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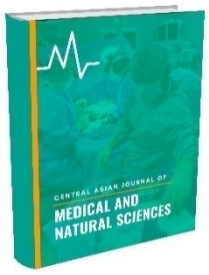

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Ultrasound Osteometry in the Diagnosis of Inflammatory Processes of Periapical Tissues

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ABSTRACT: Echoosteometry is highly sensitive to changes in the mineral saturation of bone tissue, therefore, it allows you to obtain objective information about the inflammatory process in a specific area of the bone. In patients with odontogenic osteitis, the ultrasound speed of a relatively healthy symmetrical side decreases in children by 15.8%, in adults by 10.7%, and in children the decrease in the speed of ultrasound propagation is more significant than in adults.

Keywords: Ultrasound osteometry (echoosteometry), inflammation of periapical tissues, osteitis, osteomyelitis.

Introduction: Despite the great advances in dentistry, the specific gravity of patients with complications of caries remains high. They make up 25-30% of all dental patients (1,3,7). The search for highly informative and safe methods for assessing the state of bone tissue remains an urgent area of research in modern dentistry (6). The most accessible diagnostic method, which allows timely detection of changes in the state of bone tissue and determine a decrease in the level of its mineral density, is X-ray (4, 5, 6). X-ray examination has a number of disadvantages, firstly, it has an ionizing effect on the body, and secondly, it is impossible to assess the state of periapical tissues in an acute inflammatory process (1,2).

To date, in medical practice, the method of ultrasound osteometry (echoosteometry) is used to identify a quantitative assessment of the state of bone density by measuring the time of passage of ultrasound vibrations through the studied area of the bone. This method is based on the fact that the speed of sound propagation in different media is different and depends on the density: the denser the medium, the faster the sound passes through it, and vice versa. Echoosteometry is highly sensitive to changes in the mineral saturation of bone tissue, therefore, it allows you to obtain objective information about the inflammatory process in a specific area of the bone (2,9).

Material and methods of research: The study was carried out in 29 children and 36 adults using an ultrasonic diagnostic device with an echoosteometer "ЭОМ-01ц". The distribution of patients by age and nosological forms is presented in Table 1. Ultrasound osteometry of bones does not require special preparation of the subject, is painless and absolutely harmless, which is especially valuable in the practice of pediatric dentistry (2.9,10). Before the examination, the boundaries of the pathological focus were visually and palpatorically determined and the distance was measured. The surface of the ultrasonic wave-emitting and ultrasonic wave-receiving sensors and the skin of the investigated area were abundantly lubricated with liquid vaseline or glycerin. At the proximal and distal ends of the bone, 2 sensors were installed, one of which is a ultrasonic wave emitter and the other is a receiver. The speed of ultrasound transmission in the area of the jawbone (C) located between the sensors was determined by the classical method according to the formula "C = L: t" where "L" is the length of the investigated part of the jawbone, "t" is time.

Results of the study and discussion. Ultrasound osteometry according to the above recommended procedure was performed by us in 65 patients with various inflammatory processes.

Data on the speed of propagation of ultrasound in inflammatory diseases of the maxillofacial region are presented in Table 1.

As can be seen from Table 1, the rate of origin of ultrasound in the jawbone depends on the form of the disease. The younger the patient's age, the more pronounced the decrease in the speed of ultrasound transmission. Apparently, the decrease in the ultrasound speed is due not only to a decrease in the sound conductivity of soft tissues due to the inflammatory process, but also to the peculiarities of their structure in children in younger age.

Table 1

Results of ultrasound osteometry in acute odontogenic inflammatory diseases of the jaw

Forms of inflammatory diseases	Number of patients		The speed of ultrasound advancement along the healthy jaw (m / s)	The difference in the speed of advancement of ultrasound on the affected side (m / s)			
				1-3 days		7-10 days	
			M ± m	M ± m	%	M ± m	%
Acute odonotogenic osteitis of the lower jaw	children	18	2264 ± 53,6	358,9 ± 40,5	15,8	178,7 ± 21,1	7,9
	adults	12	3011,2±35,2	321,2 ±21,7	10,7	176 ± 18,1	5,8
Acute odontogenic osteomyelitis of the lower jaw	children	11	2673,7± 119,9	690,9 ± 135,7	25,84	617 ± 120,7	22,9
	adults	24	3044 ±29	750,6 ±13,8	24,65	702 ± 19,3	23,3

With odontogenic acute osteitis, there was a significant decrease in the rate of ultrasound passage through the jaw bone (up to 19%), which indicates the involvement of the jaw bone in the inflammatory process. (pic. 1) The decrease in the rate of ultrasound passage in children with acute odontogenic osteitis was 15.8%, in adults - 10.7%.

In patients with odontogenic osteomyelitis of the jaws in all age groups, a decrease in the rate of passage - ultrasound in children by 25.8% and by 24.6% in adults was found.

The results obtained allowed us to conclude that in patients with odontogenic osteitis, the ultrasound speed of a relatively healthy symmetrical side decreases by 15.8% in children, by 10.7% in adults, and in children, the decrease in the ultrasound propagation speed is more significant than in adults.

In order to study the restoration of the rate of ultrasound passing through the jaw bones, we conducted repeated studies on the 7-10th day of treatment. By this period, signs of an acute inflammatory process subsided. Along with the normalization of a number of clinical and laboratory indicators in the majority of patients, purulent discharge ceased, and epithelialization of wounds began.

In patients with acute odontogenic osteitis in the course of treatment, the speed of ultrasound in the jawbone is significantly restored (from 82.3% to 90%), but did not reach the speed of the healthy symmetric side.

In children with acute odontogenic osteomyelitis of the jaw, as mentioned above, the ultrasound rate on the affected side decreased by 25.8% relative to the symmetrical side. In the course of treatment, in the subacute stage of osteomyelitis, the ultrasound rate is somewhat restored by 22.9%, but not reliably.

Studying the dependence of the rate of ultrasound passage on the outcome of acute odontogenic osteomyelitis, it was found that it tends to be restored in patients with a favorable outcome (recovery). If the ultrasound rate does not tend to recover or continues to decline further and reaches 28-30% relative to the symmetrical healthy side, it can be predicted that the process goes into a chronic stage.

Thus, according to the results of ultrasound osteometry, the course of the disease can be predicted.

Conclusion. Ultrasound osteometry is an additional primary-oriented diagnostic method that allows assessing changes in the bone tissue in the periapical zone and the jaw in the early stages of diseases, when the pathology of bone tissue cannot be established by radiological examination. Based on the results of ultrasound osteometry, it is possible to trace the dynamics of the restoration of the bone structure, to predict the course of the disease. Harmlessness, simplicity, painlessness make it possible to recommend echoosteometry for use in practical dentistry.

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