

Assessment of Bone Tissue Quality During Orthopedic Treatment of Patients with Mandibular Defects Obtained After Tumors Resection with Using Dental Implants

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Annotation: This article presents information obtained in the study of the properties of the bone tissue of the lower jaw, namely its density, after dental implantation in patients with acquired defects of the lower jaw after surgical treatment of tumor formations. We used a densitometric method for studying bone tissue at various periods of treatment.

Key words: bone tissue, densitometry, implantsupported prostheses, dental implantation.

Introduction. In recent years, there has been an increase in the number of patients with the development of tumors and tumor-like formations, severe combined anomalies and deformities of the maxillary system, including on the lower jaw, which require complex bone-plastic and reconstructive operations with a concomitant long rehabilitation period. [7,4] However, with the introduction of the implantation method into dental practice, it became possible to expand the indications for the use of fixed prostheses in this contingent of patients. Currently, the phenomenon of osseointegration in the field of dental implants is the main factor in increasing the duration of the functioning of prosthetic structures on implants in patients receiving chemotherapeutic treatment [5,6,2] Therefore, when using the method of installing dental implants in this group of patients, the risks of bone resorption and osteoporosis, disorders of osteointegrative processes, and, as a consequence, the development of periimplantitis and rejection of dental implants.[1,3]

The aim of the work is to determine the density of bone tissue in the area of dental implants by periotestometry in patients with acquired mandibular defects after surgical treatment of tumor formations.

Materials and methods. We performed orthopedic treatment of 60 patients aged 30 to 68 years (28 men and 32 women). In all the studied patients, the defects were caused by tumor-like formations of the lower jaw (ameloblastomas, osteoblastomas), which covered the boundaries of the chin. An endoprosthesis made of titanium nickelide was made for all patients to replace the post-resection defect.

The oncological diagnosis of patients before surgical treatment was established by osteoscintigraphic examination and subsequently was confirmed by clinical and laboratory methods of investigation (cytomorphological).

Depending on the proposed treatment plan, all patients (60 people) were divided into 2 main groups:

Group I consisted of 30 patients with a postoperative permanent temporary prosthesis based on mini-implants and delayed loading of classical dental implants + the proposed comprehensive general somatic treatment.

Patients of this group were recommended to undergo a course of osteo-modifying therapy. The main drug of choice was the bone resorption inhibitor "Bonviva". The composition of the drug "Bonviva" includes ibandronic acid - a highly active nitrogen-containing bisphosphonate, an inhibitor of bone resorption and osteoclast activity. The duration of the course and the dosage regimen were 150 mg orally 1 time per month, 6 months. Special instructions when taking the drug "Bonviva": the tablet should be taken in the morning on an empty stomach 30-60 minutes before meals, without chewing, drinking 200 ml of clean water; at the same time, it is forbidden to take a horizontal position for at least 60 minutes. Additionally, it is

recommended to take calcium 1000 mg / day and vitamin D 1000 units throughout the entire period of antiresorptive therapy.

Group II consisted of 30 patients with simultaneous implantation and immediate (temporary) prosthetics. Patients of both groups underwent a course of chemotherapeutic treatment after surgical intervention.

For the control group, 30 patients were selected who did not have a history of tumor neoplasms, without cardiovascular pathology, who were admitted to the department of orthopedic stomatology with a diagnosis of "complete secondary mandibular adentia" and underwent dental orthopedic treatment with the installation of dental implants.

A non-removable bridge-shaped plastic prosthesis was used as a temporary orthopedic structure, and a non-removable bridge-shaped metal-ceramic prosthesis supported by all-on-4 dental implants served as an option for choosing a permanent orthopedic structure. On the upper jaw, patients mostly had bridge-like prostheses or fixed orthopedic structures supported by dental implants.

The method of comparative densitometry quantified the process of bone tissue restoration in the periimplant area. The relative optical density of the periimplant lesion was determined in comparison with the reference area of the jaw. The bone density in the same part of the jaw, but with the opposite (healthy) one, was chosen as the reference point the sides are on the same orthopantomogram. The software of the digital scanning X-ray machine "Vzor" (JSC "Institute of Applied Physics", Novosibirsk) was used as a densitometer. The density of the bone structures of the studied areas is directly proportional to the digital value of the corresponding area of the X-ray file, therefore, the ratio of the digital values of the reference and the studied areas corresponded to the relative density of the bone tissue of the focus of the study.

When digitizing the orthopantomogram by computer, the maximum and minimum brightness of the image was fixed, which were taken as the standard of the degree of bone mineral density (BMD), so, the minimum was fixed in the area of the air maxillary sinus (3-5%), the maximum - in the area of the nasal spine, zygomatic bone (87-90%). Brightness is determined as a percentage of gradations (grad) of gray, and the minimum is taken as one (1 grayscale), and the maximum is 100% (256 grayscale). Further, in the range of 1-100%, the brightness is determined as a percentage on any other part of the orthopantomogram. In a picture with normal brightness, the minimum brightness in the maxillary sinus area was 3-5% deg; the maximum brightness in the zygomatic bone/nasal spine area was 87-90% deg.

When assessing the value of bone density around the implants, the average value between the three measured zones was used: on the right, top and left around the implants.

According to the results of osteodensitometry of the periimplant area, the value of the indicator was calculated in the first and second main groups and control groups during the periods: at admission, 3 months, 6 months and 12 months after the installation of permanent dental implants and subsequent prosthetics.

The results of the study.

All patients (100%) of both main study groups admitted to the Department of orthopedic dentistry were clinically diagnosed with dystrophic periodontal changes, namely gingivitis (n=54), periodontitis of moderate severity (n=37), periodontitis of severe severity (n=23).

For the norm of mineral density indicators The bone tissue was taken from the data obtained during the study of orthopantomograms of patients in the control group who did not have clinically detected pathological changes in periodontal tissues.

The results of X-ray diagnostic examination of patients of both main groups upon admission with dystrophic changes in the periodontal of the lower jaw, clinically manifested in the form of gingivitis of moderate and severe severity and periodontitis of moderate and severe severity, with concomitant tumor-like formation, indicated the presence of changes in the mineral density of the bone tissue of the lower jaw.

Table 1. Indicators of bone mineral density around implants for the entire period of observation in various comparison groups.

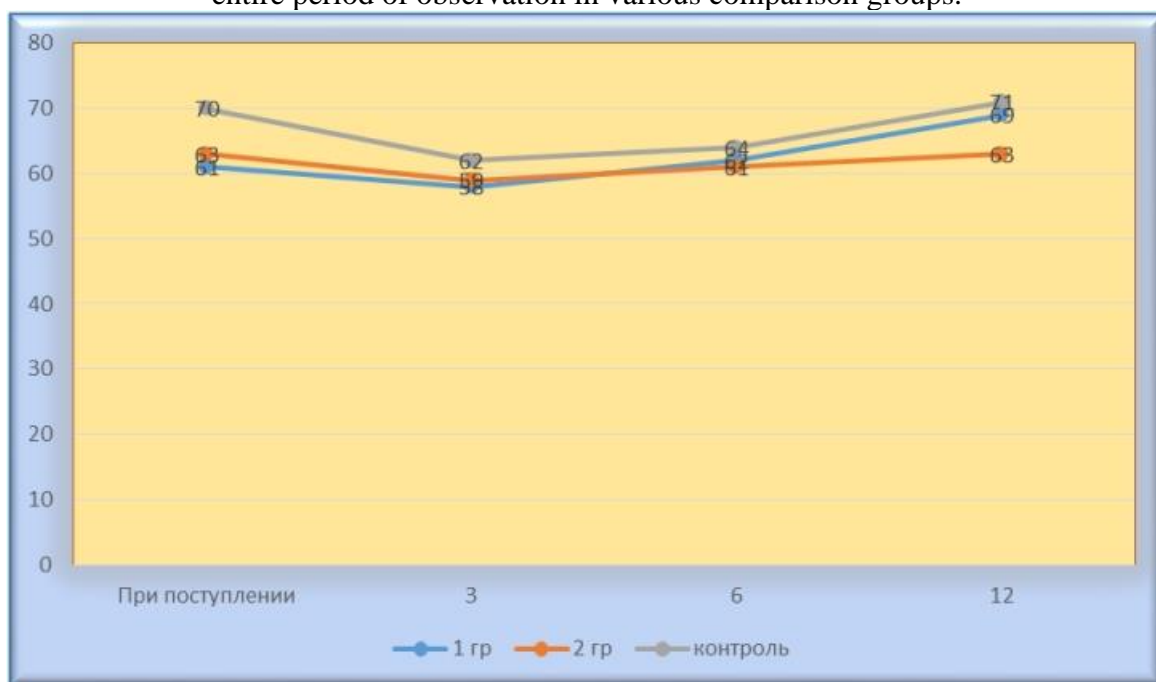
Time	I group	II group	The control group
Upon admission	61±0,03	63±0,06	70±0,07
3 month	58±0,04	59±0,02	62±0,09

6 month	62±0,02	61±0,04	64±0,06
12 month	69±0,01	63±0,01	71±0,01

When studying the control radiological data of patients of the I main group who underwent surgical treatment of a tumor formation (resection of the affected area of the lower jaw) with direct replacement of the formed defect with a nickel-titanium endoprosthesis and installation of temporary implants, we noted that a month after fixing the titanium plate, the bone structure of the lower jaw body area bordering the endoprosthesis, almost it remains unchanged in this group of patients. Also, the X-ray examination showed satisfactory results of restoring the continuity of the mandibular arch while preserving the natural anatomical structure of the lower third of the face. Dynamic restoration of the function of mouth opening and swallowing was observed. There was also a weakly pronounced periosteal reaction in the areas around all mini-implants.

The results of the examination in this group 3 months after reconstructive surgery showed that in 1 (3.3%) case there was a bed sore around the reconstructive plate, in the remaining cases (96.7%) cases there were good conditions for subsequent dental implantation.

Figure 1 shows the dynamics of changes in the mineral density of bone tissue around the implants over the entire period of observation in various comparison groups.



After 3 months after the installation of classical permanent implants, we observed the following indicators of densitometric examination of the bone density of the lower jaw. We noted a decrease in bone density in the area of the installed implants in all three observation groups. Thus, the percentage of decrease in bone density of NP in patients of group I was 5.2% compared with the background study at admission, in groups II and control, this percentage was 6.7% and 12.9%, respectively.

Six months after implantation of classical dental implants in patients of the II main group, small areas of osteoporosis and bone compaction in the area of fixation of the titanium plate to the body of the LF are radiologically traced, as well as emerging zones of osteoporosis around the implants, a periosteal reaction is detected. The bone density index in this group of patients has practically not changed compared to the previous study. In group I patients, there are small zones of osteoporosis at the junctions of the titanium endoprosthesis with the body of the lower jaw, but signs of its fusion with the sawdust of the jaw prevail. The structure of the bone tissue around the implants is osteoporotic in places, however, the mineral density of the bone tissue of the lower jaw in this area was restored to the values that were obtained during the background study of densitometry and amounted to 62 ± 0.02 , which is only 3.2% lower than the values obtained in the control group at these study dates (64 ± 0.06).

The following study of the bone density surrounding the implant and stability indicators were carried out during rehabilitation after prosthetics in all three comparison groups.

In patients of the I main group, it is radiologically visible that the anatomical integrity of the lower jaw was unchanged. The bone tissue was tightly attached to the implants throughout, not differing from the surrounding bone structures. On the periphery of the implants, the bone tissue had a normal structure, the zone of osteoporosis was absent. A year after implantation, a progressive increase in bone density around the implant is determined in the main group I and the control group - 69 ± 0.01 and 71 ± 0.01 , respectively, this is 19 and 14.3% higher compared to the study conducted 3 months after the operation of permanent dental implants. We did not observe a complete restoration of bone density around the implants, in patients of the II main group, the percentage in this group did not undergo significant changes compared to previous study periods and amounted to only 62 ± 0.01 .

Conclusion. In patients with delayed loading of dental implants and taking the drugs recommended by us with antiresorptive properties, an increase in bone density was observed in the area of installed dental implants according to densitometry. This may indirectly indicate the germination of the newly formed bone into the pores of the implant. Bone density indicators in patients with immediate dental implant loading tended to decrease over the entire follow-up period. The method of X-ray osteodensitometry can be used in the treatment of patients of this patient to assess the condition of the bone tissue around the implants.

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