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Article

Diagnosis and Treatment of Wedge-Shaped Defects of Hard Dental Tissues

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Abstract: A wedge-shaped defect is considered a non-carious lesion of the tooth because it is not caused by cariogenic microflora. Until recently, there was no unified theory explaining the origin of this condition. The restoration of dental tissues with such defects presents certain difficulties, as it requires a special approach to cavity preparation and treatment, as well as a correct choice of filling material. It is also necessary to take into account systemic diseases that can influence the process of hard tissue loss.

Keywords: Wedge-Shaped Defects of Hard Dental Tissues, Classification, Treatment of Wedge-Shaped Defects

Introduction

In recent years, the incidence of non-carious diseases of hard dental tissues has significantly increased. One such condition is the wedge-shaped defect of the teeth [1], [2], [3]. According to various authors, the prevalence of wedge-shaped defects among the population in the 1960–1980s ranged from 8% to 22% [4], while in recent years it has increased to 75–83% [5], [6], [7], [8].

Various nomenclatures are used to describe non-carious lesions of hard dental tissues. In some sources, the term *"wedge-shaped defect of the teeth"* is interpreted as *"cervical defect of unspecified etiology"* [9]; in others, as *"non-carious cervical defect"* [10] or *"wedge-shaped cervical erosion"* [11]. The term *"wedge-shaped defect"* refers to the geometric form of the lesion. It is characterized by the loss of hard dental tissues in the shape of a wedge formed by two planes, with the apex directed toward the tooth pulp.

Materials and Methods

According to the classification proposed by **A.S. Burlutsky (1984)**, three forms of wedge-shaped defects are **distinguished**:

1. **Cervical** – localized at the enamel-cement junction, develop slowly, occur in about 50% of cases (most often affecting premolars);
2. **Coronal** – localized on the crown surface, develop rapidly, occur in about 20% of cases (most often affecting the incisors and canines of the upper jaw and premolars of the lower jaw);
3. **Root** – localized at the enamel-cement junction and extend toward the root, occur in about 30% of cases (most often affecting the incisors and canines of the upper jaw and the first molars of the lower jaw).

According to **S.M. Makhmudkhanov's classification** of wedge-shaped defects, four groups are distinguished:

1. **Initial stage** – no visible tissue loss; increased sensitivity to stimuli is observed.
2. **Superficial wedge-shaped defects** – tissue loss visible as slit-like enamel lesions, accompanied by increased hypersensitivity of the cervical area (depth up to 0.2 mm; length 3–3.5 mm).
3. **Moderate defects** – formed by two planes at an angle of 40–45 degrees (depth 0.2–0.3 mm; length 3.5–4 mm).
4. **Deep defects** – involving the parapulpal layers of dentin (depth over 0.3 mm; length from 5 mm).

Wedge-shaped defects of hard dental tissues are illustrated in Figures 1–4 in the insert.

A **morphological classification** of wedge-shaped defects of hard dental tissues has been developed [12]:

1. Type A – Cervical.
2. Type B – Root.
3. Type C – Coronal.
4. Type D – Cervico-coronal.
5. Type E – Combined form.

Results and Discussion

Recently, combined forms of wedge-shaped defects have often been observed, occurring together with **other** pathologies of hard dental tissues of both non-carious and carious origin [13].

There are various theories explaining the development of wedge-shaped defects of the teeth. One is the **mechanical abrasion theory**, which attributes the condition to excessive brushing with a hard-bristled toothbrush or the use of abrasive toothpastes. These factors may act together or independently [14].

The **erosive theory** suggests that wedge-shaped defects result from excessive consumption of acidic foods and beverages. Another hypothesis proposes that the condition is associated with impaired mineralizing function of saliva, as enamel demineralization begins at a salivary pH of 5.5 [15].

Although wedge-shaped lesions of the teeth have been known for a long time, there is still no unified view on the main mechanisms of this pathology (Burlutsky A.S., 1988; Tsimbalistov A.V., 1999; Golovatenko O.V., 2009; Tyas M.J., 2002). Borovsky E.V. and Leus P.A. (1971) considered the relationship between wedge-shaped tooth defects and gastroenterological pathology. It is also known that diseases of the gallbladder and biliary tract play an important role in the development of wedge-shaped defects due to changes in the composition of gingival fluid [16].

Studies have also shown a connection between wedge-shaped defects and gastroesophageal reflux disease (Barlett D.W. et al., 1996). Endocrine disorders likewise influence the development of this condition [17]. In addition, when examining wedge-shaped defects, attention should be paid to occlusal disturbances, dentoalveolar anomalies, temporomandibular joint disorders, masticatory muscle pathology, and improperly modeled occlusal surfaces of fillings, crowns, or fixed and removable prostheses [18].

In the works of Grippo J. et al., the mechanism of interaction between **abfraction**, **corrosion**, and **abrasion** is described [19].

Thus, the development of wedge-shaped defects leads to the gradual loss of hard dental tissues, accompanied by pain caused by thermal, chemical, and mechanical stimuli [1]. Most often, patients complain of an aesthetic defect and pain. Because of pain, their level of oral hygiene decreases, which increases the risk of other oral diseases. Therefore, **hypersensitivity** in wedge-shaped defects occurs in **82–90%** of cases and is most pronounced in young and middle-aged individuals.

A wedge-shaped defect may be **single or multiple**, often located on **symmetrical teeth** [20]. Differential diagnosis should distinguish this condition from **superficial and moderate caries**, **erosion of hard dental tissues**, and **cervical enamel necrosis**.

Treatment of wedge-shaped defects should be properly **differentiated** depending on the stage of the lesion. It is necessary to identify the **etiological** and **predisposing factors** that caused the damage and to study the patient's medical history. After analyzing all these factors, treatment planning can

begin. Depending on disease progression, **remineralizing therapy**, **therapeutic**, or **prosthetic treatment** may be used.

Remineralizing therapy is carried out by introducing microelements into the dental tissues to saturate the demineralized surface layers of enamel and dentin. This includes agents that **seal dentinal tubules**, **block nerve impulse transmission**, **fluoride-containing varnishes**, **desensitizers**, and **desensitizing toothpastes**.

All treatment measures must begin with **professional oral hygiene**, performed according to standard clinical protocols.

The use of desensitizers is necessary to eliminate pain sensations.

This is achieved by:

a. Reducing the excitability of the terminal branches of nerve fibers surrounding the odontoblasts;
b. Preventing fluid movement within dentinal tubules by sealing their open ends.

The most commonly used agents include: *"Gluftored," "Enamel-Sealing Liquid," "Dentin-Sealing Liquid," "Gluma Desensitizer," "All Bond 2,"* and *"Fluorlac."*

Effective desensitizing toothpastes include *"Colgate Sensitive Pro-Relief," "Sensodyne Fluoride," "Oral-B Sensitive Original," "Oral-B Sensitive with Fluoride,"* and *"Blend-a-med."*

It is essential to educate the patient on proper tooth-brushing techniques using an appropriately selected toothpaste and toothbrush, as home oral hygiene forms the foundation for both treatment and prevention of dental diseases.

In cases of extensive hard tissue lesions, **therapeutic and prosthetic treatment** is indicated. Restoration of wedge-shaped defects should be performed using **modern light-curing materials** such as *Filtek Supreme XT, Filtek Supreme XT Flowable, Filtek Flow,* and *Vitremer*—materials with a high elastic modulus.

Tooth preparation for wedge-shaped defects must correspond to the **topographic features** determined by the morphology of the lesion. To achieve optimal results, it is recommended to prepare dentin to a depth of up to **1 mm** and excise clinically intact enamel along the periphery of the lesion to **3–5 mm** [21].

This method is based on the premise that the **morphofunctional inferiority** of enamel and dentin in the area of a wedge-shaped defect contributes to the progression of the lesion and compromises adhesion of composite materials during restorative procedures.

Filling such defects or wear facets **without first eliminating supracontacts** on the affected teeth may lead to unsatisfactory results—specifically, restoration failure and material loss (Vinogradova T.F. et al., 1996).

Conclusion

The treatment of wedge-shaped defects of hard dental tissues should be **differentiated** depending on the size of the lesion, its stage, and the clinical course of the disease. A **comprehensive approach** is essential.

Prior to treatment, it is recommended to collect a detailed **medical history** to identify the patient's **dietary habits**, **associated systemic diseases**, **harmful habits**, and **quality of oral hygiene practices**. Timely **diagnosis** and **elimination of supracontacts** are also strongly advised.

REFERENCES

[1] S. Kh. Abdirakhmanov and Yu. V. Lunitsyna, "Effectiveness of treatment of abfraction defects using various dental materials," *Scientist*, no. 2, 2022.

[2] O. V. Basharova, "Wedge-shaped defect: A brief overview. Analysis of the clinical picture, etiology, and modern approaches to treatment and prevention," 2023.

[3] E. G. Adzhisalieva and O. A. Zalata, "Prevalence and risk factors of bruxism among medical students from India," in *All-Russian Science Days of the Association of Young Dentists – 2020: Conference Proceedings*, St. Petersburg: Nordmedizdat, 2020, pp. 13–16.

[4] Yu. V. Andreeva, "Features of tooth restoration in wedge-shaped defects," *Bulletin of Medical Internet Conferences*, vol. 8, no. 2, pp. 44–45, 2018.

[5] O. I. Spiridonova, G. V. Semenova, O. Yu. Knyazeva, and K. Yu. Ivanova, "Aspects of diagnosis and treatment of wedge-shaped defects," *Innovation. Science. Education.*, no. 47, pp. 2460–2461, 2021.

[6] N. G. Ashurova, M. B. Norova, and M. V. Orifkhuzhaeva, "A modern approach to the treatment of dental hypersensitivity in the postpartum period in women," *Integrative Dentistry and Maxillofacial Surgery*, vol. 1, no. 1, pp. 74–77, 2022.

[7] A. A. Bizyakina, "Non-carious tooth lesions, wedge-shaped defect, erosion, attrition, and jawbone osteoporosis as a consequence of mineral metabolism disorders," *Youth Innovation Bulletin*, vol. 11, no. S1, pp. 422–428, 2022.

[8] S. V. Bolashova, "Clinical and laboratory justification for the use of the erbium laser in the treatment of wedge-shaped defects: A review," *Russian Dentistry*, vol. 12, no. 1, pp. 32–35, 2019.

[9] S. V. Bolashova, "Comparison of the effects of Er,Cr:YSGG laser preparation at different power levels and traditional preparation of wedge-shaped defects on the structure of cervical dentin," *Russian Dentistry*, vol. 14, no. 1, pp. 26–30, 2021.

[10] V. A. Zhurenko and A. E. Karlash, "Study of the prevalence of tooth hypersensitivity among young adults," *Regional Bulletin*, no. 3(59), pp. 10–12, 2021.

[11] A. K. Iordanishvili, O. L. Pikhur, and D. A. Cherny, "Wedge-shaped defects of teeth in adults of different age groups: Remarks on prevention and treatment," *Stomatology*, vol. 96, no. 3, pp. 14–17, 2017.

[12] A. K. Iordanishvili, "Effectiveness of tooth hypersensitivity management and patient compliance – two sides of the same coin," *Periodontology*, vol. 26, no. 2, pp. 159–162, 2021.

[13] N. I. Krikheli and S. V. Bolashova, "A clinical case of using the Waterlase iPlus chrome-erbium laser in the treatment of wedge-shaped defects," *Problems of Dentistry*, vol. 15, no. 3, pp. 19–22, 2019.

[14] R. S. Mirkhusanova and G. E. Ramazonova, "The relationship between dental status in patients with bruxism and systemic pathology," *Ogarev-Online*, no. 13(166), p. 7, 2021.

[15] D. M. Pastukhov, "A modern view on theories of bruxism development," in *Innovative Development of Science and Education: Proceedings of the XI International Scientific and Practical Conference*, Penza: Nauka i Prosveshchenie, 2020, pp. 130–132.

[16] O. S. Gileva, *Increased Tooth Sensitivity (Guidelines)* [*Povyshennaya chuvstvitel'nost' zubov (methodical recommendations)*], 2009.

[17] Zh. A. Rizaev and O. K. Muslimov, "Some aspects of the pathogenesis of non-carious dental diseases and their relationship with hormonal disorders," *Stomatologiya*, no. 3, pp. 95–98, 2017.

[18] L. K. Ibragimova, N. K. Kerimli, M. V. Damirchiyeva, and S. G. Mamedova, "Modern methods of preventing wedge-shaped tooth defects," *Norwegian Journal of Development of the International Science*, no. 82, pp. 36–38, 2022.

[19] Sh. M. Turdiev and D. Sh. Atadzhanova, "Modern problems of preventing dental morbidity," *Biology and Integrative Medicine*, no. 2(30), pp. 16–27, 2019.

[20] G. G. Chistyakova, "Evaluation of microhemodynamic disorders in the dental pulp during restorative therapy of wedge-shaped defects," *Dentistry. Aesthetics. Innovation.*, vol. 3, no. 3, pp. 327–339, 2019.

[21] N. A. Yudina and D. K. Medvedskaya, "Non-carious tooth lesions among the adult population of the Republic of Belarus," in *Achievements in Fundamental and Clinical Medicine and Pharmacy: Proceedings of the 78th Scientific Session of VSMU*, Vitebsk: Vitebsk State Medical University, 2023, p. 61.