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CLINICAL AND RADIOLOGICAL ASSESSMENT OF CHANGES OCCURRING IN PERIODONTAL TISSUES AFTER ORTHODONTIC TREATMENT

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Abstract: The purpose of the article was, using computer tomograms of patients with pathological and physiological inclinations of teeth, to analyze the thickness of bone tissue and develop a universal table, the use of which will give the orthodontist information about the required thickness of bone tissue in various segments of the root when changing the vestibulo-oral inclination. Using this table, the doctor can assess the possibility of planned tooth movement when torque changes, taking into account areas of critical bone deficiency, which will ensure safe tooth movement, stable retention and a favorable outcome of orthodontic treatment.
Keywords: orthodontic treatment, center of resistance, bone thickness, tooth torque.

INTRODUCTION: An orthodontist planning orthodontic treatment takes into account a number of general factors: the patient's age, the body's ability to grow, gender, somatic diseases, which will determine the prognosis of treatment. It is also important to take into account local factors: the mechanics of tooth movement with the center of resistance, inclination, vitality of the tooth, the thickness of the bone tissue surrounding the tooth [1, 2].

MATERIALS AND METHODS: Thus, when planning changes in the vestibulo-oral inclination of the tooth in the frontal segment, the doctor must take into account the thickness of the bone tissue surrounding the teeth [1]. It is important to correctly predict tooth movements in order to avoid complications that may arise from bone deficiency. When diagnosing dental anomalies, X-ray techniques are widely used. Cone beam computed tomography (CBCT) makes it possible to diagnose and measure vestibular and oral bone thickness at different root length levels for orthodontic treatment planning [2]. Tooth movements are dangerous in the absence of CBCT data on the thickness of the bone tissue around the studied roots. However, using CBCT in the frontal segment, in combination with the technique we propose, the orthodontist can accurately determine the inclination and position of the incisors, measure the volume of bone tissue at different levels of the length of the root of the tooth under study, predict the final position of the tooth root after movement and thereby ensure absence of a number of complications associated with bone deficiency.

RESULTS AND DISCUSSION:A CBCT analysis of patients was performed to study the anterior segment in the area of teeth 1.3–2.3; 3.3–4.3. We studied 106 tomograms of patients aged 20–35 years. Criteria for inclusion of patients in the study: presence of dentofacial anomalies in the frontal region along the sagittal plane; absence of diseases of the cardiovascular and endocrine systems; absence of blood diseases. Exclusion criteria: patient age younger than 20 and older than 35 years; presence of pregnancy; women during lactation; the presence of general somatic pathology; the presence of diseases of the cardiovascular and endocrine systems, blood diseases; systemic osteoporosis, smoking. Among the examined there were 45 (44.6%) men and 61 (55.4%) women. The studied tomograms were divided into three groups: the first group included tomograms with normal inclinations of the incisors of the upper and lower jaws, the second - with protrusion of the incisors of the upper and lower jaws, and the third - with retrusion of the incisors of the upper and lower jaws. To identify the relationship between the pathological inclination of teeth and the

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thickness of the cortical plate, measurements were taken at the level of the tooth root in three segments: the cervical, middle and apical third from the vestibular and oral surfaces. CBCT was performed on a Planmeca ProMax 3DMid Ceph computed tomograph with the patient's head positioned vertically.

Centering was performed using the corresponding light marks. The scanning area included both the upper and lower jaws, the maxillary sinus, and the orbit. Scanning conditions: voltage - 90 kV; current strength - 12.5 mA. The minimum informative slice thickness was 0.2 mm, the voxel size was 200 μm, and the radiation dose was 90 μSv. The field of view (FOV) size was 16 × 16 cm.

When studying tomograms of anterior teeth, a number of parameters were determined:

1) the thickness of bone tissue in the cervical third of the vestibular surface on the upper jaw was measured from the outer cortical plate (Av) to the outer surface of the root in the cervical region (Bv); on the lower jaw, the distance from the outer cortical plate (Gv) to the outer surface of the root in the cervical region (Hv) was measured (Fig. 1);

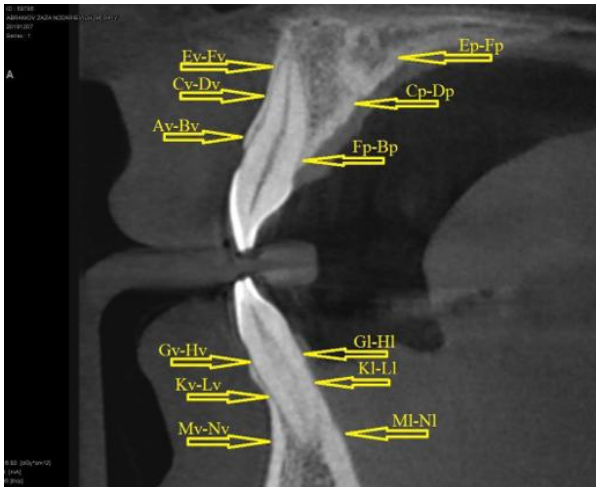

Fig 1. Measurement parameters on the upper and lower jaw

2) the thickness of the bone tissue in the region of the middle third on the vestibular side was measured from the outer cortical plate (Cv) to the outer surface of the tooth root in the middle third (Dv); on the lower jaw, it was measured from the outer cortical plate (Kl) to the outer surface of the tooth root in the middle third (Lv) (see Fig. 1);

3) the thickness of the bone tissue from the palatal surface in the apex area was measured from the apex of the tooth under study (Ep) to the outer cortical plate (Fp); on the lower jaw, it was measured from the apex of the root of the tooth under study (Ml) to the outer cortical plate (Nl) (see Fig. 1);

4) the area of bone tissue from the lingual and palatal surfaces was measured from the outer cortical plate in the area of the apex of the tooth under study (Al) to the apex of the tooth root (Bl) to the upper (palatal) vault (Cl) (Fig. 2);

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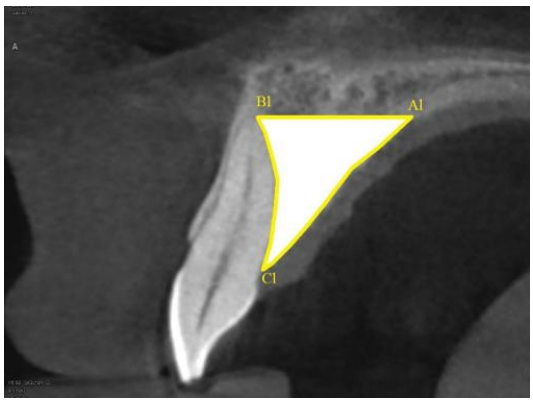

Figure 2. Measuring bone tissue area

Thus, by analyzing the thickness of the bone tissue near tooth 3.3 with protrusion in the cervical third, you can plan a change in the tooth torque by an acceptable (safe) number of degrees, checking the universal table, where the length of the tooth root will be in the range from 13 to 14 mm. Accordingly, it is possible to safely move tooth 3.3 by 9°, taking into account the volume of bone tissue in the cervical third. In the apical third there is no bone deficiency in this area. In tooth 3.3, during retrusion, the root length will be in the range from 16 to 17 mm; accordingly, we can safely move tooth 3.3 by 3°, since the existing bone tissue deficiency in the indicated zone does not allow us any more; there is no deficiency in the apical third.

CONCLUSION: The use of a universal table makes it possible to calculate the required thickness of bone tissue at different levels of root length; when changing the vestibulo-oral inclination of the tooth in patients with pathological inclinations of the teeth, it makes it possible to calculate the required thickness of bone tissue when planning a change in the torque of the incisors at the stage of orthodontic treatment. CBCT, together with the use of a universal table, makes it possible to visually assess the safe movement of the tooth and the required thickness of bone tissue at various levels of the root of the tooth being moved. The proposed table simplifies the diagnostic stage when planning orthodontic treatment and helps plan safe tooth movement with the ability to take into account the required bone tissue thickness for frontal teeth.

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