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# The Use of Tiefenfluorid for Desensitization of Dentinal Hyperesthesia*

SUMMARY

*The aim of this study was to provide clinical results of dentinal desensitization treatment of non-carious defects. 146 patients were treated, who were diagnosed with generalized and local hyperesthesia of the second and third level. The patients were treated with Tiefenfluorid during 2 sessions carried out in interval of 8 days. Level of hyperesthesia and success of the treatment were assessed not only according to patient's complaints but also by using the test-meter for making evaluations in mkA. The opposite tooth side of the same patient, was treated with conventional fluoride gel to serve as control side. The patients were followed up for 2 years.*

*The cases treated with Tiefenfluorid, which included treatment of general dental hyperesthesia, localized hyperesthesia in the tooth necks, as well as treatment of cuneiform defects, resulted more successful compared to the treatment with traditional fluoride gel. The immediate response as well as the long term result was better (it was necessary to perform 10 sessions of traditional fluoride gel treatment and only 2-3 treatments with Tiefenfluorid).*

**Keywords:** Dentinal Hyperesthesia; Cuneiform Defects; Fluoride Gel; Tiefenfluorid

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## Introduction

Dentinal hyperesthesia is a high sensitivity of the tooth's tissues, caused by chemical, mechanical and temperature irritation. Normally, the dentine is surrounded and protected by the enamel, meanwhile in the gingival level it is surrounded and protected by the cementum. Frequently, the cementum covering the roots' dentin is absent or removed by curettage or brushing, exposing dentinal tubules. New toothpastes used for the "tartar and plaque" removal bring dentinal hypersensitivity. The smoothed parts of the dental layer removed by the action of various agents leave the opening of the dentinal tubules unprotected. After being exposed to periodontal surgery, in which many root zones were left bare as a consequence of gingival placement in a more apical direction, hypersensitivity tends to be the most prominent complaint of patients.

The dentinal slab formed and the bacteria which develop an acidic environment in the plaque create a genuine irritation barrier into the dentinal tubules. As a consequence dentine becomes hypersensitive and painful toward exposures such as brush, floss and hand instruments. In such cases, different authors have suggested various techniques to deal with a problem, ranging from the usage of fluoride gels to other liquids containing fluorine. Others go up to the point of the vital pulp extirpation. The aim of this paper is to present results of the clinical treatment of dentinal hyperesthesia with Tiefenfluorid solution and compare its efficacy to traditional methods of treatment.

## Material and Method

146 patients, 49 men and 97 women, aged from 18-70 years, were selected for the study, diagnosed to have local second and third level of hyperesthesia. The main clinical

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sign was pain in the region of the crash, in the consumed parts of the enamel and dentin, with an exposure of the roots in the tooth's neck. Under the influence of various stimuli, such as spicy foods, cold water, air, tactile stimuli etc, pain differed from insignificant sensitivity up to intensive and strong pain. The level of hyperesthesia and success of the treatment were assessed not only according to patient's complaints but also by using the test-meter for making evaluations in mkA (Tab. 1).

*Table 1. Data of the measurement of sensitivity*

| Degree of sensitivity | Test meter (mkA) | Number of patients |
|---|---|---|
| First degree | 5-8 | - |
| Second degree | 3-5 | 90 |
| Third degree | 0.5-2.5 | 56 |

The opposite part of the same patients' jaw served as a control side for comparison. Dental treatments were made through the usage of 2 Tiefenfluorid solutions. Ingredients of the first solution were: magnesium silicate fluorine, copper fluorine silicate, sodium fluoride, and distilled water; the second solution consisted of: calcium hydroxide in high dispersion, methyl cellulose and distilled water.

We conducted approximately 2 sessions in interval of 8 days from one session to the other, for each tooth. At the first session, tooth cleaning was conducted through the usage of a simple brush in lack of abrasive pastes and through isolation of operative field by using cotton rolls. The tooth has to be dried out by warm air and after that, we passed on invoking the first solution with a cotton pellet to the damaged parts of the tooth (Fig. 1).

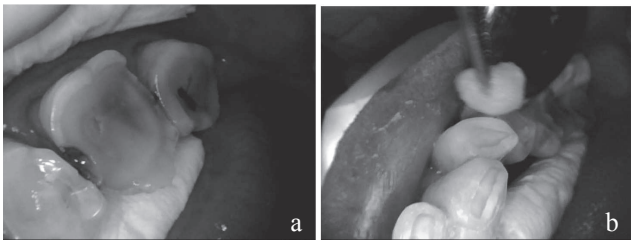


*Figure 1. Keeping the surrounding of the cleaned teeth relatively dry (a), and application of the first solution with a soaked cotton pellet (b)*

After evaporating, we invoked the second solution with the other side of the cotton pellet and left it for a few minutes in contact with the tooth (Fig. 2). After that, we removed the cotton and cleaned the tooth with water (Fig. 3). The second session took place after 8 days, implying the same procedures as the above mentioned. Only in severe cases, we had to undertake a third session.

In the opposite part of the jaw we did perform 10 up to 11 sessions with fluoric gel.

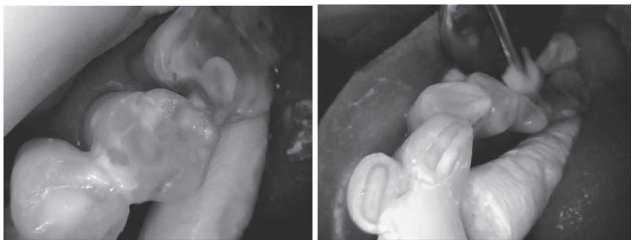

*Figure 2. Immediate application of the second solution.*

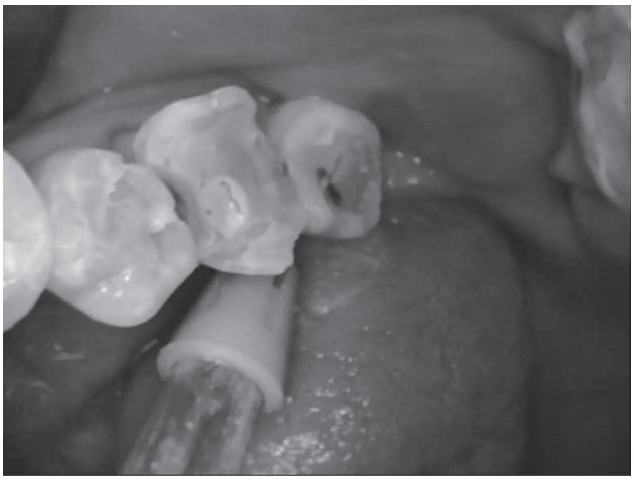

*Figure 3. Rinsing with water*

## Results

The results of the Tiefenfluorid treatment are presented in table 2. To sumarize:

1. 90 cases were stabilized after the 2nd session, in the 2nd grade; they were 100% successful in long term;
2. 56 cases were stabilized during 3rd session, in the 3rd grade; desensitization was achieved in 94.65% of the cases;
3. Sensitivity reduction was achieved with 1.5 MKA after each session, as digitest meter showed[15];
4. This was not achieved with the traditional method of gel fluoridation.

*Table 2. Success of the treatment*

| Degree of sensitivity | Success - Failure (%) | Number of patients |
|---|---|---|
| 2nd degree | 100 - 0 | 90 |
| 3rd degree | 94.65 - 5.35 | 56 |
| 2nd + 3rd degrees | 97.2 - 2.8 | 146 |

## Discussion

Current problems faced mostly in adult patients are the consequence of the fact that, in most industrialized countries, oral hygiene is accomplished through the usage of mechanical devices, such as toothbrush and toothpaste. Naturally, it helps in dental plaque removal, reducing of microbial acids and reducing frequency of caries but, on the other hand, it increases the spread of other cavity forms such as: erosion, abrasion, and exposure of the tooth necks[17]. It is recognized that teeth cleaning with certain toothpastes containing abrasive substances might lead to the loss of the tooth's hard substance. This is particularly noticed in tooth whitening pastes, which are frequently used nowadays[8], which favour enamel demineralisation. Also, the increased intake of carbohydrates and refreshments which contain acids and other compounds[16] leads to the beginning of enamel dissolution and to the abrasion coloured yellow.

The ideal desensitizing agent should not be irritating to the pulp[3]. It should be relatively painless during the application, easy to apply, and it should act fast and have long-term or permanent effects. It should isolate peripheral tubular ends in sensitive dentins. Over the years agents such as Ca $(OH)_2$, formaldehyde and silver nitrate have been tried. Other agents proved to be successful in the tubules isolation are: potassium oxalate, strontium chloride, sodium fluoride, resins and new vinyl, etc[3,14,17].

The effect derived by the varnishes which contain fluorides in teeth hyperesthesia despite meeting the requisites for desensitizing, prevents the hermetic closure of the porous and small canals by the varnish membrane[8]. It should be noted that the varnish cover prevents mainly the remineralisation, by closing the entry of the hydroxyapatite components (calcium ions, $PO_4$, OH/F) damaging in this way even the enamels' parts. Therefore, there are several ways of treating hypersensitive dentins[10,12,13].

A priority in the treatment of dentinal hyperesthesia is to perform dental plaque removal prior to the treatment. After that, the use of Tiefenfluorid seems to be successful, although a placebo effect cannot be excluded to some degree. When applied, the second solution (that includes calcium hydroxide) reacts with the fluorine complex silicate of Tiefenfluorid, even within the small tooth's canals. It is there, where small crystals of calcium fluoride ($CaF_2$), magnesium fluoride ($MgF_2$), little copper hydroxide fluoride and silica gel are obtained. Deep penetration of fluoridation derives from the fact that $CaF_2$ crystals have a size of only 50 $A^o$ ($A^o$ = 0005 μ); due to that fact, they fit well into the small canals of the enamel[4-6]. In combination with too small magnesium fluoride crystals and fluoride crystals, an optimal concentration of fluoride ion can be obtained. This high concentration of fluoride ions causes a very strong physiological remineralisation in combination to calcium, phosphate and some hydroxyl ions from the saliva. This means a precipitation of the apatite even within the small canals of the dental enamel. Therefore, very small crystals ($CaF_2$ and $MgF_2$) embedded in silica gel remain for a very long time in the depths of dental enamel canals.

This process is called true fluoridation in deep penetration as defined above. Compared to the application of sodium fluoride and other types of fluorides, none of the calcium is extracted from the dental mineral. Clinically, it was noticed that during the dentinal hyperesthesia treatment, the effect was quite quick to be achieved and sustainable at the same time. Remineralisation processes, evolve to both enamel and dentin parts. The content of phosphorus and calcium in tissues increase[1,2,11].

Mutual interaction of both liquids with each other resulted in enamel holes that were than filled by crystals of calcium fluoride, magnesium fluoride, which were polymerised and created an alkaline environment. Fluoride crystals remain into the pores for several months, from 6 months to 2 years[7,9,11,14].

## Conclusions

Strengthening remineralisation processes is an important task not only for fighting caries, but also for avoiding the abrasive phenomenon. Tiefenfluorid gives a fast desensitizing and remineralizing effect in the enamel, as well as in the dentine hyperesthesia. At the same time, the fluoric gel brings to an improvement of the hypersensible dentine, which lasts appropriately long.

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