Assessment of indicators of bone tissue resorption in patients with chronic generalized periodontitis according to the data of cone-beam computer tomography

Introduction. Periodontitis is one of the most common dental diseases of our time, which is a social problem that leads to tooth loss. Infection of periodontal pockets negatively affects the body as a whole.

In modern dentistry, the treatment of periodontitis is quite successful thanks to the introduction of new methods of diagnosis and treatment [1–3]. Early detection of the disease makes it possible to apply conservative treatment without resorting to surgical intervention. A visual examination is not enough for this; every patient must undergo periodontal tissue diagnostics to determine periodontitis at an early stage [4–6]. Timely diagnostic of diseases and damages of the maxillofacial system, objective evaluation of the results of treatment in the near and distant periods is an urgent problem in modern dentistry [7–9].

The choice of the optimal method of treatment of dental diseases depends on the correct diagnosis, which is based on the understanding of the...
problem and the use of additional diagnostic methods [10–12].

Early diagnosis of periodontal pathologies is one of the factors determining the possibility of ensuring a long-term positive result. After all, even after successful treatment, a number of negative complications are noted, which are difficult to detect clinically.

The relevance of this problem is indicated by a significant number of scientific researches devoted to the issues of diagnosis, subject to further prosthetics, of patients with chronic generalized periodontitis [8, 13, 14].

Despite the fact that the idea of evaluating soft tissue structures in periodontal tissue diseases by radiography with contrast substances appeared already at the beginning of the century, today, due to their low accuracy, radiological diagnostic methods do not always satisfy practicing doctors, which is the basis for their improvement.

In modern dentistry, the importance of the X-ray research method is steadily increasing, which has been facilitated by progress in the development of computer technology.

The technique of orthopantomography investigation has entered everyday practice as a mandatory stage of high-quality primary diagnosis, and modern digital orthopantomographs with a variety of special diagnostic programs make it possible to significantly minimize the radiation load on the patient. However, even this highly informative method of examination of dental patients does not always allow obtaining all the required amount of diagnostic information [7, 9, 15].

So according to the literature data, the only technique that makes it possible to obtain a three-dimensional image of the studied area with minimal exposure is cone-beam computed tomography (CBCT).

One of the criteria for assessing the degree of pathological changes in periodontal tissues is resorption of the alveolar process bone tissue of the jaw. However, the changes of the vestibular and oral surfaces on the panorama or focused intraoral x-rays are covered by the shadow of the teeth and objectively do not provide an opportunity for accurate diagnosis of pathological changes in the periodontal tissues [13–14, 16].

The aim of the study – to evaluate bone tissue resorption in the area of frontal teeth of patients with chronic generalized periodontitis according to CBCT data. On the basis of CBCT, to investigate the resorption of bone tissue from the medial, vestibular, oral, distal sides of the tooth in patients with chronic generalized periodontitis, with the help of statistical processing, to conduct an analysis of the study of indicators.

Materials and Methods. We used the EzD2009 software and the basic interface to work in the main MPR (multiplanar reformation) option – multiplanar visualization of a three-plane image. For the purpose of detailed study of the object, the function of adjusting the thickness of the selected layer from 0.03 mm to 3.00 cm was used. After that, sonography of the dentition and individual teeth was obtained (Fig. 1).

**Fig. 1.** The basic interface for using MPR (multiplanar reformation) – sonography.
In order to analyze bone tissue resorption from all sides (medial, distal, vestibular and oral) of teeth in patients with chronic generalized periodontitis, the cross-section mode was used (Fig. 2), which allows obtaining a panoramic tomogram in three planes.

The next step was to measure the distance from the crown of the tooth to the bone tissue of the alveolar process on each side (medial, vestibular, oral) using the tape measure tool in the main option of multiplanar imaging. Thus, we analyzed resorption in the area of frontal teeth (80 teeth); the average age of the subjects was 34–44 years.

**Results and Discussion.** The results obtained during the study were statistically processed using the STATISTICA 6.00 software and presented in the Table.

For the statistical analysis of the obtained data, measures of central tendency were applied: mean, median, mode and dispersion measures, the main of which are: lower and upper quartiles, maximum and minimum, mean squared deviation (confidence SD) and standard error of the mean (St. err.). The chosen level of significance, the margin of error was 0.05, that is, a 5 % chance of rejecting the null hypothesis was assumed, and the reliability of

![Fig. 2. Cross-section mode (measurement of resorption from all sides).](image)

**Table.** General table of cone-beam computed tomography indicators

<table>
<thead>
<tr>
<th>Variable</th>
<th>Age</th>
<th>Term</th>
<th>Resorption of b.t. M (mm)</th>
<th>Resorption of b.t. D (mm)</th>
<th>Resorption of b.t. V (mm)</th>
<th>Resorption of b.t. O (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid N</td>
<td>83</td>
<td>83</td>
<td>83</td>
<td>83</td>
<td>83</td>
<td>83</td>
</tr>
<tr>
<td>Mean</td>
<td>1974,231</td>
<td>6,627</td>
<td>1,841</td>
<td>1,487</td>
<td>2,867</td>
<td>2,877</td>
</tr>
<tr>
<td>Confidence -95,000 %</td>
<td>1271,321</td>
<td>7,318</td>
<td>1,889</td>
<td>1,535</td>
<td>1,472</td>
<td>1,440</td>
</tr>
<tr>
<td>Confidence +95,000 %</td>
<td>1642,294</td>
<td>7,935</td>
<td>2,793</td>
<td>2,205</td>
<td>2,263</td>
<td>2,315</td>
</tr>
<tr>
<td>Median</td>
<td>1962,000</td>
<td>7,000</td>
<td>1,200</td>
<td>0,900</td>
<td>1,300</td>
<td>0,700</td>
</tr>
<tr>
<td>Minimum</td>
<td>36,000,000</td>
<td>6,000</td>
<td>0,9000</td>
<td>0,7000</td>
<td>0,3000</td>
<td>0,6000</td>
</tr>
<tr>
<td>Maximum</td>
<td>1980,000</td>
<td>14,000</td>
<td>9,300</td>
<td>7,100</td>
<td>7,700</td>
<td>9,200</td>
</tr>
<tr>
<td>Lower Quartile</td>
<td>59,000,000</td>
<td>7,000</td>
<td>1,1000</td>
<td>0,8000</td>
<td>0,3000</td>
<td>0,6000</td>
</tr>
<tr>
<td>Upper Quartile</td>
<td>1967,000</td>
<td>8,000</td>
<td>3,100</td>
<td>2,800</td>
<td>2,700</td>
<td>3,300</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>849,4685</td>
<td>1,4117</td>
<td>2,0717</td>
<td>1,5334</td>
<td>1,8094</td>
<td>2,0037</td>
</tr>
<tr>
<td>Standard Error</td>
<td>93,24128</td>
<td>0,15496</td>
<td>0,22740</td>
<td>0,16832</td>
<td>0,19861</td>
<td>0,21993</td>
</tr>
</tbody>
</table>
the differences in values was equal to 0.95, or 95 %. Comparisons were made using the Wilcoxon-Mann-Whitney test. Numerical data with a small number of studies were obtained by the method of non-parametric U-test Mann-Whitney analysis for two independent samples.

The following results were obtained evaluating bone resorption indicators according to cone-beam computed tomography data: the average value (mean) of the bone tissue resorption indicator from the medial side was 1.84 mm (St. err. 0.23), with a median equal to 1.20 mm. The minimum indicator of this value was 0.90 mm, and the maximum was 9.30 mm.

The index of bone tissue resorption from the distal side (mean) reached 1.48 mm (St. err. 1.16), and had a median of 0.90 mm and a minimum of 0.70 mm and maximum – 7.10 mm.

The average value (mean) of the indicator of bone tissue resorption from the vestibular side was 2.86 mm (St. err. 0.20), while the minimum of this indicator was 0.3 mm, and the maximum was 7.70 mm. The median value was 1.30 mm.

Determination of the average value of the bone tissue resorption index from the oral side gave a result of 2.87 mm (Std. err. 0.22) with a median equal to 0.7 mm.

**Conclusions.** The results of cone-beam computed tomography obtained by us show a significant difference in the resorption rates of the bone tissue of the alveolar process of the jaw from the medial, distal and vestibulo-oral sides in the frontal group of teeth. This indicates that a detailed study of this indicator is an essential factor in the diagnosis of periodontal changes in patients with chronic generalized periodontitis.
LIST OF LITERATURE


REFERENCES


