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THE USE OF DESENSITIZERS IN CLINICAL DENTISTRY: MECHANISMS OF ACTION AND TREATMENT PROTOCOLS

Baymuradova L.R.
Asia International University
e-mail: lobar.baymuradova@gmail.com

Annotation: This article is devoted to the analysis of the role of desensitizers in modern dental practice. The etiological factors of dentin hypersensitivity, the classification of drugs by the mechanism of action, and the clinical efficacy of various groups of desensitizers are considered. Special attention is paid to the algorithm of using these drugs in the treatment of non-carious dental lesions.

Keywords: desensitizers, dentin hypersensitivity, non-carious lesions of teeth, dentinal tubules, hydrodynamic theory.

Introduction.

Dentin hypersensitivity (HD) is one of the most common complaints in outpatient dentistry, affecting up to 40% of the adult population. It is characterized by acute, short-term pain that occurs in response to thermal, chemical, or tactile stimuli.

The main theoretical basis for understanding HD is Brenstrom's hydrodynamic theory, according to which the movement of fluid inside open dentinal tubules activates nerve endings (A-delta fibers) in the pulp.

Hypersensitivity treatment methods include a wide range of technologies, from desensitizers for home and professional use to mechanical insulation of the dentine surface with adhesive materials and even endodontic dental treatment. Desensitizers are specialized drugs designed to eliminate these symptoms by sealing the tubules or blocking the transmission of nerve impulses.

The "ideal" densensitizer must meet the following key requirements: 1) rapid and complete elimination of pain 2) stable effect 3) safety of use 4) a complete set of release forms, including products for both professional and supportive home therapy.

In the dissertation research of E.S. Ulyanitskaya (2007), using the scanning electron microscopy method, it was shown that desensitizers form a protective layer on the surface of the hard tissues of the tooth. Thus, "Enamel-sealing liquid" seals interprismal spaces to a depth of 9.12 microns, is able to penetrate into dentinal tubules to a depth of 5.5 microns", "D/Sense 2" forms a dense heterogeneous layer of crystals of various shapes above the dentinal tubules, "VivaSens" forms a smooth, dense, homogeneous protective layer on the surface of enamel and dentin the layer . A scanning electron microscope examination of the hard tissues of the tooth showed that, under the action of the desensitizer, the entrances to the dentine tubules are obstructed and the structure of hydroxylapatite crystallites is compacted, while the organic components of the dentine are not visible.

Classification and mechanisms of action of desensitizers.

Although many different desensitizers have been proposed to combat dentin hypersensitivity, in fact, none of the forms used meet all of the above requirements. According to the principle of action, desensitizers used in clinical practice can be divided into two groups:

1. Means based on the obturation principle of action. The mechanism of action consists in reducing or completely blocking the lumen of the open dentinal tubules, thereby limiting the degree of fluid displacement in the dentinal tubules, and, as a result, reducing pain response to external stimuli. The effect of obturation is achieved by forming a sealing layer on the surface of exposed dentin. The active ingredients acting according to the obturation principle are different for individual and professional use. Metal salts are mainly used in the composition of desensitizers for home use. Disadvantages such as the slow elimination of hypersensitivity and a

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number of undesirable side effects (for example, the deposition of plaque on teeth) limit the use of this group of products. Of the professional products of the obturation type, fluoride-containing products (gels, varnishes) with a high (more than 1%) fluoride content have become the most widespread, although manufacturers, as a rule, position their sensitivity reduction properties only as an additional secondary effect.

2. Means of reducing the electrical conductivity of the nerve fiber. The principle of action is based on the depolarizing effect of potassium ions, which reduces the conduction of nerve impulses and increases the threshold of pain sensitivity. The effect of desensitizers for home and professional use containing potassium salts (potassium nitrate, potassium citrate, potassium chloride) is based on the principle of reducing the electrical conductivity of nerve fibers. Desensitizers based on potassium salts quickly relieve pain, but their effect is symptomatic, without eliminating the cause of hypersensitivity. As a result, the use of such drugs is not etiotropic, but masking therapy.

Also, according to the data of S.A. Pavlenko (2013), the following 5 groups of desensitizers can be distinguished:

1. Unfilled desensitizers: HurriSeal (Beutlich Pharmaceuticals L. P), USA; Aqua Prep F (BISCO), USA; Hemaseal&Cide Desensitizer (Advantage Dental Products), Inc. USA). They contain NEMA – hydroxymethylmethacrylate, the main component of adhesive systems of early generations, which acts as a wetting agent, thereby preventing the loss of collagen fibers and creating the necessary moisture content of dentin, which prepares the dentin surface for better penetration of the adhesive into the dentinal tubules.

2. Unfilled desensitizers containing NEMA and glutaraldehyde (Gluma Desensitizer (Heraeus Kulzer), Germany; Quadrant FiniSense (CAVEX), the Netherlands). The main component of this type of desensitizers is glutaraldehyde, which causes protein coagulation in the dentinal tubules, while it increases the penetration depth (up to 200 microns).

3. Filled desensitizers containing NEMA (Admira Protect (VOCO) Seal & Protect (Dentsply). Desensitizers of this group contain a nanofiller (particle size approximately 7 nm). In addition, these desensitizers include fluorides and triclosan antiseptic, which reduces the formation of "dental plaque".

4. Desensitizers containing surfactants and weak acid. Desensitizers of this group act as moisturizing agents before applying the adhesive, act as an antiseptic containing fluorides for the prevention of caries, and clean the surface of the hard tissues of the tooth. In the dental market, this group is represented by Tubulicide red and Tubulicide blue (Global dental products, Sweden). They can be used to remove the "greased layer" where etching will not be used, while the dentinal tubules are covered with an amorphous substance.

5. Desensitizers that form complex salts on the dentin surface. By forming a solid film with macrocrystals (oxalates), they block the movement of liquid in the tubules. These desensitizers do not contain toxic substances, they contain the potassium salt of oxalic acid.

The use of desensitizers. Are

desensitizers used for the following diseases?

1. Non-carious lesions: wedge-shaped defect- in the area of the neck of the tooth, the enamel is thinnest or absent, exposing sensitive dentin; enamel erosion - chemical dissolution of the surface layer opens access to the tubules; pathological erasure - with loss of enamel on the chewing surfaces, extensive areas of dentin are exposed.

2. Periodontal diseases: gum recession - when the tooth root is exposed (which is not covered with enamel, but only with a thin layer of cement), there is a sharp sensitivity to temperature stimuli.

3. After professional hygiene. Removal of tartar often "opens" the entrances to the tubules, which were previously blocked by deposits.

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4. Therapeutic treatment: hyperesthesia after bleaching - aggressive oxygen penetrates deep into the tissues, causing temporary edema of the odontoblast processes; postoperative sensitivity - occurs after the filling due to a violation of the hybrid layer or micro-flow.

The methodology of desensitizer treatment. (Protocols)

The algorithm of actions depends on the chemical composition of the drug.

I. Application of salt desensitizers (based on oxalates). Oxalates react with calcium from saliva and dentin to form insoluble calcium oxalate crystals.

1. Cleaning: The tooth surface is cleaned of plaque.
2. Insulation: Thorough drying (adhesion of crystals is impossible in excess of moisture).
3. Application: The solution is rubbed into the sensitive area for 30-60 seconds.
4. Control: Removal of excess, checking the reaction to the air stream.

II. The use of polymer and aldehyde desensitizers (such as Gluma). The most reliable method that creates a deep plug of coagulated proteins.

1. Preparation: Cleaning the surface without using aggressive abrasives.
2. Application: The preparation is applied with a brush to the sensitivity area.
3. Exposure: Waiting for 30-40 seconds for the composition to diffuse deep into the tubule.
4. Drying: Gently inflating with a jet of air until the solvent (usually alcohol or acetone) has completely evaporated.
5. Polymerization: If the desensitizer contains monomers, it is illuminated with a photopolymerization lamp.

Conclusion.

The scientific rationale for the use of desensitizers is based on the principle of "sealing the system". In any pathology accompanied by loss of the integrity of the enamel coating, the desensitizer becomes a necessary biological barrier. This is not just a symptomatic treatment, but the prevention of pulpitis, since open tubules are the entrance gates for bacterial toxins.

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