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Dynamics of echocardiography indicators in predicting long-term function of fixed prostheses.

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Abstract: The proposed diagnostic method makes it possible to assess the density of alveolar bone tissue by measuring the speed of passage of an ultrasonic wave (ultrasound) of 2.5 MHz in the studied area of the alveolar process of the upper jaw and the alveolar part of the lower jaw. Echosteometry makes it possible to determine the density of the alveolar bone of the jaws with a high degree of accuracy, which makes it possible to recommend this research method for diagnosing the mineral density of the alveolar bone and predicting possible recurrence of anomalies in the position of the teeth after completion of orthopedic treatment.

The advantages of the method are high information content (it is sensitive to loss of bone density by 3-4%, and during X-ray examination, the phenomena of osteoporosis are diagnosed with a violation of bone mineralization from 25-30%), ease of implementation, accessibility, painlessness and safety.

The purpose of the study: to identify the dynamics of echosteometry indicators in predicting the long-term functioning of non-removable prosthetics.

Materials and methods of research: The echosteometric method for determining bone density is characterized by high diagnostic objectivity, primarily due to the possibility of obtaining a quantitative assessment of the "strength" properties of bone tissue.

The speed of passage of an ultrasonic wave in the area of bone inter-root septa is measured using intraoral cone-shaped sensors fixed in a silicone impression. The

sensors are installed at the intersection point of the midline of the inter-root septum and the conditional line drawn on the upper jaw 3 mm above, and on the lower jaw 3 mm below the gingival margin line. The method allows to obtain objective data on the risk of recurrence after orthodontic treatment by using cone-shaped sensors positioned directly in the oral cavity.

Research results: Echosteometry was performed using the diagnostic device EOM-01, which used a pulse method for measuring the propagation velocity of ultrasonic vibrations in tissues - the "base increment" method, which allows to exclude the influence of soft tissues on the measurement results. A total of 322 measurements of the velocity of ultrasound propagation through the bone tissue of the mandible were carried out using the echosteometer EOM-01.

A comparative analysis with the above-mentioned study performed by the method of external echosteometry shows that the claimed method has a higher accuracy of the results of the study due to the use of cone-shaped ultrasonic sensors positioned directly in the oral cavity. In addition, the claimed method differs from the known ones in that the diagnosis of the condition of the bone tissue of the jaws is carried out.

The technical result is achieved due to the fact that the time and speed of the ultrasonic wave are recorded between cone-shaped intraoral ultrasonic sensors located at the intersection point of the midline in the area of the inter-root septum and a conditional horizontal line drawn 3 mm above (on the upper jaw) or below (on the lower jaw) the line of the gingival margin.

Conclusions: The method of echosteometry more accurately reflects changes in bone density in periodontitis, since they occur primarily in the spongy bone tissue of the alveolar bone. This is due to the physical characteristics of the ultrasonic vibrations used in echosteometry, namely, their wavelength and, accordingly, the depth of penetration into bone tissue.

Kilohertz ultrasound is less dispersed in bone tissue, and therefore gives a more accurate characterization of its echo density. At a kilohertz frequency, ultrasound penetrates into the bone to a depth of several centimeters and thus scans not only the compact plate, but also the spongy bone. It is the spongy bone that is characterized

by an active metabolism, and it is obvious that the processes of demineralization in periodontitis occur mainly in it.

As a result of our research, we developed medical and technical requirements (MTT) for a dental echosteometer, which took into account the following aspects: the generated frequency of ultrasonic vibrations should be in the kilohertz range; sensors for the bones of the facial skeleton should take into account their anatomical structure; intraoral sensors should have a minimum area for contact with the probed area - the alveolar department; The software of the device must have a database for detecting osteopenia and osteoporosis in the bones of the facial skeleton.

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