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An Objective Approach to Physical Therapy in Patients After Hip Arthroplasty

Obiektywizacja postępowania fizykalnego u chorych po endoprotezoplastyce stawu biodrowego

DOI: 10.36740/ABAL202103101

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SUMMARY

Aim: The main aim of the study was to assess the effects of hip arthroplasty and rehabilitation on pain, physical fitness and everyday functioning.

Materials and Methods: The study involved 25 HOA patients, including 19 women and 6 men, after hip arthroplasty. The patients were assessed before and after the procedure. The results were used to conduct descriptive, graphical and statistical analyses.

Results: Surgical treatment and rehabilitation improved joint mobility and had a positive influence and the subjective feeling of pain, resulting in pain reduction or elimination. The treatment also increased the patients' ability to ambulate.

Conclusions: 1. HOA is a common diagnostic and therapeutic problem that affects more women than men. 2. Since the study showed a high overweight and obesity rate, it is important to educate patients about the effects of physical activity on controlling one's body weight and inform them that overweight and obesity are risk factors for HOA. 3. The treatment used in study patients reduced or eliminated the pain, improved joint mobility and increased the patients' ability to ambulate, which had a positive effect on the quality of life.

Key words: hip osteoarthritis, arthroplasty, physical therapy and rehabilitation

Słowa kluczowe: choroba zwyrodnieniowa stawów biodrowych, endoprotezoplastyka, postępowanie fizykalno-usprawniające

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INTRODUCTION

It is estimated that in the developed countries, osteoarthritis (HOA) occurs in 1 in 7 people over the age of 25 years and in 1 in 3 people over the age of 65 years. There are 4 to 8 million OA patients in Poland, most of them over the age of 75 [1-7].

HOA causes functional deterioration, pain and limited joint mobility, which impair joint function and decrease overall physical fitness. Early HOA symptoms include pain in the inguinal area, on the lateral side of the hip or in the region of the greater trochanter of the femur. Sometimes, the pain radiates along the lateral surface of the thigh towards the knee joint [8-14].

Limited mobility, if neglected and untreated, can lead to fixed hip contractures, which considerably impair musculoskeletal function. As the degenerative changes progress and contractures develop, muscles become weaker, resulting in their functional failure.

The initial conservative treatment consists in the elimination of risk factors, including obesity and joint overload, for instance due to work, and also in the elimination of pain and maintaining the highest possible level of hip mobility and muscle strength in the affected limb.

The more advanced degenerative changes are treated surgically. Hip arthroplasty is the most common type of arthroplasty [4-7].

Arthroplasty is aimed at improving the quality of life by reducing pain and increasing joint mobility. An arthroplasty procedure allows the patient to start ambulating soon after surgery, which is particularly important in older patients.

The use of X-rays is the basic method of diagnostic imaging in osteoarthritis. Typical radiographic findings include joint space narrowing, subchondral bone sclerosis and osteophyte formation.

Evaluation of the Effectiveness of Laser Therapy in Complex Treatment of Periodontal Diseases

Ocena skuteczności laseroterapii w kompleksowym leczeniu chorób przyzębia

DOI: 10.36740/ABAL202103110

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SUMMARY

Aim: The object of the study is to increase the efficiency of treatment in patients with generalized periodontitis by using a laser in complex treatment.

Materials and Methods: Eighty patients underwent for instrumental and X-ray examination of the oral cavity, bacteriological studies of the microbiota of periodontal pockets, clinical analysis of peripheral blood that was taken from the ulnar vein and capillary blood that taken from the gums, as a local treatment carried lesion treatment portion of diode laser.

Results: It was determined that opportunistic microflora, dominating before treatment in the contents of periodontal pockets, was not isolated in all patients, but on the 10th day of treatment, the microflora of periodontal pockets had stabilized. Both in the main group and in the comparison group, among neutrophils and monocytes, the populations of phagocytes with a low digesting ability prevailed, however, the proportions of medium- and highly active phagocytes after laser treatment were higher than after treatment with standard conservative therapy.

Conclusions: The use of a laser for the therapeutic stage of the complex treatment of patients with generalized periodontitis of the I-II degree, chronic course contributes to the acceleration of reparative processes, a decrease in the degree of destruction in bone tissue, a decrease in the intensity of pain syndrome, a decrease in collateral edema, has an antibacterial effect and a longer stabilization of the periodontal condition.

Key words: generalized periodontitis, laser, periodontal indices, phagocytes, microflora, periodontal pockets, treatment

Słowa kluczowe: uogólnione zapalenie przyzębia, laser, wskaźniki chorób przyzębia, fagocyty, mikroflora, kieszonki przyzębne, leczenie

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INTRODUCTION

The relevance of studying the issues of diagnosis and treatment of inflammatory and destructive periodontal diseases is explained by the high prevalence of such pathology – more than 85% [1, 2]. Generalized periodontitis, today, is one of the main causes of tooth loss, including young patients [3]. In addition, with periodontitis, the focus of chronic infection located in the periodontal pockets contributes to the general sensitization of the body, which leads to unsatisfactory health and exacerbation of chronic diseases [4, 5]. The given data indicate that inflammatory-destructive periodontal diseases are not only a general medical problem, but also a socio-economic problem that dictates the search for new methods of treatment of this pathology [6].

The modern concept of treatment of generalized periodontitis provides a complex of therapeutic, orthopedic,

surgical and orthodontic measures, the effectiveness of which, as knowns, is not always ultimate. Local treatment usually much considerable and brings scientific interest, that allows to eliminate foci of inflammation, lead to long-term stabilization of the periodontal tissues and, if necessary, create favorable conditions for preoperative preparation [7].

It is known that generalized periodontitis is characterized by dysbiotic disorders, where there are immunosuppression and inflammatory reaction [8, 9]. Thus, an effective medicinal effect in periodontitis should be directed both to the microbiota of the oral cavity and to the correction of immunological changes and dysergic inflammation [10, 11].

AIM

The object of the study is to increase the efficiency of treatment in patients with generalized periodontitis by using a laser in complex treatment.

MATERIALS AND METHODS

An open and randomized study was conducted of 80 patients (women – 49, men – 31) aged 35-44 years (according to the WHO classification – young age) with a diagnosis of generalized periodontitis, I-II degree, chronic course, who applied to the Dental Medical Center of the National Medical University named after O.O. Bogomolets at the Department of Therapeutic Dentistry.

During the examination and instrumental research, the intensity of dental caries was determined using the DMFT index, the hygienic state of the oral cavity – OHI-S, the PMA gingivitis index, the degree of gingival bleeding – PBI, the degree of the inflammatory-destructive process – PI. Further, an X-ray examination was carried out.

All patients were divided into two groups: the main group (40 people) and the comparison group (40 people).

In order to assess local nonspecific resistance in patients, peripheral blood was taken from the ulnar vein and capillary blood from the gums.

Bacteriological studies of the microbiota of periodontal pockets: to obtain isolated colonies of microorganisms, subculture from thioglycolic medium to solid nutrient media was carried out by using the method of sector inoculations according to Gould. Facultative anaerobic microorganisms were cultivated on nutrient media: 5% blood agar, yolk-salt agar, Endo medium. To isolate the fungi was used a Sabouraud's medium surrounding. Isolation and cultivation of anaerobic and microaerophilic bacteria was carried out on 5% blood agar using a GasPak EZ gas generating container system (GasPak 100, Becton Dickinson, USA).

Considering the complexity of isolation and identification of anaerobic microorganisms, as the main etiological agents of the development of chronic generalized periodontitis, were used the methods of “express diagnostics”. The contents of the periodontal pockets were used to prepare preparations in Gram stain and native preparations “crushed drop” (dark-field microscopy). The isolated microorganisms were indicated by morphological, tinctorial, and cultural conditions, taking into account pathogenicity factors.

Investigation of the number and functional activity of neutrophils and monocytes in blood taken from the gums – is clinical analysis of peripheral blood taken from the ulnar vein and capillary blood that taken from the gums, as well as determination of the digesting ability and absorption activity of neutrophils and monocytes in the blood of the gums. Blood from the gums, in an amount of 0.5 ml, was taken with a syringe with a blunt cannula after professional hygiene, treatment of the oral cavity with distilled water, drying with sterile gauze napkins and isolation from saliva. Blood sampling was carried out in tubes with heparin. To formulate the reaction of spontaneous and stimulated HCT – tests, as well as phagocytosis with latex, only 0.06 ml of blood was used, the rest was transported to the clinical diagnostic laboratory within an hour.

After the examination, all patients received an individual plan of complex treatment in accordance with the protocol for the management of patients with periodontal diseases.

Local treatment consisted of professional oral hygiene, correction of overhanging edges of fillings, contact points, replacement of restoration, and filling of carious cavities. All patients with orthopedic structures in the oral cavity were referred to a dentist orthopedist to assess the consistency of the structures.

According to indications was recommended the following treatments: orthopedic, surgical, orthodontic treatments. The initial stage of local treatment is professional oral hygiene, which includes, first of all, motivation and training in individual oral hygiene with a demonstration of the technique of brushing teeth, and also the use of interdental agents on models with subsequent control. Much attention has been focused on creation trusting relationship with patient. To remove supra- and subgingival dental deposits, were used a Piezon Master 600™ ultrasound apparatus (EMS, Switzerland), curettes Gracie (Hu – Friedy, USA) performed closed curettage of periodontal pockets with an antiseptic – 0.2% aqueous solution of chlorhexidine bigluconate. Further, were removed the overhanging edges of the fillings, the surfaces of the teeth were polished. Personal hygiene products were recommended. Patients of the main group, as a local treatment had treatment of the affected area with a diode laser 0.400 mm/980 nm for 60 sec at 0.7 W with a continuous wave.

Obtained data were analyzed by using Statistical Package for Social Sciences software for Windows, version 18.0 (SPSS Inc., Chicago, USA). The test for the normality of the distribution of the selected groups was carried out with the definition of the Kolmogorov- Smirnov criterion. Descriptive statistics included the calculation of the arithmetic mean (M), standard deviation (SD), standard error (m), minimum, maximum, mode, median. The indicator of the significance of differences between the compared data was determined using the Student's t-test. The results of the statistical analysis were considered significant if the error probability was not more than 5% ($p < 0.05$).

RESULTS

A analysis results of clinical indicators showed that both groups had reduction or absence of bleeding gums when brushing teeth, hyperemia, pain and discomfort in the gums, as well as the disappearance of bad breath on the 3rd - 4th day from the start of treatment. The values of the simplified hygiene index OHI-S in patients of the main group and the comparison group in the control periods of observation after the treatment had a tendency to positive dynamics, which is manifested in a decrease in the index values after 10 days (Table 1).

Parameters of the PMA index in all patients in the control periods of observation after the treatment also significantly decreased in comparison with the initial data before treatment by two times (Table 2). In the main group, at the control periods of observation, the results did not statistically differ from the comparison group (after treatment, $p = 0.159$; after 10 days, $p = 0.127$).

10 days after treatment, there was a significant decrease in the values of the Russell's Periodontal Index in patients of

Table 1. Dynamics of the OHI-S hygiene index ($M \pm SD$) in patients with generalized periodontitis, grade I-II, chronic course in the control periods of observation before and after treatment

Study groups	Before treatment	After treatment	P_1^*	After 10 days	P_2^*
Main group	2,5±0,05	0,91±0,03	<0,001	0,92±0,04	<0,001
Comparison group	2,44±0,05	0,92±0,04	<0,001	0,93±0,05	<0,001

Note: * - the significance of differences corresponding to the two-tailed Student's test for dependent paired samples with a critical value of 0.05: p_1 - between indicators before and after treatment and, p_2 - between indicators before treatment and after 10 days.

Table 2. Dynamics of the PMA index ($M \pm SD$) in patients of the main group and the comparison group at different periods of observation

Study groups	Before treatment	After treatment	P_1^*	After 10 days	P_2^*
Main group	51,62±0,64	24,82±0,47	<0,001	24,7±0,48	<0,001
Comparison group	50,57±0,88	25,77±0,47	<0,001	25,8±0,52	<0,001

Note: * - the significance of differences corresponding to the two-tailed Student's test for dependent paired samples with a critical value of 0.05: p_1 - between indicators before treatment and after 10 days, p_2 - between indicators before treatment and after 3 months.

Table 3. Dynamics of the Russell's periodontal index ($M \pm SD$) in patients of the main group and the comparison group at different periods of observation

Study groups	Before treatment	After treatment	P_1^*	After 10 days	P_2^*
Main group	3,79±0,08	1,48±0,05	<0,001	1,49±0,04	<0,001
Comparison group	3,82±0,08	1,56±0,05	<0,001	1,59±0,05	<0,001

Note: * - the significance of differences corresponding to the two-tailed Student's test for dependent paired samples with a critical value of 0.05: p_1 - between indicators before and after treatment, p_2 - between indicators before treatment and after 10 days.

Table 4. Dynamics of the PBI index ($M \pm SD$) in patients of the main group and the comparison group at different periods of observation

Study groups	Before treatment	After treatment	P_1^*	After 10 days	P_2^*
Main group	1,95±0,06	0,98±0,08	<0,001	1,0±0,08	<0,001
Comparison group	1,99±0,07	1,04±0,08	<0,001	1,07±0,08	<0,001

Note: * - the significance of differences corresponding to the two-tailed Student's test for dependent paired samples with a critical value of 0.05: p_1 - between indicators before and after treatment, p_2 - between indicators before treatment and after 10 days.

Table 5. Dynamics of isolation of microorganisms from the contents of periodontal pockets of patients with generalized periodontitis, I-II degree, chronic course using laser therapy (abs /%).

Genus of microorganisms	Before treatment		5th day of treatment		7th day of treatment		10 day of treatment	
	abs	%	abs	%	abs	%	abs	%
1. <i>Streptococcus spp. β hemolysis and without hemolysis</i>	10	100	10	100	10	100	10	100
2. <i>Lactobacillus spp</i>	3	30	3	30	3	30	3	30
3. <i>Propionibacterium spp.</i>	--	--	1	10	2	20	2	20
4. <i>Peptostreptococcus spp.</i>	4	40	1	10	1	10	-	-
5. <i>Enterococcus spp.</i>	3	30	2	20	1	10	-	-
6. Gram-negative bacteria	3	30	2	20	1	10	-	-
7. <i>Micrococcus spp.</i>	2	20	1	10	1	10	-	-
8. <i>Actinomyces spp.</i>	3	30	1	10	-	-	-	-
9. <i>Neisseria spp.</i>	2	20	1	10	-	-	-	-
10. <i>Leptotrichia spp.</i>	2	20	1	10	-	-	-	-
11. <i>Corynebacterium spp.</i>	1	10	1	10	-	-	-	-
12. <i>Staphylococcus spp.</i>	1	10	1	10	-	-	-	-
13. <i>Spirillum spp.</i>	1	10	-	-	-	-	-	-

Table 6. Absorption activity of phagocytes in blood taken from the gums in patients with generalized periodontitis, I-II degree, chronic course before and after treatment

	Before treatment		After treatment			
	Neutrophils	Monocytes	Neutrophils		Monocytes	
			Main group	Comparison group	Main group	Comparison group
The number of phagocytic cells, $\cdot 10^9/l$	7,37 \pm 2,35	0,57 \pm 0,25	0,24 \pm 0,06*	0,26 \pm 0,06*	0,054 \pm 0,027*	0,058 \pm 0,029*
Number of latex particles per active cell	3,3 \pm 0,2	4,4 \pm 0,1	2,63 \pm 0,07*	2,19 \pm 0,05*	3,19 \pm 0,13*	3,00 \pm 0,11*

Note: * Indicators are marked that significantly differ from those before treatment.

Table 7. Digestion capacity of phagocytes in blood taken from the gums in patients with generalized periodontitis, I-II degree, chronic course before and after treatment

	Before treatment		After treatment			
	Neutrophils	Monocytes	Neutrophils		Monocytes	
			Main group	Comparison group	Main group	Comparison group
Number of HCT positive cells, $\cdot 10^9/l$	6,45 \pm 2,06	0,50 \pm 0,22	0,012 \pm 0,003*	0,11 \pm 0,03*	0,012 \pm 0,06*	0,038 \pm 0,019*
Number of formazan granules per active cell	3,33 \pm 0,65	3,67 \pm 0,65	2,13 \pm 0,84	2,2 \pm 0,13*	1,75 \pm 0,85*	2,79 \pm 0,16*
The number of HCT positive cells with a stimulated test, $\cdot 10^9/l$	6,76 \pm 2,15	0,51 \pm 0,23	0,037 \pm 0,00855*	0,13 \pm 0,03*	0,028 \pm 0,014*	0,044 \pm 0,022*
The number of formazan granules per active cell in a stimulated HCT test	3,66 \pm 0,17	4,54 \pm 0,20	2,6 \pm 0,28*	2,75 \pm 0,06*	2,27 \pm 0,20*	3,35 \pm 0,27*

Note: * Indicators are marked that significantly differ from those before treatment.

both groups by almost 2.5 times in comparison with the data before treatment (Table 3). In the main group, at the control periods of observation, the results did not statistically differ from the comparison group (after 10 days, $p = 0.285$).

The values of the PBI index in patients with generalized periodontitis, I-II degree, chronic course significantly decreased from the initial data obtained before treatment (Table 4). In the main group, at the control periods of observation, the results did not statistically differ from the comparison group (after treatment, $p = 0.613$; after 10 days, $p = 0.538$).

A decrease in pathological tooth mobility after treatment was clinically determined in both groups, as evidenced by the prevalence of the 1st degree of tooth mobility, while before the treatment, the 2nd degree prevailed.

The analysis of the obtained results of the index assessment in patients with generalized periodontitis, I-II degree, chronic course after treatment in the control periods of observation demonstrates a statistically significant decrease in all indices compared to the initial values before treatment.

Normalization of the physiological state of the biotope of periodontal pockets during treatment and 10 days after treatment with laser therapy in patients with generalized periodontitis manifested itself in the absence, and in some cases, and / or in a sharp decrease in microorganisms isolated before the start of treatment (Table 5).

Starting from the 5th day of laser application, it was revealed that opportunistic microbiota, which predominates in the contents of periodontal pockets before treatment, continued to be secreted not in all patients. On the 10th day of treatment, the microbiota of periodontal pockets stabilized, which was characterized by the dominance in the crops of monocultures represented by bacteria of the genus *Streptococcus* β hemolytic and non-hemolytic (100%) or binomial associations of bacteria of the genus *Lactobacillus* (30%) and *Propionibacterium* (20%) with *Streptococcus*.

After the treatment, compared with the initial level, the absorption activity of neutrophils and monocytes significantly decreased, as evidenced by a decrease in the number of phagocytic cells and a decrease in the phagocytic number (Table 6). At the same time, the number of phagocytic neutrophils and monocytes, as well as latex particles per active cell after treatment, did not statistically differ between the groups.

The digestive activity of neutrophils and monocytes, compared with the baseline values, significantly decreases in both groups after the treatment, as evidenced by the decrease in the number of formazan granules per active cell when a spontaneous and stimulated HCT test is performed. In both groups, the parameters of the HCT-test significantly increased, which indicated an increase in the reserve capacity of the cells (Table 7).

After the treatment, both in the main group and in the comparison group, among neutrophils and monocytes, populations of phagocytes with a low digesting ability prevailed, however, the proportions of medium and highly active phagocytes after laser treatment were higher than after treatment with standard conservative therapy.

DISCUSSION

In recent years, a large number of new technologies have been developed and introduced into practice, contributing to an increase in the effectiveness of treatment of periodontal tissue diseases, in particular, laser technologies [12-14]. It is well known that laser light has a wide range of therapeutic and prophylactic effects. In particular, it has a pronounced anti-inflammatory effect, normalizes microcirculation, lowers the permeability of vascular walls, stimulates tissue regeneration and increases the oxygen content in them, has an analgesic, bactericidal effect, stimulates the immune defense system, accelerates wound healing [15-18].

It was found that in patients with various pathologies of the soft tissues of the oral cavity after a using a diode laser with a wavelength of 970 nm, observed a clear reduction or absence of bleeding of the gums during brushing teeth, hyperemia, pain and discomfort in the gums, as well as the disappearance of bad breath - PMA index indicators have significantly decreased by half (24.7 ± 0.48).

The use of a laser promotes the stimulation of healing processes to a greater extent in comparison with the conventional method, reduces the intensity of postoperative pain and edema formation expressed collateral [19-21]. The use of laser contributes to the stabilization process in parodontite - decreases the mobility of the teeth, the degree of destruction of the alveolar bone, the severity of gingival recession, eliminates bleeding and swelling of the gums normal hemodynamics [22, 23].

E.R. Kusek et al (2012) published a study showing that a diode laser stimulates the immune defense system, reduces the pathogenicity of microflora, increases its sensitivity to antibiotics, and positively regulates the functions of cement plaque in vitro [12].

It is known that during inflammation, laser radiation causes general and local effects. The general effect is expressed in an increase in the content of nonspecific humoral defense factors (such as complement, interferon, lysozyme), general leukocyte reaction, an increase in the phagocytic activity of micro- and macrophage systems. Arises a desensitizing effect that activating immunocompetent system, specific cellular and humoral immune defense, that increasing overall protective adaptive reactions [7, 8, 11]. We found that the digestive activity of neutrophils and monocytes, compared with the baseline values, significantly decreases in both groups after the treatment, as evidenced by a decrease in the number of formazan granules per active cell when a spontaneous and stimulated HCT test is performed. In both groups, the indicators of the HCT test significantly increased.

CONCLUSIONS

1. The use of a laser for the therapeutic stage of complex treatment contributes to the acceleration of reparative

processes, a decrease in the intensity of pain syndrome, a decrease in collateral edema and long-term stabilization of the periodontal state in patients with generalized periodontitis of the I-II degree, chronic course.

2. The use of a laser leads to the elimination of bleeding, a decrease in the degree of tooth mobility, a decrease in recession, it helps to reduce the depth of periodontal pockets and improve oral hygiene to a greater extent than the traditional method.
3. The use of a laser helps to reduce the degree of destruction in bone tissue and leads to long-term stability of the process.
4. The use of a laser has also an antibacterial effect on representatives of periodontal pathogenic microflora, although it does not completely eliminate them.

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Conflict of interest:

The Authors declare no conflict of interest

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Informacja prasowa

**KREM SKUTECZNIE POPRAWIAJĄCY OWAL TWARZY I ZMNIEJSZAJĄCY OBSZAR
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