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## NEW METHODS OF DENTAL HYPERESTHESIA TREATMENT

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The article presents the results of eliminating dental hyperesthesia by new effective methods of treatment developed and implemented in practical dentistry. Patients were divided into four groups: with hyperesthesia after professional or home teeth whitening; with hyperesthesia during the preparation of vital tissues for orthopedic structures; with hyperesthesia in pathological abrasion of the enamel and periodontitis. Analysis of the results and their comparison with previous studies showed that the use of drugs based on the eco-mineral complex bischofite is highly effective and ranges from 100 to 66.7 % depending on the observation group.

**Key words:** whitening, tooth preparation, pathological abrasion, periodontitis.

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## НОВІ СПОСОБИ ЛІКУВАННЯ ГІПЕРЕСТЕЗІЇ ЗУБІВ

В статті надані результати усунення гіперестезії зубів за розробленими та впровадженими в практичну стоматологію новими ефективними способами лікування. Пацієнти були розподілені на чотири групи: з гіперестезією після професійного або домашнього вибілювання зубів; з гіперестезією під час препарування вітальних тканин під ортопедичні конструкції; з гіперестезією при патологічному стиранні емалі та пародонтозі. Аналіз отриманих результатів та їх порівняння з раніше проведеними дослідженнями показав, що застосування препаратів на основі екомінерального комплексу бішофіт має високу ефективність, і коливається від 100 до 66,7 % в залежності від групи спостереження.

**Ключові слова:** вибілювання, препарування зубів, патологічна стертість, пародонтоз.

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Tooth hyperesthesia is characterized by transient acute pain in response to thermal, chemical, and mechanical stimuli associated with increased enamel permeability or dentin exposure.

According to the literature, the incidence of dental hyperesthesia ranges from 1.34 to 98 % depending on the nosology [2, 8, 11, 12].

It most often occurs in patients after professional or home teeth whitening, during the preparation of vital tissues for orthopedic structures, in pathological abrasion of enamel and dystrophic diseases with manifestations in the oral cavity, characterized by exposure of the neck, dentin and root cement defects [1-4, 7].

The influence of hypersensitivity of teeth on the physical, psychological and social spheres of human life has been scientifically proven [6, 9]. Patients in this category have to avoid certain foods and beverages, and sometimes this may be due to a certain diet, medication, etc.

Traditionally, calcium supplements in the form of electrophoresis or long-term application of remineralizing therapy and fluorides are used to treat tooth sensitivity, which give high efficiency, however, the film or crystals formed on the surface are removed over time by mechanical abrasion. In addition, the problem of using most drugs to eliminate hyperesthesia is their acid solubility, and therefore the effectiveness of use is temporary [11, 13, 14].

At present, in order to eliminate hyperesthesia, desensitizers, preparations based on potassium, iron and strontium are used, with the mechanism of sealing the hard tissues of the teeth due to the formation of submicroscopic salt crystals in them. This technique is quite effective, but is based on the use of chemical compounds, not natural substances [6, 11, 15].

When dental hyperesthesia is detected, the first stage in the treatment of patients is etiotropic therapy, which is aimed at secondary prevention of hypersensitivity, and certain diseases (periodontitis, generalized pathological abrasion) with existing dental hyperesthesia require a comprehensive approach to treatment with normalization of mineral metabolism.

The need to introduce new approaches to the problem of eliminating hyperesthesia allows us to consider as an alternative the use of a new mineral complex – bischofite, which is an eco-mineral with a significant content of salts and trace elements. The main remineralizing role belongs to mineral salts - magnesium chloride (100 g/l), bromide (3.5 g/l) and sodium chloride, sulfate and potassium chloride (9 g/l), which fill the intercrystalline spaces in the hard tissues of the teeth. It also contains more than twenty

macro-and micronutrients, such as iron, copper, iodine, phosphorus, boron, bismuth, molybdenum, aluminum, silicon, nickel, cadmium, lithium, sulfur, vanadium, titanium, rubidium, etc.. The composition of the above complex allows it to be used in disorders of mineral metabolism in the human body [5].

**The purpose** of the study was to develop and implement in practical dentistry new, effective ways to treat dental hyperesthesia in various clinical manifestations.

**Materials and methods.** 4 groups of patients were selected for the clinical study.

Group I – 9 patients, aged 23–46 years, with hyperesthesia of I-II degree, which occurred after the procedure of office teeth whitening.

Group II – 18 patients, aged 36–68 years, with hyperesthesia of I and II degrees after preparation of vital teeth for fixed orthopedic structures.

Group III – 8 patients, aged 40–47 years, with hard tissue hyperesthesia of II-III degree with pathological abrasion of teeth.

Group IV – 12 patients, aged 45–57 years, with periodontitis of I and II degrees and hyperesthesia of II and III degrees.

As a comparison group, we used data obtained from previous studies using this mineral complex [5].

Comprehensive dental examination of patients included: traditional clinical examination (survey, examination), determination of the level of oral hygiene according to the Green-Vermillion index, the condition of periodontal tissues according to the Schiller-Pisarev test and the intensity index of dental hyperesthesia (IIDH). Patients signed an informed voluntary consent for dental manipulations.

Patients of group I used our proposed method of treatment (Patent of Ukraine for utility model No. 139126), namely: after the whitening procedure, in the presence of dental hyperesthesia, made an individual cap of transparent silicone, it made a 10 % solution of “Bischofite Poltava” (TM Bischofite Poltavsky, Bisheffect, Ukraine), placed it on the teeth and performed applications for 30 minutes, daily, a course of 10 procedures.

Patients of group II, who developed hyperesthesia after preparation of vital teeth for fixed orthopedic structures, developed and controlled the algorithm of individual hygiene and prescribed electrophoresis of prepared vital teeth or application of 10% solution “Bischofite Poltava”, daily, a course of 7-10 procedures for Ukraine utility model №143046). Individual hygiene included: brushing teeth with organic therapeutic toothpaste Bisheffect (TM “Bischofite Poltava”, Bisheffect, Ukraine) on the basis of bischofite, 2 times a day and the use of organic therapeutic mouthwash Bisheffect on the basis of bischofite, 2-3 times a day for 1-2 minutes [1].

Patients of group III with the presence of hyperesthesia in pathological abrasion of teeth were treated as follows (Patent of Ukraine for utility model No. 143146): after professional oral hygiene, an algorithm of individual hygiene was compiled. For general therapy, patients were prescribed “Bischofite Poltava”, orally, 2-5 ml in 200 ml of water, take 3 times a day for 200 ml for 30 minutes. before meals; as a means of local exposure to the hard tissues of the teeth in pathological abrasion used “Bischofite Poltava”, 10 % solution, in the form of electrophoresis or applications, daily, a course of 10-15 procedures. The algorithm of individual hygiene included: brushing teeth with organic therapeutic toothpaste Bisheffect on the basis of bischofite, 2 times a day, a toothbrush of soft hardness and application of organic therapeutic mouthwash Bisheffect on the basis of bischofite, 2–3 times a day for 1–2 minutes.

Group IV patients underwent comprehensive treatment (Patent of Ukraine for utility model No. 143043), which included: performance of professional oral hygiene with subsequent compilation and control of the algorithm of individual hygiene; sealing of wedge-shaped defects; electrophoresis of gums with 10 % solution “Bischofite Poltava”, daily, a course of 10-15 procedures. Individual hygiene includes: brushing teeth with organic therapeutic toothpaste Bisheffekt, based on bischofite, 2 times a day and the use of organic therapeutic mouthwash Bisheffect, based on bischofite, 2-3 times a day for 1-2 minutes. In the general treatment for the purpose of normalization of microcirculatory disturbances in vessels of periodontal tissues the nootropic drug of systemic action “Bilobil” (KRKA, d.d., Slovenia) – internally on 1 capsule 3 times a day, a course of 30 days was appointed.

Treatment of patients in the experimental groups was considered effective in achieving positive results in the clinical picture of the disease and methods of examination.

The results of the study were subjected to statistical processing, according to generally accepted methods of variation statistics, using the appropriate software Microsoft Office Excel and extension REUL Statistics 2019. To check the distribution for normality, the calculation of the Shapiro-Wilk test was used. To assess the statistical significance of the differences used a nonparametric criterion, namely: Mann-

Whitney U-test. The difference was considered statistically significant when the reliability of the random data difference did not exceed 0.05 ( $p < 0.05$ ).

**Results of the study and their discussion.** As a result of the study, it was found that the study groups included patients with comparable baseline data.

In group 1 of the study, good oral hygiene (0 to 0.6) before treatment with the OHI-S hygiene index was found in 8 patients, in the second and third groups of 9 and 6 patients, respectively, and in 10 people in the fourth group. In 1 patient of the first group, 9 people in the second group and 2 patients in the third and fourth groups, a satisfactory hygienic level prevailed (0.7–1.6). Patients with poor oral hygiene were not included in the study groups.

The average value of the OHI-S index in all groups was  $1.1 \pm 0.12$  and did not differ significantly. After treatment in all experimental groups, this figure decreased by almost 90%, which can be explained by good oral hygiene in the absence of pain inherent in hyperesthesia.

The values of the Schiller-Pisarev test in the first, third and fourth groups of the study before and after treatment corresponded to the indicator "negative", which corresponded to the absence of gingivitis. In patients of the second group who underwent tooth preparation for crowns, the Schiller-Pisarev test was "positive", and the color ranged from light brown to brown, indicating a mild degree of inflammatory lesions, possibly associated with trauma during dental manipulation. After the treatment, this indicator returned to normal and corresponded to the healthy condition of the gums.

The intensity index of dental hyperesthesia in all patients of the first group before whitening corresponded to 0 points. Assessment of the degree of hyperesthesia of the hard tissues of the teeth was performed before and after the application of the proposed treatments at different times (10 days and 1 month), which allowed to characterize the intensity of tooth sensitivity before the procedure and analyze the effectiveness of the recommended remineralization.

At values of IIDH from 1,0 to 1,5 points were diagnosed with hyperesthesia of the 1st degree; from 1.6 to 2.2 points – 2nd degree; at values from 2.3 to 3 points – hyperesthesia of the 3rd degree. Water heated to 600 C and cold water from an empty dental unit were used as thermal stimuli, 40 % glucose solution and citric acid were chemical, and a dental probe was used mechanically.

Hyperesthesia after bleaching was diagnosed in 7 patients of the first group, which amounted to 77.8 %. Grade 1 hyperesthesia was found in 5 (71.4 %) patients, grade 2 – in 2 people (28.6 %).

In patients of the second group, who underwent preparation of vital teeth for crowns, hyperesthesia was diagnosed in 18 people, which was 100 %. Twelve patients (66.7 %) had grade 1 hyperesthesia and six (33.3 %) had grade II hyperesthesia.

With pathological abrasion of the teeth, the third group of the study, second-degree hyperesthesia was diagnosed in 2 patients (25 %) and the third in six people (75 %).

In patients of the fourth group, diagnosed with periodontitis of I, II degree, hyperesthesia was diagnosed in 12 people, which was 100 %. According to the degree of severity, the group was divided equally, six people showed hyperesthesia of the 2nd and third degree of severity (50 %).

All patients with hyperesthesia, respectively, for each group were prescribed treatment according to our proposed methods of treatment, for a certain time and algorithm, as well as diet and personal hygiene.

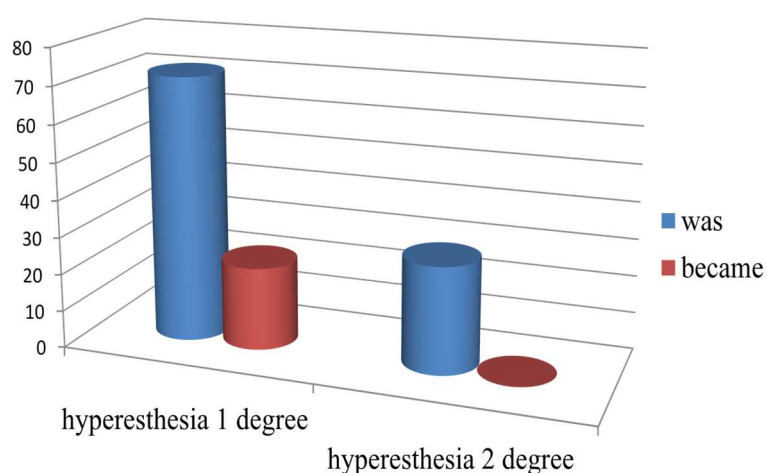


Fig.1. Intensity index of dental hyperesthesia in patients of group I before and after treatment.

After the course of treatment, all patients noted a significant improvement, absence or reduction of tooth hypersensitivity.

In 2 patients (22.2 %) of the first group, who were initially diagnosed with grade 2 hyperesthesia, after the course, grade 1 hyperesthesia was recorded, but of low intensity. They were advised to continue the procedure until complete disappearance of sensitivity. In other patients of the group after treatment hyperesthesia was not observed (fig.1).

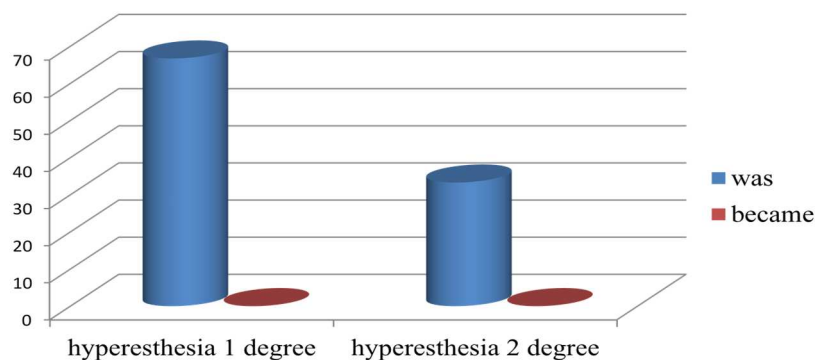


Fig.2. Intensity index of dental hyperesthesia in patients of group II before and after treatment.

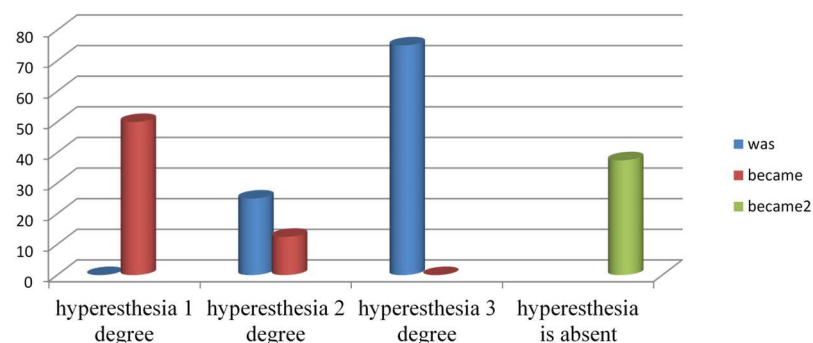


Fig.3. Intensity index of dental hyperesthesia in patients of group III before and after treatment.

with third- degree hyperesthesia had no sensitivity (37.5 %). In four persons (50 %) the indices decreased from the II degree to the I degree of sensitivity and in one case (12.5 %) the hyperesthesia of the II degree was preserved (fig.3).

The fourth group of studies with a diagnosis of periodontitis of I, II degree, where comprehensive treatment was performed, also showed a positive dynamics of treatment. All patients in the group noted a decrease in tooth sensitivity. Of the six people with grade 2 hyperesthesia, five (41.7 %) were diagnosed with a reduction to grade I hyperesthesia, and one (8.3 %) had a complete lack of sensitivity to stimuli. At the third degree of hyperesthesia at the beginning of the study it was found to decrease to the first degree

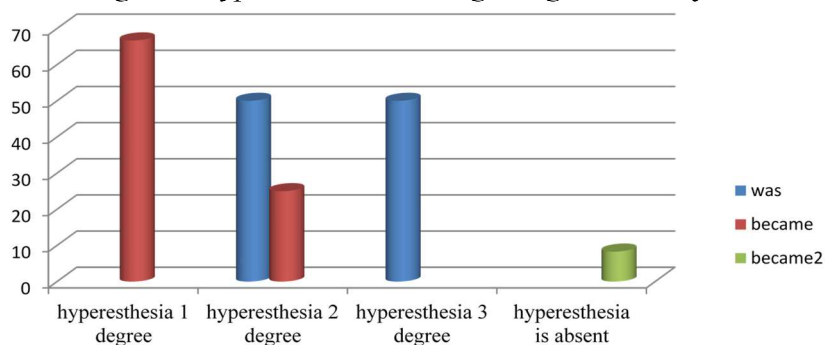


Fig.4. Intensity index of dental hyperesthesia in patients of group I before and after treatment.

in 2 people (16.7 %) and in four (33.3 %) to the second degree of sensitivity (fig.4). According to Petrushanko TO due to increased remineralization of tooth enamel when using bischofite increases by 30 % compared to the results achieved due to exposure to other remineralizing drugs [5], and the result is explained by the excellent remineralizing value of bischofite, which is based on the concentration of sodium chloride-magnesium complex. – and microelements, causes recrystallization of hydroxyapatite and filling of intercrystalline spaces in hard tissues of teeth.

The results obtained by us are consistent with the data of Nikonov AM [4]. Most patients noted a decrease in sensitivity after some time from the start of treatment, which can be explained by the complete closure of the tooth surface [1, 3].

The analysis of the obtained results and their comparison with previous studies showed that the use of drugs based on the eco-mineral complex bischofite is highly effective.

After treatment in patients of the second group of hyperesthesia was not detected (100 %). Most of them noted a decrease in sensitivity a few days after treatment, which can be explained by the complete closure of the tooth surface with orthopedic structures (fig.2). Our results are consistent with the data of A.M. Nikonov et al. (2020).

Group III patients with hyperesthesia in pathological abrasion of teeth who are recommended a course of bischofite in the form of applications, hygienic cleaning with a toothbrush soft toothpaste and organic mouthwash based on bischofite are diagnosed with decreased sensitivity. Two patients with second-degree hyperesthesia and one patient

with third- degree hyperesthesia had no sensitivity (37.5 %). In four persons (50 %) the indices decreased from the II degree to the I degree of sensitivity and in one case (12.5 %) the hyperesthesia of the II degree was preserved (fig.3).

This positive dynamics of treatment in patients of the third and fourth groups can be explained by the complex effect of the remineralizing bischofite complex with the use of local and general therapy on human mineral metabolism.

### Conclusions

Thus, the studies indicate the effectiveness of the proposed methods of eliminating hyperesthesia using drugs based on the eco-mineral bischofite. An important point when choosing a means to eliminate hyperesthesia is to take into account the cause that led to the development of pathology and knowledge of various methods of its prevention.

Prospects for further research are to study modern drugs, methods of prevention and increase the effectiveness of treatment of dental hyperesthesia in various clinical manifestations.

### References

1. Dvornyk VM, Ilenko NM, Riabushko NO, Popovych IYu, Lytovchenko IYu, Nikolishyn IA, Lemeshko AV. Sposib usunennia hiperesteziyi na etapakh preparuvannya vitalnykh zubiv. Informatsiyni pro novovvedennia v systemi okhorony zdorovya. Kyiv: Ukrmedpatentinform MOZ Ukrainy. 2020; 155: 3s. [in Ukrainian]
2. Ivanytskyi IO, Ivanytskayia ES, Petrushanko TA. Hiperchutlyvist zubiv: Navchalnyi posibnyk. Poltava: Dyvosvit; 2019. 108s. [in Ukrainian]
3. Nikolishyna EV, Marchenko AV, Nikolishyn IA. Efektyvnist likuvannya dyskolorytiv zubiv iz vykorystanniam vybilyuyuchykh system riznogo typu aktyvatsiyi ta riznoyi kontsentratsiyi perekysu vodniu. Svit medytsyny ta biolohiyi. 2018; 3(65): 99–102. [in Ukrainian]
4. Nikonov AM, Mukhina ZS, Breslavetz NM. Profilaktychni aspekty suchasnoho protezuvannya. Problemy bezpererвної medychnoy osvity ta nauky. 2020; 2: 76–79. [in Ukrainian]
5. Petrushanko TA. Ispolzovaniye unikalnogo minerala Byshofit Poltavskiy v stomatolohycheskoy praktike. Stomatolohyia. Estetyka. Innovatsiyi. 2018; 2(1): 157–159. [in Russian]
6. Bekes K, Hirsch C. What is known about the influence of dentine hypersensitivity on oral health-related quality of life? Clin Oral Investig. 2013 Mar; 17(Suppl 1): 45–51. doi: 10.1007/s00784-012-0888-9.
7. Choi YJ, Bae MK, Kim I, Park JK, Son SA. Effects of microsurface structure of bioactive nanoparticles on dentinal tubules as a dentin desensitizer. J Pone. 2020; 15(8): e0237726. doi:10.1371.0237726.
8. Ding PH, Dai A, Hu HJ, Huang JP, Liu JM, Chen LL. Efficacy of nano-carbonate apatite dentifrice in relief from dentine hypersensitivity following non-surgical periodontal therapy: a randomized controlled trial. ChiCTR-IPR-17011678, <http://www.chictr.org.cn/>, registered 16 June, 2017.
9. Exarchou C, Betsani I, Sakellari D, Chatzopoulou D, Gillam D. A Survey of Dentists in the Management of Dentine Hypersensitivity: A Questionnaire-based Study. European Journal of Dentistry. 2019; 13(3):383–390. doi: 10.1055/s-0039-1694306.
10. Hegde SI, Rao BH, Kakar RC, Kakar A. A comparison of dentifrices for clinical relief from dentin hypersensitivity using the Jay Sensitivity Sensor Probe. Am J Dent. 2013; Spec No B:29B-36B.
11. Khin Yapar K, Masayuki O, Noriko H, Michelle Sunico S, Junji T. Effect of application of desensitizers before bleaching on change of tooth shade. 2019; 38(5): 790–797. doi: 10.4012/dmj.2018-129.
12. Sahar T, Brian HC. Clinician's Guide to the Diagnosis and Management of Tooth Sensitivity. 2014; 236s.
13. Sanjay M, Vivek A, Bhoomika A. Dentin hypersensitivity: Recent trends in management. J Conserv Dent. 2010; 13: 218–224. doi: 10.4103/0972-0707.73385.
14. Stephen M, Rose K, Lucy S, Máiréad H. Clinical study to monitor dentinal hypersensitivity with episodic use of a desensitising dentifrice. BDJ Open. 2017; 3: 17011. doi: 10.1038.
15. Yiannios N, Kerstein RB, Radke J. Treatment of frictional dental hypersensitivity (FDH) with computer-guided occlusal adjustments. Cranio. 2017; 35(6):347–357. Doi: 10.1080/08869634.2016.1251692.

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