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Article

Treatment of Wedge-Shaped Tooth Defect with the Symptom of Hypersensitivity

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Abstract: A wedge-shaped defect leads to the gradual loss of hard dental tissues and is characterized by pain. Most often, patients complain of pain and an aesthetic defect, both of which negatively affect their psycho-emotional state and quality of life. This issue remains relevant, since the effectiveness of available medications is not always sufficient, or they may be too expensive. Therefore, the search for adequate means and methods of treatment is highly important. In Ufa, wedge-shaped defects and the associated symptom of dental hypersensitivity account for 5.65% and 63.0%, respectively, of the total number of dental patients. Analysis of questionnaires revealed a correlation between sociological parameters (sex, age, profession) and patient quality of life. Positive changes in all clinical manifestations are observed as a result of comprehensive treatment.

Keywords: Wedge-Shaped Tooth Defect, Dental Hypersensitivity Symptom, Comorbidities, Quality of Life, Comprehensive Treatment

Introduction

Wedge-Shaped Defect (WSD) is an isolated form of non-carious lesion of the hard dental tissues in the cervical area. The development of a wedge-shaped defect leads to a gradual loss of hard tissues and is characterized by pain of varying intensity, provoked by different types of stimuli (thermal, tactile, chemical) [1]. It is generally accepted that every fifth adult has experienced dental hypersensitivity [2], [3]. Studies conducted in Russia show that 3–57% of the adult population suffer from hypersensitivity. The relevance of this issue is further supported by the fact that 78.8% of patients are of working age [4].

Most often, patients complain of an aesthetic defect and pain, both of which negatively affect their psycho-emotional state and quality of life. In addition, in such patients, pain during tooth brushing reduces the level of oral hygiene, thereby increasing the risk of other oral diseases. Therefore, the elimination of dental hypersensitivity (DH) is one of the main objectives in the treatment of wedge-shaped defects.

The etiology of hypersensitivity involves multiple factors. The leading ones include both systemic and local causes. Systemic factors involve general health conditions: metabolic disorders, neuropsychiatric and endocrine dysfunctions, disturbances in the mineral composition of hard dental

tissues, the condition of the neurovascular apparatus of the tooth, occlusion, as well as lifestyle, working conditions, and diet [5].

Local factors contributing to the development of hypersensitivity of hard dental tissues include: frequent consumption of fruit juices and citrus fruits, mechanical damage to enamel and cementum by hard toothbrushes and abrasive toothpastes, exposure of teeth to acids, sugars, and radiation, all of which promote demineralization of hard dental tissues [6]. Hypersensitivity is accompanied by demineralization, which reduces the resistance of hard tissues to the effects of various adverse local factors [7].

Thus, the influence of diverse systemic and local risk factors on the development of wedge-shaped defects and dental hypersensitivity implies the need for a more comprehensive assessment of the quality of life of patients with this pathology and the development of new diagnostic criteria and therapeutic-preventive approaches.

Currently, a wide variety of agents are available for reducing dental hypersensitivity. Nevertheless, this issue remains relevant, since the effectiveness of the proposed methods is not always high, or they are prohibitively expensive. Therefore, the search for adequate therapeutic approaches that can enhance the resistance of dental hard tissues under hypersensitivity conditions is of great importance [8], [9], [10].

In this context, studies based on the use of nanosized hydroxyapatite Nanofluor in the complex treatment of non-carious dental lesions are particularly relevant and may help improve both treatment effectiveness and quality of care [11], [12].

The aim of our study was to optimize the diagnosis and treatment of wedge-shaped tooth defects with the symptom of hypersensitivity.

Materials and Methods

To assess the prevalence of wedge-shaped tooth defects, we conducted a retrospective analysis of 75,200 outpatient records of patients who had sought care at dental polyclinics in Ufa. In patients diagnosed with wedge-shaped defects, medical history and the presence of comorbid conditions were evaluated.

At the second stage, we examined 94 patients with wedge-shaped defects accompanied by dental hypersensitivity. To evaluate the effectiveness of comprehensive treatment, we formed a study group of 47 patients and a control group of 47 patients.

The study group included 31 women (66.0%) and 16 men (34.0%) aged 22–78 years, with a mean age of 52.1 ± 14.7 years. The control group consisted of 47 patients aged 22–73 years, including 30 women (63.8%) and 17 men (36.2%), with a mean age of 48.2 ± 13.3 years. Both groups were homogeneous by age (coefficient of variation 28.3% and 27.7%, respectively). Group comparability and treatment effectiveness were determined by statistical analysis.

Statistical processing of the obtained results was carried out using Microsoft Excel and *Statistica 6.0* software in the MS Windows environment.

The examination of patients with wedge-shaped defects and hypersensitivity symptoms was performed according to the classical scheme, which included basic and additional diagnostic methods.

- **Basic methods:** patient interview, medical history, and clinical examination.
- **Additional methods:** electric pulp testing (μA) using an *Averon* device, assessment of the tooth response to air using the *Schiff Air Index* (scoring system), and evaluation of oral hygiene status according to the *Green–Vermillion Index*.

When collecting medical and dental history, we used a self-designed questionnaire. Since the main complaint in wedge-shaped tooth defects is dental hypersensitivity, one of the primary objectives of treatment was to eliminate this symptom [13].

In the study group, we used *Nanofluor* — a bioactive fluoridating varnish manufactured by *Vladmiva*. The following protocol was applied: the tooth surface was first cleaned of soft dental plaque

using a brush and professional fluoride-free polishing paste, and then dried with an air stream before application of *Nanofluor*.

The *Nanofluor* varnish was applied in three layers, with each layer carefully dried. Reapplication of the varnish was carried out during the next visit, 1–2 days later.

The comprehensive traditional treatment protocol in the second (control) group included the management of dental hypersensitivity using *Gluftored* (Vladmiva). The tooth surface was also preliminarily cleaned of soft plaque with a brush and professional fluoride-free polishing paste, followed by drying with an air stream. Liquid No. 1 was then applied, with each layer thoroughly dried. The surface was rinsed with water, dried with an air stream, and then abundantly wetted with the solution. After one minute, the excess solution was removed, and a calcium hydroxide suspension was applied to the treated surface. After another minute, the surface was rinsed with a water stream. To consolidate the achieved effect, the procedure was repeated after 2 weeks.

All patients were examined by an orthodontist and a periodontist, and treatment was provided when necessary. Patients were followed up dynamically at 1 month, 3 months, and 6 months.

Results and Discussion

As a result of the retrospective analysis of the prevalence of wedge-shaped defects and dental hypersensitivity, we obtained the following data: wedge-shaped defects were found in 5.65% of patients, and dental hypersensitivity in 63% of those who sought dental care in Ufa (Table 1).

According to our findings, wedge-shaped defects are more common in women aged 60 years and older (1.9%), with a predominance among women (74.7%) compared to men (25.3%) in this age group. Dental hypersensitivity was observed both as a symptom associated with wedge-shaped defects and as an independent condition.

Dental hypersensitivity was reported in 63.57% of patients seeking dental care, of whom women accounted for 64.74% compared to 35.26% men [14]. Thus, this condition affects all age groups, including individuals of working age (35.2%). The presence of hypersensitivity symptoms and impaired aesthetics significantly reduce patient comfort and consequently lower their quality of life.

The results of the study demonstrate a clear correlation between wedge-shaped defects and certain comorbidities. Among the patients with this pathology, 47% presented with periodontal disease, 21% with various cardiovascular disorders, while the remaining 32% had conditions of the endocrine, skeletal, or gastrointestinal systems.

Analysis of the patient questionnaires revealed several risk factors for dental hypersensitivity. Specifically, 25.3% of respondents reported using whitening toothpastes, 3.71% associated hypersensitivity with professional tooth whitening procedures, and 19.1% had multiple carious lesions. Nearly half of the patients (46.51%) with symptoms of dental hypersensitivity were undergoing periodontal treatment for inflammatory periodontal diseases of varying severity, while 5.38% were receiving orthodontic treatment.

Analysis of Results

A comparative analysis of the condition of patients in the main and control groups before treatment allows us to conclude that the null hypothesis is accepted, i.e., the results of EOD (electroodontodiagnostics) are homogeneous across the groups, and the condition of the patients is practically identical.

The mean EOD values were: **3.4255 ± 1.2466** in the main group and **3.3830 ± 1.0745** in the control group. The most frequent value (mode) was **3 μA** in both groups. The results of probing and thermometry were also homogeneous between the groups, with the most frequent value (mode) being **3** in both groups, i.e., sharply painful.

The mean Schiff air index values were: **1.7872 ± 0.6896** in the main group and **1.8298 ± 0.6365** in the control group. The most frequent value (mode) was **2** in both groups.

The effectiveness of the therapy was assessed over time according to all categorical indicators at **1 month, 3 months, and 6 months**. As a result of the comprehensive treatment, we observed positive dynamics in all clinical manifestations in both the main and control groups [15]. In the main group, the EOD indicators remained stable throughout the entire study period, while in the control group a tendency toward a decrease in these indicators was noted after 3 and 6 months.

Results of All Tests

The results of all tests indicate that **six months after treatment**, the condition of patients in the main and control groups is no longer homogeneous and differs in clinical parameters, particularly in EOD and Schiff air index values.

Conclusion

Based on the results obtained, we determined that wedge-shaped defects and the associated symptom of dental hypersensitivity occur in Ufa in 5.65% and 63%, respectively, of all dental patients. It was also found that WSD and hypersensitivity symptoms are more common in women (64.74%) than in men (35.26%).

A clear correlation was observed between wedge-shaped defects and hypersensitivity with comorbid conditions: 47% of patients had periodontal disease, 21% had cardiovascular disorders, and to a lesser extent, patients had pathologies of the endocrine, skeletal, and gastrointestinal systems.

Statistical analysis showed that the greatest differences and improvements in the main group compared to the control group were observed in EOD and Schiff air index values. Standard deviations decreased across almost all parameters, indicating the consistent effectiveness of the treatment method in the main group in promoting patient recovery.

It should be noted that highly significant differences were observed between time points in clinical assessments (mean ranks differed, with significance levels within acceptable limits). Furthermore, temporal clinical assessments were more consistent in the main group (indicating minimal variations over time in clinical parameters) and less consistent in the control group (indicating greater changes over time).

Thus, the results of all tests indicate that before treatment, the condition of patients in the main and control groups was homogeneous and did not differ in clinical parameters. The treatment protocol developed in this study allows for the achievement of sustained remission of the disease based on the evaluated clinical criteria.

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