 patients with crowded teeth on the background of CCG (main group) and 30 patients with crowded teeth without concomitant periodontal pathology (comparison group) was conducted a quantitative computed tomography of the jaws in three areas. The obtained results were compared with 30 people without orthodontic and periodontal disease (control group).

As a result of conducted studies we found (table 1) that mineral density of the body of the alveolar sprout of the upper jaw, on average, in patients of main group was in 1.8 times and patients of comparison group in 1.1 times lower than in persons of control group, *p*<0.01. Thus, in examined of main group BTMD of the upper jaw in area of incisors was 551.28±14.40 HU that was in 1.9 times lower than in patients of control group – 1065.78±18.19 HU, *p*<0.01. At the same time, patients of comparison group BTMD of the upper jaw in area of incisors was in 1.14 times lower compared with the data in control (934.45±12.50 HU against 1065.78±18.19 HU, *p*<0.01).

Bone tissue mineral density of the alveolar sprout of the upper jaw in area of canines in patients of main and comparison groups were significantly lower than in persons of control group: 692.58±12.28 HU and 1041.55±16.25 HU, respectively against 1172.18±19.08 HU, respectively, *p*<0.01.

Bone tissue mineral density of the upper jaw in patients of main group in area of premolars amounted to 525.88±12.50 HU that was in 1.9 times lower in comparison with the data in control – 996.88±18.45 HU, *p*<0.01. In examined of comparison group BTMD in the same point of the measurement was 922.55±15.45 HU and was significantly higher relative to the data in control, *p*<0.01.

Bone tissue mineral density of the alveolar sprout of the lower jaw in patients with crowded teeth on the background of chronic catarrhal gingivitis was on average in 1.7 times, and in individuals with crowded teeth without periodontal pathology – in 1.07 times lower in comparison with the data in control, *p*<0.01.

**Table 1:** The indices of mineral density of the body of alveolar sprouts in patients of study groups

Study groups	The upper jaw in area of incisors	The upper jaw in area of canines	The upper jaw in area of premolars	Mean value	The lower jaw in area of incisors	The lower jaw in area of canines	The lower jaw in area of premolars	Mean value
Control (n=30)	1065.78±18.19	1172.18±19.08	996.88±18.45	1077.96±18.57	1006.48±14.18	1130.48±11.28	991.20±18.18	1042.56±14.55
Main (n=32)	551.28±14.40°	692.58±12.28°	525.88±12.50°	590.91±13.06°	579.48±15.18°	625.68±19.33°	591.28±13.77°	598.81±16.09°
Comparison (n=30)	934.45±12.50°,*	1041.55±16.25°,*	922.55±15.45°,*	966.18±14.73°,*	941.12±16.15°,*	1035.00±15.75°,*	936.15±15.10°,*	970.76±15.67°,*

Notes:  
 1. °*p*<0.01 – significant difference of values relative to the data of control group.  
 2. \**p*<0.01 – significant difference of values relative to the data of main group.

Paid attention that in persons of main group BTMD of the lower jaw on average was in area of cutters in 1.6 times and area of canines in 1.8 times and area of premolars in 1.7 times lower than in examined of control group, *p*<0.01. In patients of comparison group BTMD of the upper jaw in area of incisors was in 1.07 times, canines in 1.09 times and premolars in 1.06 times lower than in persons of control group, *p*<0.01.

It should be noted that in examined with crowded teeth on the background of chronic catarrhal gingivitis bone tissue mineral density of the upper and lower jaw was significantly lower than in patients with crowded teeth without concomitant periodontal disease. So, we have found that BTMD in patients of main group in area of incisors of the upper jaw was in 1.7 times, canines in 1.5 times and premolars in 1.8 times lower than in individuals of comparison group, *p*<0.01. At the same time, it was found that in people with crowded teeth on the background of chronic catarrhal gingivitis BTMD in areas of

incisors and premolars of the upper jaw was in 1.6 times and canines in 1.7 times less than in examined of comparison group.

**4. Conclusions.** Thus, the obtained data suggest that crowded teeth on the background of inflammatory diseases of periodontal tissues is accompanied by a pronounced decrease of bone tissue mineral density that can be the consequence of various factors, particularly the availability of combined orthodontic and periodontal diseases.

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