

THE REPUBLIC OF AZERBAIJAN

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ENHANCING THE EFFICIENCY OF DIAGNOSTICS AND TREATMENT OF THE HYPERESTHESIA OF HARD TOOTH TISSUES

Specialty: 3226.01 - Stomatology

Field of science: Medicine

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A B S T R A C T

of the dissertation
for the degree of doctor of philosophy

BAKU – 2021

The dissertation work was performed at the department of therapeutic dentistry of the Azerbaijan Medical University

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GENERAL CHARACTERISTICS OF THE STYDU

According to numerous literature data, there has been a definite tendency to an increase in the prevalence and intensity of dental hypersensitivity in recent years. Thus, according to the results of clinical and epidemiological studies, the frequency of the studied pathology which has both medical and social significance varies within 10-65% among the adult population in some countries^{1,2,3}. There are various exogenous and endogenous causes of dental hypersensitivity, among which are periodontal diseases, caries and non-carious tooth lesions, dental injuries, environmental factors, some general somatic pathologies^{4,5,6}.

To increase the resistance and mineralization of hard tooth tissues, there are used physical methods as well as calcium and fluoride- containing preparations for the purpose of prophylactic and therapeutic effects on the main links of the hyperesthesia etiopathogenesis of various degrees of severity observed after medical procedures, in particular, restoration of carious cavities and

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defects of non-carious origin, odontopreparation, and bleaching 7,8,9,10,11,12. But, despite the constant development and widespread introduction of new agents and methods for treatment of hypersensitivity of hard tooth tissues, the absence of long-term therapeutic effect still and frequent occurrence of relapses make the issue of choosing the most optimal therapeutic and prophylactic measures very urgent.

Timely solution of problems associated with dental hyperesthesia which very often occurs during implementation of dental rehabilitation of patients can significantly increase the efficiency and quality of treatment in modern dental practice. And dental hyperesthesia, which is of great scientific and practical interest from the point of view of various dental manipulations and medical procedures and is one of the most common dental pathologies, still remains a rather urgent problem as to the very problem of etiology, pathogenesis, clinical picture, diagnosis and treatment.

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Object of study

200 patients, including 90 women and 110 men, aged 18 to 45 years, with hyperesthesia of hard tooth tissues of varying severity, observed after medical procedures, in particular, restoration of carious cavities and defects of non-carious origin, with periodontal diseases, after odontopreparation, bleaching.

The aim of this study

Improving the quality of prevention and treatment of hypersensitivity of hard tooth tissues.

Research objectives

1. To determine the frequency and severity of dental hyperesthesia using indices of frequency and prevalence of dental hyperesthesia
2. To establish exogenous and endogenous factors affecting the degree of perception of the dental receptor apparatus to temperature, chemical and mechanical stimuli.
3. To reveal the prevalence and severity of hard tissue hyperesthesia in patients with non-carious tooth lesions, gingival recession and inflammatory periodontal diseases in a comparative aspect.
4. To study the dependence between different types of modern adhesive systems and the frequency of hypersensitivity of hard tooth tissues.
5. To study the electrical excitability of the sensory tooth nerves in normal conditions, with various forms of hyperesthesia and in the course of therapeutic and prophylactic measures.
6. To assess the effectiveness of new desensitizers in treatment of caries, non-carious lesions of hard tissues, dental bleaching and odontopreparation accompanied by dental hypersensitivity in near and remote terms.

Research methods

Questioning, methods of diagnostic and clinical research of hypersensitivity of hard tooth tissues, electroodontodiagnostics, statistical analysis.

The main provisions for the defense:

1. Desensitizers form a protective layer on the surface of hard tooth tissues, which differs in structure, thickness and density, depending on the composition of the preparation.
2. Clinical and laboratory studies of the effectiveness of using desensitizers of various compositions make it possible to develop a method for symptomatic therapy of dental hypersensitivity in case of gingival recession, wedge-shaped defect, pathological abrasion and erosion of hard tooth tissues.
3. The expediency of a differentiated approach to the selection of a desensitizer of various composition in the treatment of hyperesthesia of hard tooth tissues of various etiology (odontopreparation, bleaching, gingival recession) was established.
4. Use of desensitizers in treatment of dental hypersensitivity with non-carious lesions and gingival recession leads to a decrease in the electrical conductivity of the hard tooth tissues.

Scientific novelty of the research

Optimization of the agents that increase the effectiveness of complex prevention and treatment of dental hyperesthesia after restoration of carious and non-carious dental lesions, bleaching and odontopreparation. Revealing the features of clinical manifestations and intensity of dental hyperesthesia depending on the etiopathogenetic causes of onset and development (irritants, adhesive systems, pathology of soft tooth tissues, dental bleaching, odontopreparation, and gingival recession).

The practical significance of the results that were obtained

Obtained results will make it possible to offer dentists affordable therapeutic and prophylactic agents, in particular, adhesive systems which will reduce the likelihood of dental hypersensitivity, significantly improve the quality of treatment of patients with carious and non-carious lesions of hard tooth tissues and provide an optimal clinical effect.

Against the background of the frequent development of hypersensitivity of hard tooth tissues during odontopreparation, dental bleaching and gingival recession, it will be recommended to carry out timely regular medical check-up, early diagnosis and effective methods and means of treatment and prevention. Obtained data will provide an opportunity to offer agents that will improve the quality of treatment of hyperesthesia after odontopreparation, dental bleaching, and will also allow achieving an increase in the resistance of hard tissues and reduce the risk of complications in the longer terms in dental practice.

Approbation of work

Materials on the research topic were reported and discussed at: III International Medical Congress for Students and Young Doctors (Baku, 2016); All-Ukrainian Scientific and Practical Conference of Young Scientists (Poltava, 2017); XLIII International Scientific and Practical Conference Europeanresearch: InnovationinScience, EducationandTechnology (London, 2018); VII International Conference: GeneralQuestionofWorldScience (Amsterdam, 2019). The dissertation materials were discussed at the scientific session of the department therapeutic dentistry AMU (minute No 4, 25.12.2019) and at scientific seminar of the Dissertation council ED 2.05 operating at Azerbaijan Medical University (minute No 4, 08.05.2021).

The name of the organization where the dissertation has been accomplished

Dental Clinic of the Azerbaijan Medical University; 5ADent Dental Clinic attached to Ahmedbeyli MMC.

Implementation of research results into practice

The results of this research were introduced into the practice of a dental clinic and AMU Dental Clinic, as well as into the educational process of Departments of Preventive and Prosthodontic Dentistry.

Publications

14 scientific works, including 10 journal articles (3 articles in foreign publications) and 4 theses were published on the topic of the dissertation research.

The structure and volume of the dissertation

The dissertation is presented on 180 (223 489 characters) pages of computer text, contains 13 tables, 23 diagrams. The dissertation consists of the following chapters: introduction (5 pages, 7432 characters), a literature review (26 pages, 44054 characters), a chapter describing materials and research methods (11 pages, 16188 characters), 3 chapters dedicated to the personal research (82 pages, 127034 characters), conclusions (5 page, 5113 characters), practical recommendations (1 page, 896 characters), literature index (23 pages), appendices (3 pages). The bibliographic index includes 184 publications.

MATERIALS AND METHODS OF RESEARCH

The research involved 200 patients, including 90 women and 110 men, aged 18 to 45 years with hyperesthesia of hard tooth tissues of varying severity, observed after medical procedures, in particular, restoration of carious cavities and defects of non-carious origin, with periodontal diseases, odontopreparation and bleaching.

Comprehensive examination included general clinical (anamnesis, survey, examination), as well as additional methods using special indices. During preventive measures and treatment of hyperesthesia of hard tooth tissues in all research groups, desensitizing agents were applied to the sensitive surface of the tooth waiting for 1.5-2 minutes after professional cleaning of the oral cavity. After that, the patients did not take food and water for an hour; the total course of therapy averaged 10 days.

For a comparative assessment of the effectiveness of various agents in reducing and completely neutralizing the symptom of hypersensitivity of hard tooth tissues, traditional indices of the prevalence and intensity of dental hyperesthesia were used - IPDH, IIDH by Shtorina Q.B. (1986)¹³, as well as the dental sensitivity index

by L.Y.Orekhova-S.B.Ulitovsky, TSI, (2008)¹⁴, which combines both the results of a subjective assessment of the teeth condition by a patient and the expert assessment of pain reactions by specialists.

Material and methods of research for non-cariou dental lesions

3 groups of male and female patients aged 35 to 45 years who suffered from dental hyperesthesia which arose against the background of non-cariou tooth lesions were formed for a comparative assessment of the effectiveness of the use of different agents of treating hyperesthesia of hard tooth tissues.

Group 1 consisted of 32 patients who used Telio CS Desensitizer (Ivoclar Vivadent) to treat dental hypersensitivity throughout the research period. Group 2 consisted of 34 patients who used Gluma Desensitizer (Kulzer) for hyposensitizing treatment, and Group 3 (n=35) used the desensitizer AdmiraProtect (VOCO). Comparative assessment of the effectiveness of hyposensitive treatment was determined by the TSI index. Assessment of the severity of clinical manifestations of hyperesthesia of hard tooth tissues was carried out before and after the use of different methods of therapy using various diagnostic tests: a cotton pellet, probe moving along the tooth surface, thermometric tests with a water stream, and teeth treatment with an air stream. Sensitivity indicators were determined immediately before and after the end of the therapeutic course, 10, 15 days later, as well as 1 and 2 months later. Indices of the prevalence and intensity of dental hyperesthesia were used (Shtorina G.B., 1986)¹³ for an objective assessment of the degree of hyperesthesia or dental hypersensitivity with three types of non-cariou lesions (wedge-shaped defect, erosion and pathological abrasion). Research of the electrical conductivity of hard tooth tissues (EOD) was carried out before treatment, 1 week, 1 month, 6 months and 1 year later.

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Effectiveness of the treatment and prophylactic measures was assessed by the dynamics of decrease or increase in the indices of hyperesthesia prevalence, intensity and the indices of the electrical conductivity of the hard tooth tissues before treatment and in a certain period of time after its completion.

Methods for studying the effectiveness of adhesive systems

To determine the effect of adhesive systems on changes in the dental sensitivity, there were formed 4 groups of patients with various defects of hard tooth tissues using GLUMA2Bond (Kulzer), n=14; TetricN-Bond (Ivoclar Vivadent), n=12; AdperSingleBond 2 (3MESPE), n=12; FuturabondU (VOCO), n=13. To assess the sensitivity, the classification of hyperesthesia of hard tooth tissues proposed by Fedorov Y.A. et al (1981)¹⁵ was used. Evaluation of the quality of the treatment and prophylactic measures was carried out both in the near and remote terms: immediately after the end of the restoration, 3 days and 1 month later.

Methods of Research for Patients with Periodontal Disease and Gingival Recession

According to the objectives of the research, all patients were divided into three groups: Main Group (n=41) consisted of patients with dental hyperesthesia, who received Telio CS Desensitizer in combination with a prophylactic toothpaste Opalescence (Ultardent) with a desensitive effect after professional oral hygiene.

Comparison Group (n=35) consisted of patients who were applied with a similar desensitizer after professional oral hygiene. Control Group (n=37) included persons with the researched pathology, who were prescribed only prophylactic dental hygiene, as in Main Group, after professional oral hygiene. To assess the hygienic state of the oral cavity, the OHI-S Hygiene Index was used, and the state of the periodontal soft tissues was assessed by the PMA Index.

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The results of the course of basic therapy were determined by the dynamics of changes in the indices of prevalence, the intensity of dental hyperesthesia and tooth sensitivity, by the electrical conductivity of the hard tooth tissues before the start of treatment and in the period after its completion - immediately after, and also 15 days, 1 and 2 months later.

Research methods for odontopreparation

To determine the tactile sensitivity (TS), we used the technique of probing the surface of the prepared vital tooth by a dental probe, as well as with a cotton pellet, which was held with tweezers. The digital data obtained during clinical study were subjected to statistical processing during probing using the following scale, where: 0 points - complete absence of hypersensitivity of the hard tissues of abutment teeth; 1 point - there was a painful reaction when a special probe was sliding along the vestibular surface; 2 points - patients noted a certain painful reaction when probing simultaneously with a cotton pellet and a dental probe.

The thermosetting parameters of the researched teeth (TR) were studied using the cold test method which was carried out by direct exposure to a cold water jet the temperature of which fluctuated within +15 - +17C, and the scoring of the obtained results was carried out as follows: 0 points - complete absence of pain reaction; 1 point - patients noted slight discomfort; 2 points - complaints of minor pain; 3 points - an increased level of hyperesthesia or a pronounced pain reaction from the causative tooth.

The TS and TR indicators were studied on vital teeth immediately before and after odontopreparation, and at certain times after its completion, treatment and prophylactic measures: a week later, 15 days later and the most final stage - immediately before fixation of prosthetic structure 1 month later, and the EOD indicators - before, after, 15 days and 1 month later. Main Group consisted of 11 people who used Telio CS Desensitizer to treat dental hypersensitivity, after odontopreparation. Comparison Group consisted of 13 people

who used Gluma Desensitizer for hyposensitive treatment, and Control Group consisted of 12 people who used the AdmiraProtect desensitizer.

Methods of Patient Examination During Dental Bleaching

In order to assess the effectiveness of the hyposensitive agents tested in the research for the complex therapy of hypersensitivity of hard tooth tissues against the background of professional chemical bleaching, 33 patients with discolored teeth out of the total number of respondents were divided into three study groups: Group 1, Main Group, (n=11; 80 teeth), Group 2, Comparison Group, (n=12; 88 teeth) and Group 3, Control Group, (n=10; 76 teeth).

Professional chemical bleaching was carried out using Opalescence Boost PF (Ultradent, USA) containing 40% hydrogen peroxide, potassium and fluoride nitrate activated by mixing the two components.

The therapeutic and prophylactic effect in Main Group was achieved by applying a desensitizer (Telio CS Desensitizer) for 2-3 minutes and daily use of the prophylactic toothpaste Opalescence (Ultradent, USA) with a course of treatment for 10 days after completion of professional dental bleaching.

The therapeutic and prophylactic effect in Comparison Group was achieved only by application of a desensitizer (Telio CS Desensitizer) for 2-3 minutes with a course of treatment for 10 days, also after completion of professional dental bleaching.

The patients in Control Group daily used Opalescence toothpaste (Ultradent, USA) to achieve a hyposensitive effect after completion of professional dental bleaching; the course of treatment lasted 10 days.

The effectiveness of the use of hyposensitive agents was assessed before the use of the recommended agents and the course of basic therapy and 1 and 6 months after its completion.

Statistical Processing Methods

For statistical processing of the obtained data, a statistical analysis software package was used. The research results were processed by the method of variation statistics. To characterize a group of homogeneous units, their arithmetic mean values (M), its standard error (m) and the range of changes (min-max) were determined. For statistical data processing the nonparametric Mann–Whitney U-test were used as a method for assessing the differences in indicators. The statistical difference between the groups was considered significant at $p < 0.05$. Statistical processing of the obtained data was carried out on a personal computer using modern software, the Microsoft Excel 2007 spreadsheet editor and the Statistica 7.0 application package.

RESULTS OF THE RESEARCH

In the groups of patients with non-carious dental lesions, it was possible to evaluate a significant improvement in the condition of patients with dental hypersensitivity at different periods of the study period, as well as at the final stage, especially against the background of the use of the Telio CS Desensitizer in clinical Group 1, according to the data of diagnostic test using a cotton pellet.

According to the data of the probe movement along the tooth surface before the start of treatment, the sensitivity indices for the groups ranged from 3.51 points to 3.78 points, which indicated of more than half of the sensitive teeth from the total number of teeth. By the end of the observation period, patients of all three groups had a satisfactory clinical condition for the studied pathology, but the most favorable trend, as in the test with a cotton ball, was determined in patients of the Group 1, where the Telio CS Desensitizer was used (Chart 1).

When conducting a thermometric test with a cold stream of water before the start of treatment and prophylactic measures, the index assessment of hyperesthesia of hard tooth tissues varied from 4.85 ± 0.062 to 4.91 ± 0.052 points, depending on the group assessment.

In the dynamics of changes in digital data in different groups, a similar trend was most often observed at the initial stages of examinations.

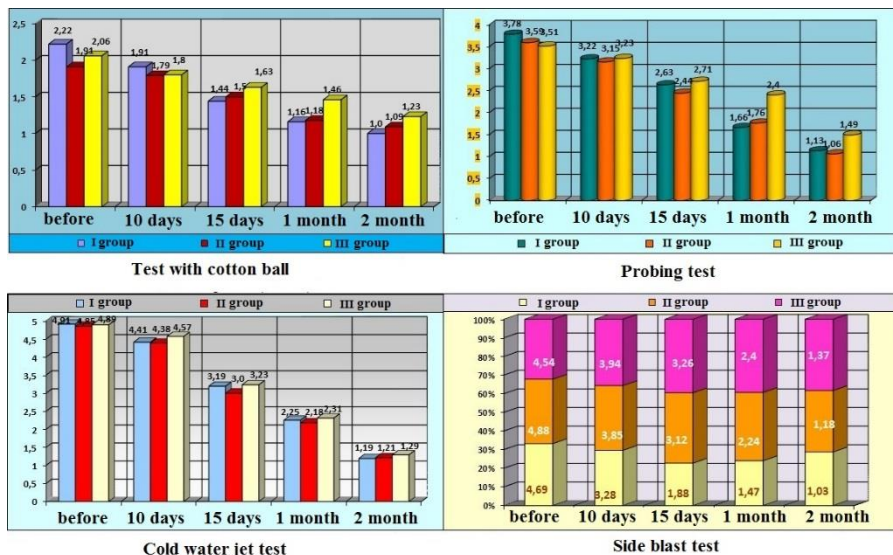


Chart 1. Comparative assessment of the hyposensitive efficacy of desensitizers in terms of dental sensitivity as a result of various tests (points)

At the final stage of the research, where a comparatively more pronounced and positive trend also was determined in Group 1 of patients, where Telio CS Desensitizer was used, the values of the index indicator significantly decreased to 1.19 ± 0.070 points, versus 1.29 ± 0.077 points in Group 3, where Admira Protect desensitizer was used.

When treating the tooth surface with a lateral air stream before the start of therapeutic procedures, digital values were recorded within 4.54 points in the 3rd group of patients, 4.88 points in the 2nd group of patients and, accordingly, 4.68 points in the 1st group. a group of examined patients. Clinical observation of patients of all three groups for two months showed a marked improvement in the values of the studied parameter, as in all previous tests, in patients of the 1st and

2nd groups, where, respectively, Telio CS Desensitizer and Gluma Desensitizer.

As in previous studies, and in this case, to a lesser extent, a positive effect was recorded in patients with hyperesthesia of the 3rd group, where the digital value of the diagnostic test using a lateral air stream 10 days after the start of treatment was 3.94 points. In more distant terms, according to the data of the test performed with the treatment of the surface of the teeth with a lateral air stream in the patients of the above group, compared with the main group and the comparison group, a less persistent therapeutic effect was achieved, which indicated a less pronounced hyposensitive efficacy of "Admira Protect" (Chart 1).

Statistical analysis according to the evaluation criteria of the dental sensitivity index under L.Y. Orekhova - S.B. Ulitovskiy made it possible to determine the severity of the condition and course of hyperesthesia of hard tooth tissues against the background of non-carious lesions, as well as the effectiveness of therapeutic and prophylactic agents tested in the research. According to the obtained data, before the start of the course of basic therapy, a pronounced severe degree of the pathological process was noted in all observation groups, since the digital values of the dental sensitivity index ranged from 78.5 to 81.3%, which is assessed as a "serious condition". After 15 days from the start of treatment, the course of hyperesthesia of hard tooth tissues was defined as a relatively compensated state characteristic of an average degree of dental sensitivity which was also confirmed by a decrease in the value of the studied dental sensitivity index which varied in all three groups within 46.1- 57.3%, respectively. A similar picture of the dynamics of changes in the index and the state of hard tooth tissues was observed at the subsequent stages of clinical studies (Table 1).

So, after 1 month from the beginning of treatment measures for dental hypersensitivity, the values of this indicator were determined lower than those of the previous stages which could also be interpreted as a "compensatory mild degree of dental sensitivity", a condition characteristic of moderate dental sensitivity.

At the final stage of treatment in all groups, especially in Main Group (21.9%) and Comparison Group (22.8%), there was noted a condition that was also assessed as "compensatory mild degree of dental sensitivity", but very close to the indicators criterion "20% healthy natural sensitivity to stimuli". In Control Group, where the indices of the dental sensitivity index using the Admira Protect desensitizer were ultimately determined in the same assessment criterion, however, they were significantly higher, 26.5%, than in Main Group and Comparison Group, where Telio CS Desensitizer and GLUMA Desensitizer were used, respectively.

Table 1.

Assessment of the severity of pathological process using the dental sensitivity index (DSI) according to L.Y. Orekhova - S.B. Ulitovskiy (%)

Examination time	Group 1, n=32	Group 2, n=34	Group 3, n=35
Before treatment	81.3±0.83	80.1±0.80	78.5±0.91
10 days later	65.3±0.66 *	67.8±0.89 *	69.9±0.92 *
15 days later	46.1±0.82 *	53.5±1.00 *	57.3±1.08 *
1 month later	34.0±0.72 *	38.9±1.03 *	44.3±1.15 *
2 months later	21.9±0.62 *	22.8±0.87 *	26.5±1.15 *

*Note: * - statistically significant difference from the indicator before treatment (p<0.05, according to the Mann-Whitney U-test)*

A comparative statistical analysis of the clinical efficacy of various modern desensitizers, carried out in the course of the research, showed a pronounced decrease in the electrical conductivity of the hard tissues of the affected teeth with various types of non-carious lesions such as wedge-shaped defect, erosion and pathological abrasion, according to the EOD indicators.

After completion of treatment and prophylactic measures in Main Group using Telio CS Desensitizer, the greatest decrease in the

electrical conductivity of hard tooth tissues was found in patients with wedge-shaped teeth defects (from 3.76 to 2.63 μA , decrease by 1.13 μA), then in patients with pathological abrasion (from 2.43 to 1.83 μA , a decrease by 0.6 μA) and with erosions (from 2.15 to 1.73 μA , decrease by 0.42 μA). Use of another desensitizer, GLUMA Desensitizer, led to a pronounced decrease in the electrical conductivity of hard tooth tissues, then in patients with wedge-shaped teeth defects (from 4.87 to 3.83 μA , decrease by 1.04 μA), with pathological abrasion (from 5, 14 to 4.66 μA , decrease by 0.48 μA) and with erosion (from 2.88 to 2.75 μA , decrease by 0.13 μA).

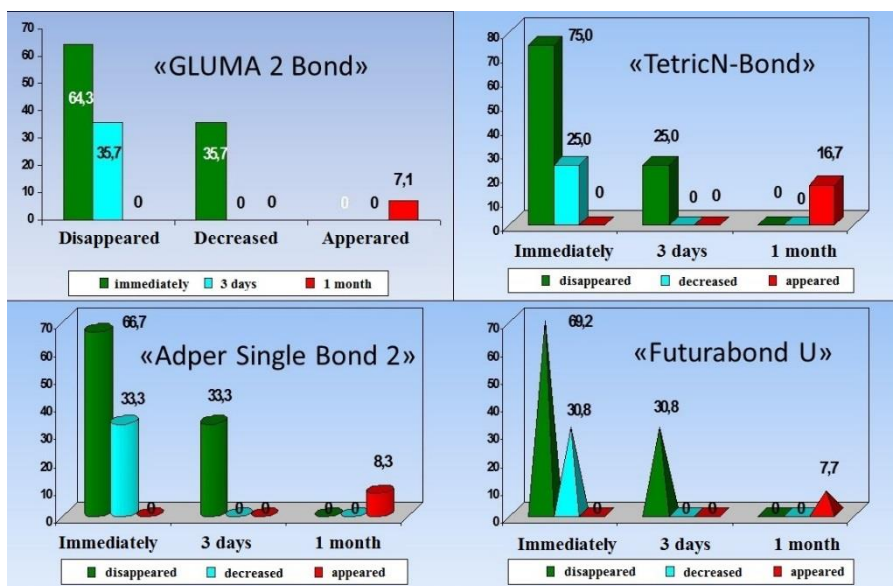


Chart 2. Evaluation of the effectiveness of adhesive system use.

According to the results of the analysis and statistical data obtained during the examination of patients' teeth in Control Group, hyposensitive treatment with the Admira Protect desensitizer led to a less pronounced decrease in electrical conductivity indices both in the short term after treatment and at remote stages.

Thus, to summarize all of the above mentioned, we can state the fact that after testing all diagnostic samples and completing the therapeutic and prophylactic actions of dental hypersensitivity with various types of non-carious lesions, all three approved desensitizers had a different hyposensitive effect. At the final stage of the research, a more pronounced and stable hyposensitive therapeutic effect was observed in Main Group using Telio CS Desensitizer.

The minimum decrease in the indicators of electrical conductivity of the teeth at all stages of clinical observations was revealed in the control group of patients, where the desensitizer Admira Protect was used for therapeutic purposes.

Coating of hard tooth tissues prepared for restoration with adhesive systems tested in the study, with the aim to reduce and prevent possible postoperative sensitivity according to the results of our clinical studies, is accompanied by a significant decrease or even complete disappearance of dental hyperesthesia.

Table 2.

The number of patients without complaints of dental hyperesthesia after treatment (%)

Examination time	Main Group, n=41		Comparison Group, n=35		Control Group, n=37	
	Abs.	%	Abs.	%	Abs.	%
Before treatment	41	100.0	35	100.0	37	100.0
After treatment	38	92.7±4.07	29	82.9±6.37	26	70.3±7.51
15 days later	34	82.9±5.88	25	71.4±7.64	24	64.9±7.85
1 month later	33	80.5±6.19	20	57.1±8.36 *	15	40.5±8.07 *
2 months later	25	61.0±7.62	9	25.7±7.39	12	32.4±7.70 *

*Note: * - statistically significant difference from the indicator of Main Group (p<0.05, according to the Mann-Whitney U-test)*

The analysis of our data and statistical indicators indicate that a more pronounced decrease in the dental hypersensitivity in response to stimuli at the initial stage of observation and then a smaller percentage of repeated relapses of the studied pathology at the final stage of clinical observations was noted in Groups 1 and 4 of the examined patients where the new generation GLUMA 2 Bond double-acting and Futurabond U adhesive systems were used during restoration manipulations for therapeutic and prophylactic purposes (Chart 2).

However, the best hyposensitive result was found in the group of patients where the new-generation double-acting adhesive system GLUMA 2 Bond, the composition of which contains a desensitizer, was used for restoration of defects.

When comparing the results of therapeutic and prophylactic measures against the background of inflammatory periodontal diseases and recessions immediately after their completion, almost $92.7 \pm 4.07\%$ of the patients in Group 1 showed a significant decrease or a pronounced weakening of the clinical manifestations of dental hypersensitivity. Whereas, in the other two groups of examined patients, a favorable trend in improving their condition was observed to a relatively lesser extent, $82.9 \pm 6.37\%$ and $70.3 \pm 7.51\%$ ($p < 0.05$).

This is the number of patients in these groups who reported the absence of hyperesthesia at the same time. 15 days after the completion of treatment procedures at the control examination, the number of patients who did not experience pain sensations to various kinds of stimuli slightly decreased in the first group to $82.9 \pm 5.88\%$, versus $71.4 \pm 7.64\%$ and $64, 9 \pm 7.85\%$ in the second and third groups, respectively. Comparative statistical analysis of the data obtained 1 month after treatment revealed a further decrease in all groups in the number of patients who did not complain of dental hypersensitivity. And a certain difference in indicators was recorded in the above timeframe. Thus, $80.5 \pm 6.19\%$ of patients noted the high efficiency of the therapy and the therapeutic agents used in Group 1. In the remaining groups, the percentage of persons who showed positive dynamics in the state of hard tooth tissues was slightly lower,

57.1±8.36% and 40.5±8.07%, in Groups 2 and 3 of patients, respectively. A comparative analysis of indicators at the final stage of clinical studies among patients revealed an increase in the frequency of occurrence of complaints of hypersensitivity, in contrast to the previous periods in all groups (Table 2).

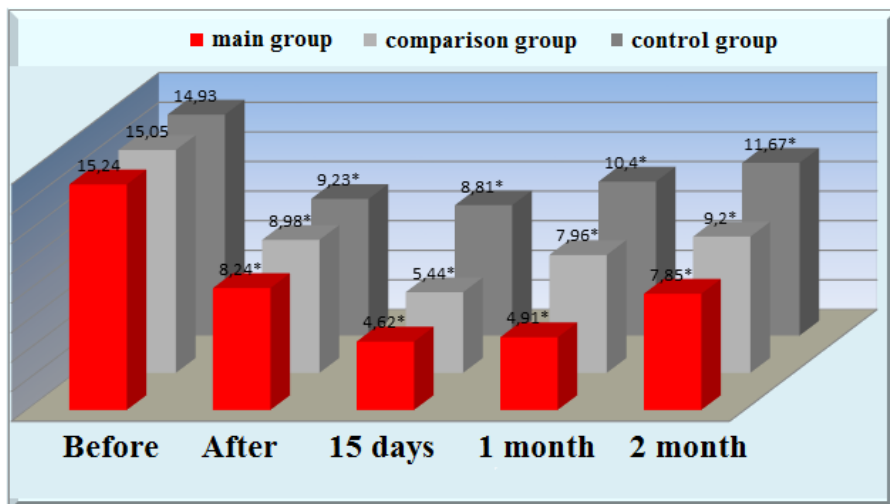


Chart 3. Index of prevalence of dental hyperesthesia in patients with inflammatory periodontal disease and gingival recession.

When analyzing the index of prevalence of dental hyperesthesia and patients with inflammatory periodontal diseases, it is necessary to emphasize the fact that a more pronounced decrease in the studied indicator was recorded in the above periods only in Group 1. So, if the index data decreased here to the level of 4.91±0.27%, then in the other two groups of patients with hyperesthesia developing in the hard tooth tissues against the background of inflammatory periodontal diseases and gingival recession, then their opponents in the other groups had comparatively higher values which amounted to 7.96±0.20% and 10.40±0.41%, respectively ($p < 0.05$). In the same group, all subsequent dynamics of changes in indicators in the comparative aspect turned out to be much more significant.

Comparative analysis of digital index data obtained 2 months later in the process of dynamic observation of the condition of the examined patients revealed some tendency to an increase in indicators directly in all three groups. But even in this case, a significant difference was determined for this fact. So if the index of the prevalence of hyperesthesia of hard tooth tissues increased by the end of observations in Group 1 to a value of $7.85 \pm 0.26\%$, then the data for other groups turned out to be significantly higher and were recorded in the area of $9.20 \pm 0.31\%$ and $11.67 \pm 0.38\%$ in Groups 2 and 3, respectively, at the same time (Chapter 3).

Comparative analysis of effectiveness of the materials used in the study for treatment of hyperesthesia of hard tooth tissues after odontopreparation in Groups 1, 2 and 3 revealed excellent indicators for reduction or complete elimination of hyperesthesia. At the same time, use of Telio CS Desensitizer material turned out to be more effective in patients of Main Group, for whom treatment of hyperesthesia of hard tissues prepared for artificial crowns of abutment teeth was carried out by rubbing in solutions of the above therapeutic agent for 3 minutes with a general course of basic therapy which was 10 days.

According to our hypothesis, decrease in hypersensitivity of the prepared teeth in this group of patients occurred much faster and the effect of rubbing was longer and more persistent due to the ability of the preparation to deeper mineralization. In the most distant terms after desensitive therapy, the best results in terms of hyperesthesia indices, as well as according to the data of electroodontodiagnostics, are preserved in Main Group. In the patients of Comparison Group, where Gluma Desensitizer was used, a decrease in hyperesthesia was also observed in the same study periods, but the statistical analysis of remote results in Comparison Group showed a less pronounced decrease in the sensitivity of prepared teeth in response to the action of chemical and thermal stimuli in comparison with Main Group.

The effectiveness of hyposensitive agents after professional chemical bleaching was assessed based on the study of the index of prevalence and intensity of dental hyperesthesia, the index of oral

hygiene OHI-S, as well as the PMA periodontal index, which were determined before and after the research, as well as before using the recommended agents and the course of basic therapy and 1 and 6 months after its completion.

In a comparative statistical analysis of the obtained index data of the IPDH and IIDH, the tendency to normalization of the indicators of the functional state of the hard tooth tissues of the patients of Main Group, observed at all stages of clinical studies, indicates a significant positive effect on the resistance of hard tooth tissues and a more pronounced therapeutic and prophylactic effect of the agents tested.

As a result of effective therapeutic and prophylactic measures, the OHI-S hygienic index was significantly reduced and stable, which indicated the preservation of the intact state of the soft periodontal tissues, at all subsequent stages after bleaching.

Despite the fact that the level of oral hygiene in all observation groups at all stages corresponded to a good indicator, the preventive measures that were carried out in Main Group using Telio CS Desensitizer contributed to a reliable and more pronounced improvement in oral hygiene and the functional state of hard tooth tissues that have undergone chemical bleaching.

Professional oral hygiene and subsequent bleaching contributed to a pronounced decrease in the digital values of the PMA index which proves absence of side effects of bleaching gels.

On the basis of the obtained data on the feasibility and effectiveness of application after chemical bleaching of vital teeth with subsequent preventive measures by exposing the teeth surface to desensitive preparations, recommendations are given for their widespread use in practical dentistry.

CONCLUSIONS

1. According to the evaluation criteria of the indicators of dental sensitivity index under L.Y. Orekhova-S.B. Ulitovskiy, the severity and course of hyperesthesia of hard tooth tissues against the background of non-carious lesions is determined in the range from 78.5 to 81.3%, which is estimated as "severe condition, 61-80%", with periodontal diseases 36.3-36.8%, which is assessed as "compensated mild degree of dental sensitivity, 21-40%." In patients with periodontal diseases, the IPDH scores are 14.93-15.24%, and the IIDH scores are 2.21-2.33 points [4].
2. The results of various diagnostic and clinical tests (mechanical and thermal tests, indicators of TR, TS, IIDH, IPDH, DSI, EOD) indicate an increase in the degree of perception of the dental receptor apparatus against the background of carious and non-carious lesions, inflammatory periodontal diseases and recessions, with occupational chemical bleaching, odontopreparation when exposed to thermal, chemical and mechanical stimuli [5].
3. The highest prevalence rates of hyperesthesia of hard tooth tissues are observed in patients with non-carious lesions and are in the range of 78.5 to 81.3%. Similar rates with gingival recession and inflammatory periodontal diseases are determined in the range of 36.3-36.8%. The maximum rates that determine the severity of hyperesthesia of hard tooth tissues are defined with non-carious lesions in the range of 1.91-4.91 points. In inflammatory periodontal diseases and recessions, the indicators of hyperesthesia are in the range of 2.21-2.33 points [4,6].
4. Coating of hard tooth tissues prepared for restoration with tested adhesive systems GLUMA2Bond, TetricN-Bond, Adper Single Bond 2 and Futurabond U is accompanied by a significant reduction or complete disappearance of dental hyperesthesia. At the initial stage of observation, a more pronounced decrease in dental hypersensitivity in response to the action of stimuli, and

then a smaller percentage of repeated relapses at the final stage of clinical observations was noted in Groups 1 and 4 of researched patients, where new generation adhesive systems GLUMA 2 Bond with double action and Futurabond U were used during restoration manipulations for treatment and preventive aim. The best hyposensitive result was determined in the group of patients where the new generation adhesive system with double action GLUMA 2 Bond was used, the composition of which contains a desensitizer [8].

5. Indicators of EOD for non-carious dental lesions vary within 2.15-6.21 μA , and reduced to 1.56-5.64 μA after treatment and prophylactic measures; in case of periodontal diseases, they vary within 3.23-4.39 μA before treatment; afterwards, they decrease to 2.65-3.71 μA ; 1.63-1.75 μA before odontopreparing of vital teeth and 2.12-3.46 μA after [7,12].
6. a) According to various diagnostic tests, dental hypersensitivity during non-carious lesions was determined within 1.91-4.91 points before treatment (1.91 by cotton pellet; 3.22 by advancement of the probe along the tooth surface; 4.41 by thermometric tests with a stream of water; 3.50 and 3.28 by teeth treatment with a straight and a side air stream, respectively). Hyposensitive treatment with Telio CS Desensitizer led to a decrease in indicators to 1.91-4.41 points immediately after treatment (1.91;3.22;4.41;3.50;3.28 points, respectively) and up to 1.00-1.19 points 2 months later (1.00;1.13;1.19;1.13;1.03 points, respectively). Hyposensitive treatment with the use of Gluma Desensitizer led to a decrease in indicators to 1.79-4.38 points immediately after treatment (1.79;3.15;4.38;3.76;3.85 points, respectively) and up to 1.06-1.21 points 2 months later (1.09;1.06;1.21;1.18;1.18 points, respectively). Hyposensitive treatment with the use of the AdmiraProtect desensitizer led to a decrease in indicators to 1.80-4.57 points immediately after treatment (1.80;3.23;4.57;3.94;3.96 points, respectively), and up to 1.23-1.49 points 2 months later (1.23;1.49;1.29;1.26;1.37 points, respectively) [4,9].

b) Dental hypersensitivity immediately after professional chemical bleaching is determined by the indicators of IPDH in the range of 29.13-29.58% and IIDH in the range of 1.80-1.92 points. Use of a tested desensitizer (Telio CS Desensitizer) in combination with a special prophylactic hyposensitive toothpaste immediately after bleaching led to a decrease in the IPDH index from 29.58 to 0.77% and to 0.38% 1 month later; IIDH from 1.8 to 0.2 points, and to 0.1 points 1 month later. Independent use of the desensitizer led to a change in the IPDH index immediately after bleaching from 29.13 to 5.21%, and to 7.76% a month later; IIDH from 1.92 to 1.75 points, and up to 1.17 points a month later [10].

c) According to various indicators, dental hypersensitivity before odontopreparation was determined by the parameters of tactile sensitivity of TS within the range of 0.15-1.18 points; thermal reactivity TR, 0.18-0.25 points; intensity index of dental hyperesthesia IIDH, 0.14-0.23 points. After preparation, TS indices increased to 1.85-1.92 points; TR to 2.82-2.92 points; IIDH to 2.49-2.88 points. Use of the Admira Protect desensitizer in Control Group of the research led to a decrease in sensitivity 1 month later (before cementing with permanent cement) in terms of TS up to 1.67 points; TR up to 2.33 points; IIDH up to 2.46 points). Use of Gluma Desensitizer in Comparison Group of the research led to a decrease in sensitivity 1 month later (before cementing with permanent cement) in terms of TS up to 1.00 points; TR up to 1.92 points; IIDH up to 1.77 points). Use of Telio CS Desensitizer in Main Group of the research led to a decrease in sensitivity 1 month later (before cementing with permanent cement) in terms of TS up to 0.91 points; TR up to 1.27 points; IIDH up to 1.24 points) [11,13,14].

PRACTICAL RECOMMENDATIONS

1. In order to minimize postoperative sensitivity during restoration of carious and non-carious defects of hard tooth tissues using adhesive systems, it is recommended to use a new generation of adhesive systems with double action, such as GLUMA 2 Bond, which contain a desensitizer. In this regard, additional use of pretreatment of cavity with desensitizers prior to application of adhesive systems which do not contain desensitizers is urgent and necessary in the activities of practical dentists-therapists.
2. Step-by-step remineralizing therapy should be carried out based on the combined use of desensitizers and special hyposensitive toothpastes to optimally increase the resistance of hard tooth tissues to the effects of all external stimuli and prevent further violations in their structure and further destruction, as well as prevent complications after professional chemical bleaching.

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The defense will be held on «29» September 2021 at 14.00 at the meeting of the Dissertation council ED.2.05 of Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at Azerbaijan Medical University.

Address: AZ 1078, Baku, S. Vurgun str., 163 (Department of human anatomy and medical terminology, meeting hall)

Dissertation is accessible at the Azerbaijan Medical University Library.

Electronic versions of dissertation and its abstract are available on the official website of the Azerbaijan Medical University (amu.edu.az).

Abstract was sent to the required addresses on «09» July 2021.

Signed for print: 01.07.2021

Paper format: 60 x 84 1/16

Volume: 35 949

Number of hard copies: 20