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MODERN ASPECTS OF ETIOLOGY, PATHOGENESIS, DIAGNOSTICS AND TREATMENT METHODS OF INCREASED SENSITIVITY OF DENTAL HARD TISSUES

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Abstract: *A large number of patients go to the dentist with the problem of increased sensitivity of the teeth. The etiological factors that cause sensitivity of the hard tissues of the teeth are very numerous, they can be divided into general and local. A special role in the development of hyperesthesia is assigned to non-carious lesions of hard tissues of the teeth, as well as caries and periodontal diseases. Together with the study of the causes of increased sensitivity of the teeth, new methods of diagnosing this pathology were improved and appeared. The arsenal of means for the treatment of this pathology is increasing, however, one of the most common methods of treatment is a local effect on the tooth. This article presents an analysis of publications covering the issues of epidemiology, etiology, pathogenesis, diagnosis and treatment of hypersensitivity of dental hard tissues in order to update the problem of developing effective methods and means of etiopathogenetic treatment of this pathology.*

Key words: *hypersensitivity of teeth, hyperesthesia of teeth, desensitisers, desensitizing toothpastes, remineralizing therapy*

One of the most urgent problems of modern dentistry is the hypersensitivity of hard tissues of the teeth - hyperesthesia of the teeth, a common pathological condition. It is characterized by an acute pain reaction of dentinal tubules to thermal, chemical and tactile influences. For a long time, domestic and foreign authors conducted research, thanks to which the reasons for the development of this pathology became clear, and ways to eliminate it were developed. Epidemiology, etiology and pathogenetic mechanisms of hypersensitivity of teeth According to epidemiological studies and according to WHO, from 3 to 57% of the population suffers from hyperesthesia of the teeth. It has been established that in Germany 10– 15% of the adult population is seen by a dentist because of this symptom, and in the USA about 20% of the adult population suffer from increased tooth sensitivity [1,3,5].

Data on the age of patients suffering from tooth sensitivity is different: some sources note the most frequent occurrence of symptoms in people over 50 years old, others show a greater prevalence at a young age. The frequency of development of this symptom is closely related to gender, the presence or absence of general somatic pathologies, occupational hazards. According to modern concepts, with a combination of general (hypofunction of the thyroid gland, pathology of the gastrointestinal tract, gastroesophageal reflux disease) and local (excessive consumption of citrus fruits,

carbonated drinks, wine) factors, as well as some non-carious lesions (wedge-shaped defect, pathological abrasion, erosion), caries and periodontal diseases, there is an increased sensitivity of the teeth. According to the literature, complaints of hyperesthesia of the teeth occur in 89– 92% of cases with non-carious lesions of the teeth, in 72– 98% of cases with periodontal diseases [2,4].

A large number of studies have established that concomitant pathology was detected in 69.1% of cases of tooth sensitivity. With non-carious lesions (erosion, wedge-shaped defect), changes in the mineral composition of mixed saliva are noted, the severity of which affects the clinical severity of tooth sensitivity [6,7]. Studies have found a decrease in saliva inorganic phosphate and calcium in patients with enamel erosion. Functional and morphological inferiority, demineralization of the surface layer of enamel occur along the periphery of the lesion with a wedge-shaped defect. Hypersensitivity is one of the first symptoms of tooth wear and occurs in 90% of cases. Microscopic studies have established the presence of destructive changes in the hard tissues of the tooth, which indicate the processes of demineralization in the absence of clinical changes in the enamel, but a registered increased sensitivity of the dentin. The study of ultrastructural changes revealed the presence of cracks between enamel and dentin, as well as compensatory obliteration and hypermineralization of exposed dentin [2.3].

Foci of extensive destruction of hard tissues of the tooth accompany the active stage of tooth erosion, which is confirmed by electron microscopic examination. Hypersensitivity of teeth has always been a rather topical issue for researchers who, studying this pathology, have proposed several theories to substantiate it. The very first of the proposed theories is the theory of odontoblast receptors, the essence of which is the perception by processes of odontoblasts of external stimuli affecting the surface of dentin. The processes of odontoblasts in this case are receptors and transmit impulses to the pulpal region of the dentinal tubules containing the endings of sensory nerves.

The next theory explaining hypersensitivity was the theory of direct nerve endings. She suggests that dentin has its own receptor apparatus, which independently perceives irritation. However, this theory has not received wide distribution due to the fact that the nerve endings occupy only a small part of the dentinal tubules, and this confirms the view that the activation of nerve fibers occurs indirectly. The hydrodynamic theory is generally recognized in our time and the most obvious. The basis of this theory is the permeability of dentin. Due to the peculiarities of the structure and innervation of the pulp of the tooth, when the velocity of the fluid flow changes, pain appears. However, difficulties arose with the explanation of sensitivity in lesions only within the enamel, then a theory was proposed for the transmission of impulses in hard tissues by the propagation of a conformation wave in collagen fibrils.

Methods for diagnosing hypersensitivity of hard tissues of the tooth Researchers have identified two forms of hyperesthesia of the teeth: true and acquired. The true form

is due to the structural features and anatomical features of the teeth, while the acquired form, as a rule, is a consequence of the exposure of dentinal tubules [1,2]. For the diagnosis of hyperesthesia, a method of air indexing is proposed, which consists in using an air jet at a distance of 5 mm for 0.5-1 second. The controlled jet is directed to the area of the neck of the tooth at an angle of 45 degrees [1.2]. To determine the temperature sensitivity, use water at a temperature of 10 degrees, irrigating the examined teeth with a syringe. Sensitivity to mechanical stimuli is assessed by probing. When using a 40% glucose solution, a 5% citric acid solution, as well as a 1% hydrochloric acid solution, the reaction to chemical stimuli is determined.

A fairly large arsenal of tools has been proposed to eliminate the problem of tooth sensitivity. One of the most common methods of treatment is a local effect on the tooth, which is aimed directly at stopping the hydrodynamic mechanism. According to modern concepts, the treatment of hypersensitivity of teeth can be carried out in two directions: desensitization of nerve fibers and obturation of dentinal tubules. The use of a 3% solution of potassium nitrate to desensitize nerve fibers significantly reduces sensitivity within two weeks.

The obturation method is based on the formation of calcium precipitates, which prevent the movement of dentinal fluid by closing the dentinal tubules. With the problem of hyperesthesia of the teeth, according to numerous clinical studies, fluoride compounds in the form of toothpastes, gels, varnishes, rinses are quite effective. A persistent effect of reducing sensitivity (from 8 months to 2 years) is provided by the use of fluoride-containing varnish. Positive results in the treatment of limited forms of hyperesthesia have been achieved with the use of Fluocal. The use of an intraoral fluoride-releasing device has also been proposed. In a number of clinical studies, the method of deep fluoridation has shown high efficiency and stability of results [5].

Positive results are noted when using 3, 25, 30% solutions of potassium oxalate to reduce the sensitivity of dentin. But at the same time, some researchers note a rather short period of remission. Experimental studies conducted on animals have confirmed the possibility of blockade of dentinal tubules with preparations containing hydroxyapatite. During electron microscopic examination, it was noted that the crystals, penetrating into the tubules, block the gaps of the dentinal tubules. It is known that the most effective is the use of hydroxyapatite-containing paste and electrophoresis of 2% sodium fluoride solution. For a long time, researchers have studied the use of adhesive systems to eliminate tooth sensitivity, but the results have been mixed. According to some authors, relapse of hyperesthesia occurs within 12 months in 60-80% of patients. Sufficiently high efficiency is noted in the case of using the Gluma One Bond™ system. Long-term results showed a complete absence of sensitivity after 6 months; after 12 months, sensitivity occurred in 9.7% of cases. In recent years, special preference has been given to dentin desensitizers that have appeared on the dental market, the mechanism of action of which is both to obturate open dentinal tubules and

to reduce the excitability of nerve endings. One of the few studies is an in vitro experiment, which determined the ability of desensitizers to bind proteins.

The results showed that Gluma Desensitaizer was able to bind a large amount of protein. The study using electron microscopy revealed the formation of partitions in the dentinal tubules, which block the movement of dentinal fluid. In experimental studies, the effectiveness of the Optibond Solo dentin adhesive (Kerr, USA) and the Seal&Protect desensitizer (Dentsply) was compared in relation to the hypersensitive surface of erosion of hard tooth tissues. Using scanning electron microscopy, it was found that the Optibond Solo film was gradually covered with cracks throughout the study, passing through the entire thickness of the polymer coating. When using Seal & Protect, no cracking of the coating was observed, but peeling of the coating was observed in the peripheral areas. This study showed that the Seal & Protect desensitizer was more resistant to abrasion than Optibond Solo [4.5].

Conclusion

The importance of understanding the etiology, knowledge of modern methods of diagnosis and treatment of hypersensitivity of hard dental tissues does not lose its importance. Despite a fairly large number of studies, there is still no single scientific method for diagnosing dentinal hyperesthesia, and the most effective drugs for the treatment of this pathology have not been finally determined. A fairly large arsenal of tools has been proposed to eliminate the problem of tooth sensitivity. Given the greatest popularity of the hydrodynamic mechanism in the theory of the occurrence of this pathology, it becomes clear that the most common method of treatment is a local effect on the tooth, which is aimed directly at stopping the hydrodynamic mechanism. According to modern concepts, the treatment of hypersensitivity of teeth can be carried out in two directions: desensitization of nerve fibers and obturation of dentinal tubules. Unfortunately, at the moment, a 100% result in the treatment has not been achieved, which increases the importance of developing new means and methods for eliminating hyperesthesia of the teeth.

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