

PREVENTION AND METHODS OF CORRECTION OF HYPERESTHESIA OF DENTAL HARD TISSUES OF TEETH

Chornij, Nataliya; Boitsaniuk, Svitlana; Stechyshyn, Iryna; Pavliuk, Bohdana*;

Manashchuk, Nadiia; Chornii, Arsenii; Kritsak, Myroslav

I.Horbachevsky Ternopil National Medical University, MaidanVoli 1, 46001 Ternopil, Ukraine

*bohdana.vons@gmail.com

Abstract

Today, periodontal diseases remain an urgent problem in dentistry, one of the symptoms of which is hyperesthesia of dental hard tissues (HDHT), the prevalence of which varies up to 98 %. Most researchers consider HDHT in periodontal diseases as a polyetiological disease, in the pathogenesis of which much attention is paid to both local and general factors. Therefore, the aim was to investigate the range of topical therapies for hard tissue hyperesthesia in periodontitis in the form of toothpastes for treatment and prevention. The design of the research included the collection of data on the range of toothpastes and the pricing policy of the studied category. 25 foreign companies present dental products on the pharmaceutical market of Ukraine. At the same time, domestic producers do not produce these products, having the ability to do so. Of the 155 units of dental care products, only 8 % belong to toothpastes with the effect of reducing the sensitivity of the teeth, which is not sufficient to meet the needs of patients. The price of imported drugs ranges from 0.42 to \$ 11.77, and the purchase of these medical products in a pharmacy is beneficial to the consumer, as professional pharmaceutical care is provided. Given the mechanisms of the disease, a significant increase in the effectiveness of treatment of patients with hyperesthesia can be achieved through a comprehensive approach to eliminating its manifestations, using toothpastes.

Keywords: *hyperesthesia, dental products, periodontal disease, toothpaste*

Introduction

Today, periodontal diseases, which occupy 94 % of all oral diseases, remain an urgent problem in dentistry [1, 2]. One of the symptoms of these diseases is *hyperesthesia of dental hard tissues* (HDHT), the prevalence of which ranges from 1 to 98 % [3], due to population characteristics and diagnostic criteria used in the studies [4]. *Hyperesthesia of dental hard tissues* is prevalent in dental patients aged 20-50 years. Women are reported to have a higher incidence of hypersensitivity than men do, although the difference is not statistically significant [5, 6]. Hypersensitivity can bother patients during eating (sour foods (mostly fruit), sweets and salty foods), drinking and brushing teeth [7]. Studies of patients with hyperesthesia of the hard tissues of the teeth revealed not only its wide distribution but also its incomprehensible nature [4].

Most domestic and foreign researchers tend to consider HDHT in periodontal diseases as a polyetiological disease, in the pathogenesis of which much attention is paid to both local and general factors [3, 8]. According to hydrodynamic theory, stimulation of baroreceptors caused by fluid flow in the dentinal tubules leads to a nervous discharge and is transmitted as a sensation of pain. HDHT, as a rule, has a negative effect on procedures related to oral care [4]. It is proved that disorders of inorganic ion metabolism in periodontal diseases occur both in the alveolar septa and on the surface of the teeth [8, 9]. Therefore, a number of authors believe that an important role in the occurrence of hyperesthesia is played by disorders of inorganic ion metabolism, namely: reduction of Ca, P and Mg in gingival and oral fluids and in the biopsy of hard tissues of the tooth and is the main mechanism of HDHT [10, 11]. Thus, it is clear that a significant increase in the effectiveness of treatment of patients with hyperesthesia can be achieved through a comprehensive approach to eliminating its manifestations, which involves the impact on the general condition of the body, especially metabolic processes in it, and the choice of

optimal means of correction, which include in particular toothpastes.

The aim of the study is to investigate the range of tools for local therapy of HDHT in periodontitis in the form of toothpastes for the treatment and prevention of this disease.

Methods

In conducting the study, we used the method of primary information collection. We conducted a procedure to collect primary empirical information from scientific publications. Data from more than 60 sources were analyzed and summarized, 16 sources of modern foreign literature on the feasibility of treatment and prevention *hyperesthesia of dental hard tissues* was used. The study examines the scientific publications of the last decade, which are available on the Internet the key words were “*hyperesthesia of dental hard tissues*”, “*periodontitis*”, “*periodontitis patients*” and “*toothpastes*”.

The design of the research included the collection of data on the range of toothpastes and pricing policy of the studied category. Information was obtained in pharmacies, online and offline stores, using the method of direct observation. The study provided surveillance of 20 pharmacies, 3 specialized supermarkets. The study was conducted in September 2020. Toothpaste prices have been translated into a single currency - the US dollar according to the exchange rate (National Bank of Ukraine: <https://bank.gov.ua>). The exchange rate on September 1, 2020 was UAH 27.95 (Ukrainian hryvnia) for \$1.

Commonly used methods of descriptive statistics were used for the study.

Results and Discussion

As is known from the studied literature sources, in periodontal diseases there is a noticeable baring of the necks and roots of the teeth, which causes hypersensitivity (hyperesthesia) to various stimuli. It is believed that the baring of dentinal tubules (cement, which covers the dentin, is quickly erased during chewing and brushing teeth) is the main cause of pain [2], which, according to

observations, is the main reason for patients to go to the pharmacy for the selection of toothpastes.

Actually, painful sensation arises owing to influence of microflora and products of its vital activity; acid reaction of saliva; consumption of carbonated water and juices; irritation in case of intensive brushing, etc [2, 12, 13].

But at the present stage of science, the most likely hydrodynamic hypothesis, according to which various effects on the dentinal tubules (temperature, chemical, mechanical) cause rapid movement of the dentinal area, which causes irritation of the free nerve endings in the pulp [2].

Hyperesthesia may gradually disappear on its own due to sclerotization of the dentinal tubules and deposition of secondary dentin by the pulp. Actually, methods of treatment of a hyperesthesia of the exposed dentin of roots of teeth are based on stimulation of these processes [12]:

1) Sealing of dentinal tubules, which prevents the movement of dental cerebrospinal fluid;

2) Reducing the sensitivity of the nerve structures of the pulp to stimuli.

These principles of overcoming HDHT are implemented by:

a) Effects on the central nervous system (analgesics, sedatives, psychotherapy);

b) Blockade or weakening of nerve conduction (anesthetics);

c) Local action of components of toothpastes on hard tissues of teeth [12, 13].

In modern dental practice, use different groups of tools to eliminate HDHT, including toothpaste. For example, to eliminate the hypersensitivity of the hard tissues of the teeth, use the method of deep fluoridation. Sensitive tooth surfaces (crowns, necks, bare roots) are treated professionally in dental clinics with fluoride varnish (for example «Biflu Jen» (JenDental, Ukraine), «Fluor defender» (Cerkamed, Poland), «Ftorlak» (Stoma, Ukraine), «ArdeFlyuoret» (Ardenia, Germany)) or remineralizing solutions: «Zuremin-CaPF» (JenDental, Ukraine), «Tooth mousse» (GC, Japan), «Pomodentu» (Lisichansk Gelatin,

Ukraine) etc. But also in order to reduce the sensitivity of the hard tissues of the teeth, some of these components are contained in toothpastes, which patients are free to buy in pharmacies, for example, «Lacalutfluor», «Lacalut sensitive» (Arcam GmbH.), «Oral-B Sensitive» (Oral-B), Colgate Sensitive Pro-Relief [also marketed as elmex Sensitive Professional], Sensodyne Rapid Relief, the effectiveness of which were confirmed in a double 16-week blinded study [14, 15, 16]. Their use by the patient at home enhances the effectiveness of the treatment or partially replaces it [17, 18].

Among the toothpastes that reduce the hypersensitivity of the hard tissues of the tooth and are available to the public, there are also those that contain compounds of potassium, strontium, aluminum lactate («Lacalutfluor», «Lacalut sensitive» (Arcam GmbH.), «Blend-a-med extra fresh» (Procter & Gamble Ltd.); mineralizing components - salts of fluorine, calcium and phosphorus; hydroxyapatite: «Oral-B Sensitive» (Oral-B), «Colgate total», «Colgate Sensitive» (Colgate-Palmolive), «Sensodyne F» (Block drug company) etc.

In order to objectively evaluate the oral care products available on the Ukrainian market, we decided to conduct a marketing analysis. At the beginning of the study, the number of positions by manufacturing firms was analyzed to determine the coefficient of completeness of the product range (Table I).

As can be seen from the table, as of 2020, 25 companies producing toothpastes, gels and powders are registered on the Ukrainian market. Regarding the completeness of the range of this group, of the 261 oral care products (base quantity) on the market there are only 155, which is 59%. With regard to individual companies, it should be noted that the largest (over 50%) completeness of the oral care product range is characterized by such manufacturers as: Apivita, Dentissimo, Gum, Lacalut, Meridol, Parodontax, R.O.C.S., Sensodyne, Splat, Weleda, Al'pen dent, Henhichel'. However, the following manufacturers have the largest range: Splat, Lacalut, Colgate and Blend-A-Med.

Regarding the distribution of oral care products by country of origin, among the 15

countries whose products are available in Ukrainian pharmacies, the largest share is occupied by Germany 25 %, Russia 26 % and Slovakia 12 %.

Further research consisted in the distribution of dental products according to the clinical effect, the result of which was as follows: 23 % are products that have a whitening effect, 15.5 % - the oral care products with complex action, almost 13 % - products against caries and 10.5 % - products against periodontitis. Unfortunately, antiseptics account for only 8 % of all oral care products, which, according to statistics, is too small.

The next stage of the study was the structural distribution of dental products for the correction of hypersensitivity by form of release, as a result of which we can clearly see that the lion's share among the presented have toothpastes.

Regarding the availability of oral care products that have the ability to reduce tooth sensitivity, only 7 out of 25 companies have these products available. Lacalut and Sensodyne for the correction of dental hypersensitivity presented on the Ukrainian market products with the desired effect in the amount of 17 % and 36 %, respectively.

Regarding the completeness of the range of this subgroup, of the 23 dental products (base quantity) on the market there are only 13, which is 56 %. As for the price of pastes of this subgroup, it ranges from 1.72 to \$ 4.86, thus enabling different segments of the population to use dental products.

Based on the results, we can conclude that the market structure of oral care products is characterized by a capacity of 155 units of foreign production, of which - 93.5 % belongs to toothpastes, of which only 8 % with the effect of "reducing tooth sensitivity", which is not sufficient to meet the demand of patients with such a need. Thus, expanding the range of dental products for the treatment of HDHT is relevant today. Despite the stimulation of market saturation with already known types of personal care products to overcome the HDHT, such as toothpastes, gels, rinses, an interesting direction is the creation of new carriers of active pharmaceutical ingredients [18, 19].

Conclusion

Hyperesthesia of dental hard tissues is one of the symptoms of diseases of the oral cavity, the prevalence of which varies up to 98 %. Given the mechanisms of the disease, a significant increase in the effectiveness of treatment of patients with hyperesthesia can be achieved through a comprehensive approach to eliminating its manifestations, using toothpastes, a wide range of which can be found in pharmacies. On the pharmaceutical market of Ukraine, 25 foreign companies are distributors of dental products. At the same time, domestic producers do not produce these products, having the ability to do so. Of the 155 units of dental care, only 8 % belong to toothpastes with the effect of reducing the sensitivity of the teeth, which is not sufficient to meet the needs of patients. The price of imported dental products for oral care ranges from 0.42 to \$ 11.77, but the purchase of these products in a pharmacy is beneficial for the consumer, as professional pharmaceutical care is provided for a certain category of patients (the elderly, children).

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Table 1. Manufacturers of oral care products are represented on the Ukrainian market.

Nº	Manufacturer	The coefficient of completeness of the product range	Price min, \$	Price max, \$
1.	Apivita	50	9.99	11.27
2.	Aquafresh*	-	-	-
3.	Blend-A-Med	45	0.7	3.01
4.	Colgate	40	0.72	3.71
5.	Dentissimo	75	2.99	11.77
6.	Edel White*	-	-	-
7.	Enjee	25	0.42	0.46
8.	Gum	63	4.79	5.06
9.	Lacalut	77	1.15	3.57
10.	Meridol	100	3.91	4.93
11.	Parodontax	90	1.49	2.50
12.	Pierrot*	-	-	-
13.	President	22	2.27	3.86
14.	R.O.C.S.	56	3.06	5.41
15.	Sensodyne	73	1.33	2.91
16.	Splat	85	0.99	3.73
17.	Weleda	100	6.44	8.07
18.	Ziaja*	-	-	-
19.	Al'pen dent	67	1.72	2.42
20.	Henhihel'	100	6.49	8.70
21.	Ekobiz	50	1.56	1.86
22.	Elixir*	-	-	-
23.	LisovyyBal'zam	33	0.86	0.86
24.	Malavit*	-	-	-
25.	Fitoriya*	-	-	-

*at the time of analysis, these positions were not available on the market

Figure 1. Distribution of dental products by the nature of action and effect.