CAUSES OF DENTAL HYPERSENSITIVITY AND METHODS OF THIS TRETMENT IN ADOLESCENT

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ПРИЧИНЫ ГИПЕРЕСТЕЗИИ ЗУБОВ И МЕТОДЫ ИХ ЛЕЧЕНИЯ У ЛИЦ ПОДРОСТКОВОГО ВОЗРАСТА

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Abstract. *This scientific work examines the mechanism of movement of fluid under the influence of hydrodynamic pressure and relationship with dental hypersensitivity. The causes of hypersensitivity and the results of treatment using various methods are also provided and justified.*

Key words: *tooth hypersensitivity, hydrodynamic pressure, dentin canaliculus, odontoblast, remineralized therapy.*

Annotatsiya. Ushbu ilmiy ishda gidrodinamik bosim ta'sirida gingival suyuqlik harakatining mexanizmi va ularning tishlarni yuqori sezuvchanligi bilan bog'liqlik jihatlari o'rganiladi. Shuningdek, yuqori sezuvchanlik sabablari va ularni turli usullar bilan davolash natijalari taqdim etiladi va asoslanadi.

Kalit so'zlar*: tishlarning yuqori sezuvchanligi, gidrodinamik bosim, dentin tubulalari, odontoblastlar, remineralizatsiya terapiyasi.*

Аннотация. *В данной научной работе рассматривается механизм движения десневой жидкости под влиянием гидродинамического давления и их взаимосвязь с гиперчувствительностью зубов. А также предоставляются и обосновываются причины возникновения гиперчувствительности и результаты лечения различными методами.*

Ключевые слова: *гиперчувствительность зубов, гидродинамическое давление, дентинные канальца, одонтобласты, реминерализирующая терапия*

Introduction. Hyperesthesia, or tooth hypersensitivity, is one of the most common reasons for visiting the dentist, and this figure is growing year after year. This leads to the “rejuvenation” of the symptom among different age groups of people, causing discomfort or even pain. But on the other hand, it is a signal, as we can find out the cause of this symptom through thorough diagnosis, prescribe appropriate treatment, and take preventive measures. If we talk about hypersensitivity in detail, we can determine that there is enamel hypersensitivity and dentin hypersensitivity [1].

Causes of Tooth Hypersensitivity:

1. Gum recession – exposing the tooth root.
2. Enamel wear – due to aging, improper brushing, or bruxism (teeth grinding).
3. Acid erosion of enamel – caused by acidic drinks or gastric reflux.
4. Tooth decay (caries) – exposing dentin or pulp.
5. Cracks in enamel or tooth structure – microcracks compromise protection.
6. Recent dental procedures – whitening, cleaning, fillings, etc.
7. Maladjusted fillings – may cause sensitivity when biting.
8. Use of whitening products – especially those with hydrogen peroxide.
9. Periodontal disease or gingivitis – leads to gum recession and root exposure.

10. Overbrushing – especially with hard-bristled toothbrushes.
11. Loss of cementum covering the root – due to trauma or abrasion.
12. Tooth root resorption – internal or external.
13. Hormonal changes – e.g., during pregnancy.
14. Vitamin and mineral deficiencies – especially calcium and vitamin D.
15. Poor diet – frequent consumption of acidic foods.
16. Overuse of whitening toothpaste – may thin enamel.
17. Dry mouth (xerostomia) – reduced saliva affects enamel remineralization.
18. Orthodontic appliances – may provoke sensitivity.
19. Psychosomatic factors – stress and anxiety.
20. Anatomical tooth variations – naturally thin enamel or exposed dentin [2].

Enamel hypersensitivity is a condition in which the enamel tissue becomes thinner due to demineralization (the appearance of defects on the surface of the hard enamel structures), pathological abrasion, and the appearance of cracks as a result of external forces of varying intensity. Based on the cause, a treatment plan is prescribed: for caries in the stain stage, it is recommended to carry out remineralization therapy using the ICON system (a non-invasive method of restoring enamel structures by exposing it to a material containing calcium and fluoride salts). In the case of enamel abrasion, rational filling is advisable in order to prevent caries in the affected areas [3].

Dentin hypersensitivity is localized, short-term pain in the tooth on exposed dentin areas due to the absence of enamel (in some cases, the absence of part of the dentin) in response to various external stimuli (chemical, thermal, and tactile).

Dentin consists of a main substance permeated by numerous thin dentin tubules or canals containing odontoblast cell processes, whose bodies are located in the pulp. Dentin tubules diverge from the pulp of the tooth to the periphery in a radial direction. The sensory mechanism of dentin has not been sufficiently studied, but it is believed that there are nerve endings in the dentin tubules and outer layers of the pulp[4]. There are several theories about the origin of tooth sensitivity: the odontoblast receptor theory, the direct nerve ending theory, and the hydrodynamic theory. Currently, the vast majority of researchers adhere to the hydrodynamic theory of the origin of tooth sensitivity. According to this theory, there is fluid in the tooth cavity, in the pulp, which is under pressure determined by capillary blood pressure. Normally, dental fluid moves centrifugally at a very low speed. According to M.Branstrom, the founder of this theory, any hydrodynamic effect that changes the intracanal pressure causes a change in the flow velocity of the dental fluid in the dentinal tubules, which in turn mechanically irritates the nerve endings of the fibers, causing pain [5].

In clinical practice, this manifests itself as follows: as a result of thinning or disappearance of the enamel layer, the dentin is exposed, the dentin tubules open, the intracanal pressure changes, and dental fluid flows out of the external openings of the dentin tubules at an increased rate, which causes irritation of the nerve fibers. Next, the tubules become dehydrated and the unprotected nerve endings react with a sharp manifestation of pain to any external influence. Restoration of intracanal pressure (when the dentinal tubules are closed) leads to rapid elimination of pain sensitivity.

Symptoms of Tooth Hypersensitivity:

1. Sharp, sudden pain in the teeth when exposed to cold stimuli (cold air, cold drinks, or cold food).
2. Discomfort or pain when consuming hot beverages or food.
3. Sensitivity to sweet or acidic foods and drinks (e.g., citrus fruits, soda, candy).
4. Pain or tingling sensation when brushing or flossing teeth.
5. Discomfort during biting or chewing hard or crunchy foods.
6. Brief, sharp pain that quickly subsides once the stimulus is removed.
7. Sensation of “electric shock” or sudden jolt in affected teeth.
8. Sensitivity triggered by cold air exposure, such as breathing through the mouth in cold weather.
9. Increased sensitivity after dental treatments such as cleaning, whitening, or filling.
10. Mild to moderate pain localized to one or several teeth rather than the whole mouth.

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11. Sensitivity may worsen if oral hygiene is poor or gums are inflamed.
12. Occasional dull ache or discomfort around the gum line or root surface.
13. Sensitivity can be intermittent or constant, depending on the cause.
14. Teeth may feel hypersensitive to pressure or touch.
15. Sensitivity may interfere with daily activities like eating and speaking.
16. Some patients report heightened awareness of temperature changes in the mouth.
17. Pain can radiate from one tooth to adjacent teeth or the jaw.
18. Sensitivity may increase during or after orthodontic adjustments.
19. Patients may notice increased sensitivity in the morning or after prolonged exposure to stimuli.
20. Sensitivity sometimes causes avoidance of certain foods or drinks, impacting nutrition [6].

Purpose of the study. To investigate the causes and results of treatment of 12 teeth with enamel and dentin hypersensitivity in adolescents with enamel demineralization due to caries in the stain stage, enamel abrasion, and hypersensitivity due to exposure of the cervical region caused by aggressive toothbrushing techniques and the use of highly abrasive oral hygiene products.

Research methodology. Twelve permanent teeth were treated in five adolescents aged 16–18 years, six of which were in the stain stage of caries (50%), 2 teeth had enamel abrasion at the incisal edge (17%), and 4 teeth had cervical exposure with a wedge-shaped defect (33%) [7].

Before starting treatment, we did a thorough oral hygiene clean-up and isolated the teeth from saliva. Teeth with white spots (teeth 11, 21, 12, 22, 31, and 32) due to enamel demineralization were treated with the ICON remineralization system (manufactured in Germany) in accordance with the manufacturer's instructions. The procedure was repeated 3 times at 5-day intervals. Before applying the infiltrate, the necessary area was etched. The process was completed with light polymerization.

Teeth with enamel abrasion on the cutting surface (teeth 11 and 21) and with wedge-shaped defects in the cervical area (teeth 13, 14, 23, and 24) were filled in accordance with the size of the defect and its location, observing all stages of filling. Patients were given recommendations on oral hygiene and nutrition [8].

Research results and discussion. After 4 months, 90% of the results were positive. There were no complaints of tooth hypersensitivity, and no signs of enamel demineralization progression, tooth sensitivity, or pain were detected. There was no reaction to thermal or chemical irritants, as before treatment. The condition of the fillings in most cases (83%, 10 fillings) met the Alfa criterion, which meant no secondary caries and that the fillings met the aesthetic and anatomical-functional requirements for “color,” “anatomical shape,” “marginal fit,” and “surface condition.” Only in two cases (17%) was a Bravo rating given, indicating minor discrepancies in the listed criteria that did not require replacement of the fillings. It should be noted that in these three cases, discrepancies in the color and transparency of the fillings located on the contact surfaces of the teeth were identified [9].

Conclusion. The treatment of tooth hypersensitivity using remineralization therapy and dental fillings is an effective approach to managing and eliminating dental pain. Remineralization helps restore the protective function of enamel, strengthens tooth structures, and reduces their sensitivity to external stimuli. Fillings, on the other hand, repair enamel defects and prevent irritants from reaching the dentin and pulp, thus protecting the deeper layers of the tooth.

The combined use of these methods ensures a sustained therapeutic effect, reduces discomfort, prevents complications, and significantly improves the patient's quality of life. This approach is not only symptomatic but also preventive, as it promotes overall oral health and reduces the risk of recurrence in the future.

Moreover, the integration of individualized treatment plans, regular dental check-ups, and proper oral hygiene practices further enhances the effectiveness of therapy. Continued monitoring and timely intervention allow for early detection of enamel demineralization or filling deterioration, ensuring long-term maintenance of tooth sensitivity relief. Ultimately, a comprehensive, patient-centered approach offers the best outcomes in preserving dental function and comfort.

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