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Prosthetic Treatment Tactics Taking into Account a Structural Remodelling of the Alveolar Bone

Strategie leczenia protetycznego uwzględniające przebudowę kości wyrostka zębodołowego

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Abstract

Background. The tooth loss and removable denture insertion causes an active local reconstruction of bone tissue in alveolar processes. The resorption process intensification leads to decrease in bone tissue density having an adverse impact on the statics of abutment teeth.
Objectives. The aim of our research was to study the character of local blood circulation disorders in the areas of removable dentures insertion, and to ensure the reliability and durability of prostheses in patients with bone tissue density disturbance.
Material and Methods. The study group consisted of 27 persons with osteopenia and 32 persons with osteoporosis. In the control group consisting of 30 persons, the prosthetic treatment was not conducted. The alveolar process fragments have served as a material for investigation of jaw bone tissue morphologic changes in patients who have had the removable dentures placed. The results of orthopedic treatment of patients with acquired dentition defects were evaluated by means of clinical, roentgenologic and laboratory diagnostics methods, as well as according to the degree of prosthesis functional efficiency.
Results. The given research studies of the metabolic changes of bone tissue in alveolar processes and the character of local blood circulation disorders in areas of denture insertion were estimated. To assure the reliability and long-term functioning of removable dentures in patients with bone tissue density disorder, the complex treatment had been offered consisting of dentition defect correction with Bugel dentures in combination with alfa-calcidol and nucleinate prescription.
Conclusions. The correction of dentition defects with Bugel prostheses in combination with alfa-calcinol and nucleinate preparations per orally as a medical treatment and preventive measures to patients with osteopenic and osteoporotic conditions in the bone tissue promoted the increase in orthopedic treatment efficiency, prolonged the durability of removable denture functioning and decreased a number of complications (**Dent. Med. Probl. 2010, 47, 4, 456–463**).

Key words: density of alveolar process, osteopenia, osteoporosis, Bugel denture.

Streszczenie

Wprowadzenie. Utrata zębów i użytkowanie ruchomych uzupełnień protetycznych wywołują aktywną przebudowę kości wyrostka zębodołowego. Nasilenie resorpcji prowadzi do zmniejszenia gęstości kości, co ma niekorzystny wpływ na statykę zębów oporowych.
Cel pracy. Określenie charakteru miejscowych zaburzeń krążenia w polu protetycznym oraz zapewnienia niezawodności i trwałości uzupełnień protetycznych u pacjentów z obniżoną gęstością tkanki kostnej.
Materiał i metody. Grupa badana składała się z 27 osób z osteopenią i 32 osób z osteoporozą. W grupie kontrolnej liczącej 30 osób nie prowadzono leczenia protetycznego. Fragmenty wyrostka zębodołowego szczęki służyły jako materiał do określenia morfologicznych zmian tkanki kostnej u pacjentów użytkujących ruchome uzupełnienia protetyczne. Wyniki leczenia ortodontycznego zostały określone za pośrednictwem metod klinicznych, radiologicznych i laboratoryjnych, jak również w zależności od czynnościowej skuteczności uzupełnień protetycznych.
Wyniki. Opisano zmiany tkanki kostnej wyrostka zębodołowego i miejscowe zaburzenia krążenia w polu protetycznym pacjentów z chorobami ogólnymi prowadzącymi do zmniejszenia gęstości kości. W celu zapewnienia niezawodności i trwałości ruchomych uzupełnień protetycznych u pacjentów przeprowadzono leczenie kompleksowe polegające na uzupełnieniu braków zębowych protezami nakładowymi i podaniu alfakalcidolu i nukleinianów.

Wnioski. Uzupełnienie braków zębowych protezami nakładowymi w połączeniu z ogólnym podawaniem alfakalcinolu i nukleinianów u pacjentów z osteopenią i osteoporozą zwiększa skuteczność leczenia rekonstrukcyjnego, wydłuża okres użytkowania uzupełnień ruchomych i zmniejsza liczbę powikłań w przyszłości (**Dent. Med. Probl. 2010, 47, 4, 456–463**).

Słowa kluczowe: gęstość wyrostka zębodołowego, osteopenia, osteoporoza, protezy nakładowe.

The development of new approaches in dentition defect replacement by means of removable and unremovable appliances during the last decades has acquired a special significance. When choosing a proper prosthec construction, dentists have started to take into account not only biomechanical parameters of teeth that perform supportive function but also the condition of bone tissue in alveolar processes, in particular the absence or presence of osteoporotic foci.

The principal issue in the problem of inadequate biomechanical stress after the orthopedic treatment is the disturbance of bone remodeling processes. The disbalance in bone remodeling processes with bone resorption prevalence leads to osteopenic disorders and, in consequence, osteoporosis development. The resorption process intensification induces the bone tissue density decrease having a negative impact on abutment teeth statics [1–4].

Tooth loss and removable denture insertion causes an active local bone tissue reconstruction in alveolar processes, which leads to dysfunctional and compressive mechanisms [5, 6].

Taking into account the above mentioned, it is possible to assume that in patients with osteopenic syndrome, the optimization of tooth dentition defect replacement by means of dentures may be achieved in case of therapeutic treatment prescription. The recent fundamental investigations have allowed determining an essential role of antiresorption and osteotropic preparations as well as immunomodulators that have an influence on the regulation of intercellular interaction of osteoblasts in the bone tissue remodeling management. It is known that disbalance in cytokine synthesis initiates not only strengthening of bone tissue resorption but also assists in decrease of bone regeneration processes [7–9].

The aim of our research is to study the character of local blood circulation disorders in the areas of removable dentures insertion, and to ensure the reliability and durability of prostheses in patients with bone tissue density disturbance.

Material and Methods

The alveolar process fragments have served as a material for investigation of jaw bone tissue morphologic changes in patients who have had the removable dentures placed. The histological sections undergoing Hart and Van Gieson's staining with fuchsilin-picrofuchsin have been made of bone fragments. These methods allow differentiating small vessels, to study the tinctorial properties of ossein fibers, peculiarities of acid glycosaminoglycan and neutral protein content, and to reveal gluing lines.

Depending on treatment peculiarities, the examined patients were divided into 3 groups, and compared according to initial bone tissue density as well as prosthesis insertion method.

27 persons (mean age of 50,3, range: 39–68 years) with osteopenia were included into the 1st group, and 32 persons (mean age of 55, range: 42–70 years) with osteoporous reconstruction of bone tissue constituted the 2nd group. The patients underwent a complex treatment with alfa-calcidol dosed 1 mcg a day per orally, the therapeutic course lasted 3 months, the prophylactic one – 2 months, and nucleinate dosed 0.25 g was taken per orally 4 times a day after meals. The therapeutic course lasted 3 months. In the 3rd group consisting of 30 persons (at the mean age of 48,6, range: 35–70 years), the therapeutic treatment was not conducted.

The results of orthopedic treatment of patients with acquired dentition defects were evaluated by means of clinical, roentgenologic and laboratory diagnostics methods, as well as according to the degree of prosthesis functional efficiency. The bone tissue density was taken into account at every observation stage. Data from the Department of Histology and Embriology as well Biochemistry of Lviv Medical University, where these patients were examined, were analyzed.

Comparison of quantitative variables between two groups was made with use of T-Student test. The differences were recognized to be statistically significant wit the importance level of $p \leq 0.05$.

The application to conduct the study was given a positive opinion by the Bioethical Committee of the Lviv Medical University.

Results

The carried out investigations of morphologic changes in the alveolar process of the mandible at place of removable denture insertion have showed

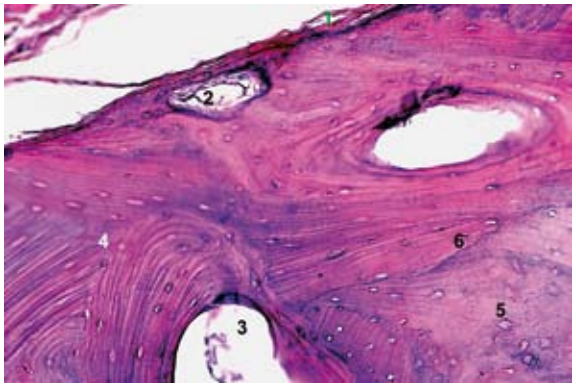

Fig. 1. The alveolar bone section at the place of removable denture insertion: 1) periosteum; 2) sinus with remnants of the connective tissue; 3) deformed lumen of osteon canal; 4) preserved bone tissue; 5) the beginning of smooth resorption; 6) gluing lines. Hematoxylin-eosin staining. Magnified 10 × 20

Ryc. 1. Kość wyrostka zębodołowego w polu protetycznym: 1) okostna; 2) zatoka z pozostałością tkanki łącznej; 3) zdeformowane światło kanału osteonu; 4) zachowana tkanka kostna; 5) rozpoczynająca się resorpcja gładka; 6) linie klejenia. Barwienie hematoksyliną i eozyną. Powiększenie 10 × 20

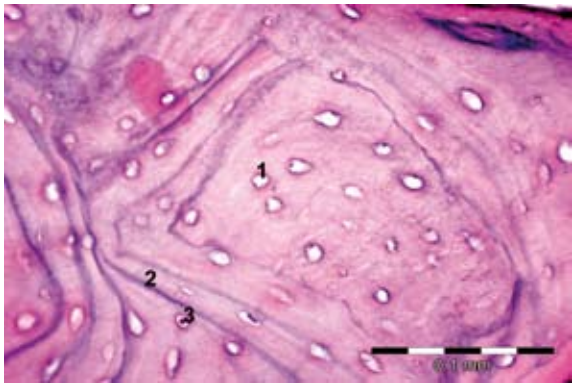

Fig. 2. The alveolar bone section at the place of removable denture insertion. Smooth resorption of bone tissue: 1) lacunes deprived of osteocytes; 2) gluing lines; 3) pyknoticly changed osteocyte nucleus. Hematoxyline-osin staining. Magnified 10 × 40

Ryc. 2. Kość wyrostka zębodołowego w polu protetycznym. Resorpcja gładka tkanki kostnej: 1) lakuny pozbawione osteocytów; 2) linie klejenia; 3) zmienione pyknotycznie jądro osteocytu. Barwienie hematoksyliną i eozyną. Powiększenie 10 × 40

Fig. 3. The alveolar bone section at the place of removable denture insertion. Changes of tinctorial properties of ossein fibers: 1) lumen of Haversian canals; 2) remnants of the connective tissue; 3) fuchsinophil ossein fibers; 4) destruction and loss of fuchsinophility by osein fibers of inserted plates. Fuchsilin-picrofuchsin staining. Magnified 10 × 10

Ryc. 3. Kość wyrostka zębodołowego w polu protetycznym. Zmiany barwienia włókien oseinowych: 1) światło kanału Haversa; 2) pozostałość tkanki łącznej; 3) fuksynofilne włókna kolagenowe; 4) zniszczenie i utrata fuksynofilności włókien oseinowych w polu protetycznym. Barwienie fuksyną zasadową i barwinkiem van Giesona. Powiększenie 10 × 10

that the marginal portion of the alveolar process built of fibrous bone tissue under the denture pressure is subjected to osteoclastic resolution, and consequently, the inserted intermediate plates are the first to become thinner and to be destructed.

In the compact bone tissue under removable denture pressure, the so-called vascular destruction takes place. The smooth resorption processes primarily develop in the inserted plates being less expressed in the haversian canal system. This process is characterized by widening of spaces around osteocytes, piknosis and lisys of their nuclei, appearance of gluing lines resembling concentrated rings, and growth of soft connective tissue along bony beams and vessel wall canals (Fig. 2). The fact that ossein fibers of bone plates, distant from vessels, are subjected to surface destruction accompanied by the changes in their tinctorial properties under tissue hypoxia comes into notice (Fig. 3).

In the spongy tissue of the alveolar process at the place of removable denture insertion, the expressed lacunar resolution is being developed. In consequence, the medium and large-sized elongated cavities, divided by thin trabeculae, where the red marrow is absent, appear. In a number of cases, the bone processes – endophytes – project into the sinus cavities. The concentrically stratified gluing lines are found around the sinuses. The osteocytes are situated in the elongated lacunae between inserted plates, and only in part of them nuclei are revealed (Fig. 4).

On the ground of clinical and roentgenologic investigations carried out in 1–3 years after prosthesis insertion, it has been determined that in 96.3% of the 1st group patients and in 93.7% of the 2nd group patients (Table 1) that had received Bugel dentures no functional changes were marked

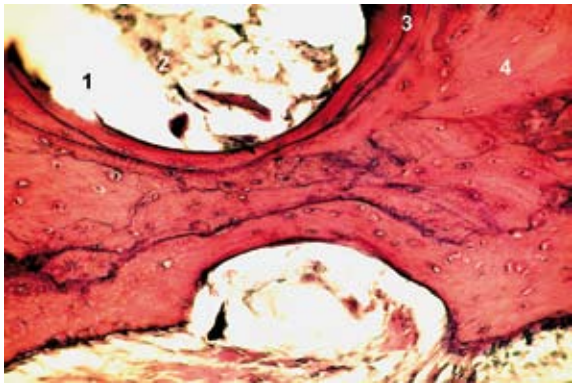

Fig. 4. The alveolar bone section at the place of removable denture insertion. Intrafocal resorption of compact bone tissue: 1) sinus cavity; 2) osteoclastic elements in the lacuna lumen; 3) gluing lines; 4) unchanged bone tissue. Hematoxylin-eosin staining. Magnified 10 × 40

Ryc. 4. Kość wyrostka zębodołowego w polu protetycznym. Resorpcja tkanki kostnej zbitej: 1) światło zatoki; 2) osteoklasty w świetle zatoki; 3) linie klejenia; 4) niezmieniona tkanka kostna. Barwienie hematoksyliną i eozyną. Powiększenie 10 × 40

in supportive tissues, the fact being confirmed by a stable statics of abutment teeth. Besides, the inflammatory processes and roentgenologic evidence of alveolar bone resorption (decrease in the interdental alveolar septum height) were absent.

In 3-year period after prosthesis insertion, 73.3% of Bugel dentures preserved their function in patients of the 3rd group. The most frequent reason of their functional value loss was loosening of abutment teeth (14.4% of cases) and to a less degree – worsening of supportive properties of attachments (7.7% of cases). In this group, patients experienced complications, and the rentgenologic changes were characterized by abutment teeth periodontal sulcus widening, decrease in interdental alveolar septum height, and the presence of osteoporotic process (Fig. 5).

The analysis of laboratory investigation dynamics have confirmed that a durable preservation of high functionality of dentures in the 1st and 2nd group of patients is connected with complete correction of altered calcium–phosphorus exchange indexes and bone remodeling processes. Thus, on the complex treatment background, at every stage of dispensary examination, the patients experienced the positive dynamics of calcium-phosphorus exchange indexes: calcium level rise and phosphorus content decrease in blood, decline in calcium excretion with urine (Table 2) and bone metabolism markers: a significant β-CTx decrease, increase in osteocalcin and basic alkaline phosphatase to normal indexes (Table 3).

A positive dynamics of cytokine level indexes have also been observed in this group of patients. In particular, in the 1st patient group in 2-year time after treatment the levels of anti-inflammatory cytokine levels were considerably lower as compared to their indexes received before treatment except for TNF-α whose level increased up to 88.2 ± 3.6 pg/ml as compared to 70.1 ± 2.6 pg/ml (Table 4). However, its level increase did not occur with high intensity, and the data, received after the 3-year observation (TNF-α level made 90.4 ± 4.2 pg/ml) testify to this fact. In the investigated group, the following results were revealed: a significant decrease of IL-1β level by 2.8 times ($p < 0.05$), IL-6 – nearly by 2 times ($p < 0.05$), IL-8 by 1.5 times ($p < 0.05$) and IL-4 de-

Table 1. Denture efficiency dependence on density changes in jaw bone tissue

Tabela 1. Trwałość uzupełnień protetycznych w zależności od zmian gęstości tkanki kostnej w szczęce

Groups of examined patients (Grupa badanych pacjentów)	Terms of investigation after denture insertion (Okres obserwacji po oddaniu protez)	Bone density according to T-criterion, SD (Gęstość kostna w zależności od kryterium T, SD)	Percent of Bugel dentures with preserved function (Odsetek protez nakładowych z zachowaną funkcją)
I group	in a year	–1.2 ± 0.1*	100.0
	in 2 years	–1.24 ± 0.1*	100.0
	in 3 years	–1.3 ± 0.12*	96.3
II group	in a year	–1.6 ± 0.1*	100.0
	in 2 years	–1.68 ± 0.2*	98.1
	in 3 years	–1.76 ± 0.1*	93.7
III group	in a year	–2.1 ± 0.2	91.6
	in 2 years	–2.6 ± 0.2	76.7
	in 3 years	–2.7 ± 0.3	73.3

* $p \leq 0,05$ – deviation probability in comparison with the control group.

* $p \leq 0,05$ – prawdopodobieństwo odchylenia w porównaniu z grupą kontrolną.

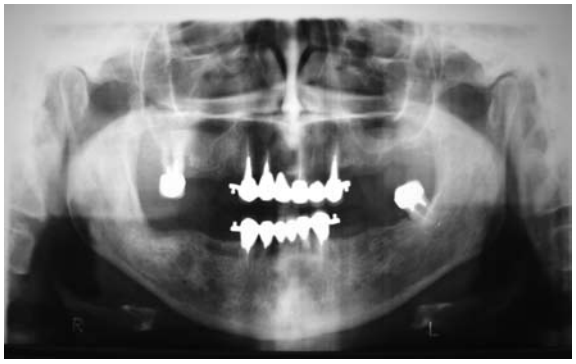

Fig. 5. The orthopantogram of patient S.H., 69 years

Ryc. 5. Zdjęcie pantomograficzne pacjenta S.H., 69 lat

creased by 3 times ($p < 0.05$). In 3-year time following the treatment, the cytokine level was not practically different from indexes obtained after the 2-year observation, and only the tendency for the increase in IL-4 and IL-6 was observed.

The cytokine level analysis in the 2nd group of patients with osteoporosis also showed a positive dynamics during the observation period (Table 4). The level of cytokines, which initiate bone tissue resorption, was lowered respectively: IL-1ß – 24.7 ± 5.6 pg/ml, TNF-α – 52.7 ± 6.8 pg/ml, IL-8 – 72.4 ± 2.6 pg/ml. At the same time, the authors have marked the increase in synthesis level of cytokines which potentiate ossification with IL-4 level making 79.6 ± 3.1 pg/ml as compared to data before the treatment – 36.6 ± 2.4 pg/ml.

The principal difference of orthopedic treatment, effectiveness in the 1st and 2nd group of patients in comparison with the 3rd one was obtained. In the 3rd group of patients, the negative dynamics concerning both calcium-phosphorus exchange indexes (Table 2) and bone metabolism markers (Table 3) as well as cytokine synthesis (Table 4) was determined in the process of dynamic investigations. 3 years later, in this patient group, the indexes of β-CTx, osteocalcin, basic alkaline phosphatase, and calcium excretion with urine worsened remarkably as compared to the initial ones, respectively: 1.17 ± 0.06 ng/ml, 27.7 ± 0.3 ng/ml, 118.9 ± 4.8 mU/l, 0.99 ± 0.01 mmol/l, and before denture application they made: 1.29 ± 0.3 ng/ml, 25.3 ± 0.2 ng/ml, 102.3 ± 3.2 mU/l and 1.12 ± 0.01 mmol/l. The level of cytokines in blood initiating bone tissue resorption increased correspondingly: IL-1β 31.4 ± 6.2 pg/ml, TNF-α – 72.8 ± 6.3 pg/ml, and after prosthesis insertion – 73.8 ± 5.1 pg/ml and 93.6 ± 3.4 pg/ml. The decrease in level of cytokine synthesis potentiating ossification was also marked: IL-4 – 56.8 ± 2.4 pg/ml, and after prosthesis insertion: 42.2 ± 4.1 pg/ml.

Discussion

A constant physiological reconstruction occurs in the bone tissue of alveolar processes. Under physiological stress, the bone tissue is resorbed by osteoclasts, and osteoblast activation leads to the substitutive formation of bone structural elements [3, 6, 10].

The structural reconstruction of the alveolar process under the removable denture action takes place owing to different mechanism combination, and thus, it is rather complex. Three main factors which determine its course may be distinguished.

Table 2. Dynamics of calcium-phosphorus exchange indexes in examined groups of patients

Tabela 2. Zmiany wskaźnika wapniowo-fosforanowego u badanych grup pacjentów

Groups of examined patients (Grupy badanych pacjentów)	Terms of observation (Okres obserwacji)		Indexes of calcium-phosphorus exchange (Zmiany wskaźnika wapniowo-fosforanowego)		
			Ca of blood (Ca we krwi) mmol/l	P of blood (P we krwi) mmol/l	Ca of urine (Ca w moczu) mmol/l
I group	before treatment		2.045 ± 0.02	0.89 ± 0.01	0.92 ± 0.02
	after treatment	in 2 years	2.221 ± 0.01*	0.32 ± 0.02*	0.24 ± 0.01*
		in 3 years	2.24 ± 0.01*	0.28 ± 0.02*	0.28 ± 0.02*
II group	before treatment		1.86 ± 0.02	1.19 ± 0.02	1.14 ± 0.04
	after treatment	in 2 years	2.27 ± 0.01*	0.33 ± 0.02*	0.26 ± 0.02*
		in 3 years	2.23 ± 0.01*	0.26 ± 0.01*	0.42 ± 0.04*
III group	before prosthesing		1.87 ± 0.03	1.18 ± 0.01	1.12 ± 0.01
	after prosthesing	in 2 years	1.89 ± 0.04	1.09 ± 0.02	0.94 ± 0.01
		in 3 years	2.01 ± 0.02	1.12 ± 0.02	0.99 ± 0.01

* $p \leq 0.05$ – deviation probability in comparison with indexes before treatment.

* $p \leq 0{,}05$ – prawdopodobieństwo odchylenia w porównaniu ze wskaźnikami sprzed leczenia.

Table 3. Dynamics of bone metabolism markers in examined groups of patients

Tabela 3. Zmiany markerów metabolizmu kostnego w badanych grupach pacjentów

Groups of examined patients (Grupy badanych pacjentów)	Terms of observation (Okres obserwacji)		Bone metabolism markers			
			Alkaline phosphatase (Fosfataza alkaliczna) mU/l	Osteocalcin (Osteokalcyna) ng/ml	ß-CTx ng/ml	Oxyproline (Oksyprolina) ng/ml
I group	before treatment		94.8 ± 2.6	28.3 ± 0.3	0.70 ± 0.04	1.0 ± 0.06
	after treatment	in 2 years	71.3 ± 2.2*	32.7 ± 0.6*	0.30 ± 0.02*	0.32 ± 0.02*
		in 3 years	68.1 ± 2.7*	32.1 ± 0.9*	0.32 ± 0.02*	0.44 ± 0.02*
II group	before treatment		113.6 ± 4.4	24.6 ± 0.2	1.36 ± 0.3	1.4 ± 0.06
	after treatment	in 2 years	64.7 ± 2.0*	35.8 ± 0.2*	0.22 ± 0.04*	0.41 ± 0.04*
		in 3 years	48.2 ± 3.1*	34.3 ± 0.3*	0.28 ± 0.07*	0.58 ± 0.04*
III group	before prosthesing		102.3 ± 3.2	25.3 ± 0.2	1.29 ± 0.3	1.36 ± 0.03
	after prosthesing	in 2 years	106.2 ± 3.9	28.4 ± 0.2	0.98 ± 0.06	1.31 ± 0.07
		in 3 years	118.9 ± 4.8	27.7 ± 0.3	1.17 ± 0.06	1.34 ± 0.07

* $p \leq 0.05$ – deviation probability in comparison with indexes before treatment.

* $p \leq 0{,}05$ – prawdopodobieństwo odchylenia w porównaniu ze wskaźnikami sprzed leczenia.

Table 4. Dynamics of cytokine blood levels in patients of examined groups

Tabela 4. Zmiany poziomu cytokin we krwi w badanych grupach pacjentów

Groups of patients (Grupy pacjentów)	Terms of observation (Czas obserwacji)			Cytokine content in blood (pg/ml) (Stężenie cytokin we krwi) (pg/ml)				
				IL-1β	IL-4	IL-6	IL-8	TNF-α
I group	before treatment			141.4 ± 5.7	158.2 ± 9.3	102.7 ± 4.2	93.5 ± 5.4	70.1 ± 2.6
	after treatment		in 2 years	49.6 ± 1.4*	48.3 ± 3.7*	52.9 ± 1.4*	60.9 ± 1.3*	88.2 ± 3.6*
			in 3 years	52.3 ± 1.6*	57.3 ± 4.9*	58.3 ± 1.2*	64.2 ± 1.4*	90.4 ± 4.2*
II group	before treatment			386.9 ± 5.5	36.6 ± 2.4	59.1 ± 4.1	244.2 ± 2.3	195.7 ± 12.4
	after treatment		in 2 years	28.3 ± 4.2*	68.7 ± 2.4*	51.4 ± 5.2*	66.7 ± 2.3*	82.8 ± 6.4*
			in 3 years	24.7 ± 5.6*	79.6 ± 3.1*	62.8 ± 4.2*	72.4 ± 2.6*	52.7 ± 6.8*
III group	after prosthesing		osteopenia	139.4 ± 8.6	164.1 ± 8.4	98.3 ± 4.2	101.2 ± 5.4	75.8 ± 3.4
			osteoporosis	371.8 ± 5.5	30.6 ± 3.4	61.2 ± 3.8	249.2 ± 8.6	186.7 ± 10.1
	after prosthesing	In 2years	osteopenia	142.2 ± 4.4	138.2 ± 10.4	90.5 ± 7.3	115.1 ± 6.3	90.4 ± 3.5
			osteoporosis	384.4 ± 9.7	24.4 ± 3.5	70.4 ± 8.1	250.4 ± 9.3	198.7 ± 10.4
		in 3 years	osteopenia	161.2 ± 7.3	104.4 ± 8.3	120.3 ± 8.4	134.5 ± 9.0	130.4 ± 4.6
			osteoporosis	395.5 ± 11.6	25.5 ± 6.1	76.3 ± 4.8	264.3 ± 8.4	235.6 ± 10.8

* $p \leq 0.05$ – deviation probability in comparison with indexes before treatment.

* $p \leq 0{,}05$ – prawdopodobieństwo odchylenia w porównaniu ze wskaźnikami sprzed leczenia.

Firstly, the age influence, as the removable dentures are most frequently applied in elderly people. The atrophic bone tissue conditions in this case are the elements of general age-related disturbance of metabolic exchange processes in the bone tissue.

Secondly, the tooth loss leads to the local dysfunctional atrophy of bone tissue in the alveolar process, and its main mechanism is based on the absence of physiologic stress on the bone tissue.

Thirdly, as the result of orthopedic treatment, a constant pressure of the removable denture on the mucous membrane and on jaw bone tissue is added to the 1st and 2nd mechanisms causing disturbance of local blood circulation in the area of prosthesis insertion [11–15].

According to V.V. Serov's and K.N. Shekhter's findings, the loss of fuchsinophility by osein fibers testifies to their surface destruction and change in their tinctorial properties occurring under tissue hypoxia, and the latter takes place in haversian canals of compact bone tissue under constant action of the removable denture.

The pressure of the removable denture on the bone tissue leads to blood circulation reduction in

veins. The local venous plethora, appearing consequently, causes the organic matrix swelling of both compact and spongy bone tissues [16].

The references state [17, 18] that the alfa-calcidol pharmacologic action is based on its anti-osteoporotic and protective properties associated not only with calcium ion balance normalization in the body but also with anabolic action due to remodeling process activation that leads to the bone tissue structural improvement. Alfa-calcidol hampers demineralization process of the bone tissue on account of the parathyroid hormone production suppression, and it promotes the bone structure demineralization increasing intestinal calcium absorption. It has been noted that alfa-calcidol slows down the loss of bone mass both in cortical and trabecular bone tissue.

The cytokine balance regulation forms the basis of nucleinate immunocorrecting mechanism. The immunomodeling action of the preparation consists in the increase of interferon and lysozyme synthesis as well as in the increase of the immune system cell activity [19].

The higher functional potentialities of long-term functioning of orthopedic dentures in patients are connected with alfa-calcidol correction of not only disturbed metabolic processes in the bone tissue but also (what is substantially important) with elimination of disbalance in cytokine regulation with nucleinate. Moreover, the 3-month treatment and 2-month annual prophylactic courses led to normalization of the indexes mentioned above immediately after treatment as well as assisted in stabilization of bone tissue remodeling processes for a long period of the observation [20, 21].

The authors conclude that the resorption processes in bone tissue of an alveolar process under removable denture action causes the local venous plethora leading to both compact and spongy bone organic matrix swelling.

The correction of dentition defects with Bugel prostheses in combination with alfa-calcinol and nucleinate preparations per orally as a medical treatment and preventive measures to patients with osteopenic and osteoporotic conditions in the bone tissue promotes the increase in orthopedic treatment efficiency, prolongs the durability of removable denture functioning and decreases a number of complications in future.

References

[1] Мєжвінска-Настальська Е., Спєховіч Е., Русіняк-Кубік К. [та ін.]: Стан жувального апарата в геріатричних пацієнтів з остеопорозом – вплив ортопедичного лікування на ефективність жування. Новини стоматології 2004, 2, 48–51.

[2] Міки Н.: The occlusion and masticatory function with relation to the bone mineral density in postmenopausal women. Proceedings of EPA Conference, Groningen 2000, 146–149.

[3] Поворознюк В.В.: Костная система и заболевания пародонта. К.: „Експрес" 2003, 446.

[4] Рожинская Л.Я.: Системный остеопороз (патогенез, клиника, лечение). М.: Крон-пресс 1996, 91.

[5] Misch C.E.: Density of bone: Effect of treatment plans, surgical approach, healing, and progressive bone loading. Int. J. Oral Implantol. 1990, 6, 23–31.

[6] Параскевич В.Л.: Дентальная имплантология: Основы теории и практики. Мн.: ООО „Юнипресс" 2002, 368.

[7] Mathur A., Michalowicz B.: Interleukin-1 alpha, interleukin-8 and interferon alpha levels in gingival cervicular fluid. J. Periodontol. Res. 1996, 31, 489–495.

[8] Roberts F.A., McCaffery K.A.: Profile of cytokine mRNA expression in chronic adult periodontitis. J. Dent. Res. 1997, 76, 1833–1839.

[9] Yamamoto M., Kawabata K., Fujihashi K.: Absence of exogenous interleukin-4 induced apoptosis of gingival macrophages may contribute to chronic inflammation in periodontal disease. Am. J. Pathol. 1996, 148, 46–49.

[10] Buckwalter J., Glimcher M., Cooper R., Recker R.: Bone biology. Part I. J. Bone Joint Surg. 1995, 77–A, 1256–1272.

[11] Жулев Е.Н.: Частичные съемные протезы (теория, клиника и лабораторная техника). Н. Новгород: Изд-во НГМА 2000, 428.

[12] Ступницький Р.М.: Морфометрична будова гаверсових каналів альвеолярного відростка нижньої щелепи залежно від віку. Український стоматологічний альманах 2006, 2, 19–21.

[13] Ступницький Р.М.: Морфологічна перебудова альвеолярного відростка нижньої щелепи після екстракції великих кутніх зубів. Acta Medica Leopoliensia 2006, 2, 8–11.

[14] Ступницький Р.М., Король Д.М., Гасюк П.А.: Алгоритм морфологічної перебудови (адаптації) кісткової тканини альвеолярного відростка після екстракції зубів та постійної дії ортопедичної конструкції. Український стоматологічний альманах 2006, 4, 47–49.

[15] Ступницький Р.М.: Морфологічна перебудова кісткової тканини альвеолярного відростка під знімним зубним протезом. Acta Medica Leopoliensia 2008, 1–2, 7–10.

[16] Терехова Г.М.: Профілактика та лікування остеопорозу: роль альфакальцидолу. Проблеми остеології 1998, 1, 69–70.

[17] Шварц Г.Я.: Витамин D, D-гормон и альфакальцидол: молекулярно-биологические и фармакологические аспекты действия. Остеопороз и остеопатии 1998, 3, 2–6.

[18] Драннік Г.М.: Клінічна імунологія та алергологія. К.: Здоров'я 2006, 675.
[19] Ступницький Р.М.: Вибір тактики лікування дефектів зубних рядів з різним станом кісткової тканини альвеолярних відростків. Современная стоматология 2008, 2, 166–169.
[20] Ступницький Р.М.: Комплексне ортопедичне лікування набутих дефектів зубних рядів. Acta Medica Leopoliensia 2007, 4, 12–16.

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