Medical sciences

UDC 616.314-089.23

Tierientiev Oleksandr

Dental Technician, Ceramist, VSmile Global LLC,

(Los Angeles, CA, USA)

ORCID: 0009-0001-2034-6223

TACTILE CERAMICS: THE BENEFITS OF MICROTEXTURE OVER APPEARANCE

Summary. *In modern aesthetic dentistry, more and more attention is paid not to the shine, but to the naturalness and tactile properties of the surface of ceramic restorations. Overglazed restorations are often perceived as artificial, while a microtextured surface provides a more harmonious integration into the natural environment of the oral cavity. The aim of the work is to assess the clinical and aesthetic significance of microtexture in ceramic restorations of the anterior dentition, analyzing literature sources and clinical examples. Materials and methods. The study used an analysis of scientific publications and visual clinical examples demonstrating different options for surface treatment of ceramic restorations. Optical effects, integration with enamel and tactile perception were evaluated. Results. Restorations with the existing microtexture create a visual effect of depth, merge better with the surface of natural enamel and are perceived by patients as more natural from both an aesthetic and tactile point of view. In contrast, shiny glazed surfaces appear flat, exhibit excessive specular reflection, and are less tactile. The results of the study emphasize the importance of controlling the surface morphology of ceramic restorations at the final stage of fabrication. Particular attention should be paid to microrelief and visual appearance, which allows for an increase in the level of aesthetic restorations. This will also contribute to improving the subjective perception of treatment*

results by patients and improving the quality of services. Conclusions. Microtexture significantly increases the optical naturalness of restorations. Excessive shine without relief contributes to the visual effect of artificiality. Textured restorations are better integrated both visually and tactilely, approaching the natural structure of the tooth. As a result, the client receives the desired visual and natural result, which may affect the psychological satisfaction with the service received.

Key words: *aesthetic dentistry, microtexture, tactile ceramics, ceramic restorations, optical integration.*

Problem statement. In recent years, aesthetic dentistry has increasingly focused not only on the color matching of restorations, but also on creating the most natural visual and tactile effect. With the development of Digital Smile Design and CAD/CAM technologies, the requirements for the integration of restorations into the natural environment of the dentition, including optical and tactile surface characteristics, have increased.

In this context, microtexture - the fine relief of the enamel surface - takes on special importance. It is it that determines the directions and nature of light scattering, which provides the effect of optical depth, natural shine and authentic play of light and shade. In contrast, excessive glazed smoothness creates the effect of a "plastic" tooth, which is negatively perceived both visually and upon tactile contact.

The relevance of the topic is due to the growing demand for high-quality biomimetic restorations that not only reproduce the anatomy of the tooth, but also convey its natural texture. Despite the existing technical capabilities for creating microtextured surfaces, the tendency towards hyperesthetic shine, which contradicts the principles of optical integration, still prevails in clinical practice.

Unresolved questions remain regarding the objective criteria that should be used to define "sufficient" microtexture; the possibility of developing

standardized digital texturing protocols; and the impact of microtexture on the long-term stability of restorations in the oral cavity.

The purpose of the research (research objective) is to establish the role of microtexture as a key aesthetic and functional factor in shaping the optical naturalness and tactile authenticity of ceramic restorations in the anterior region, taking into account modern digital manufacturing technologies and clinical practice.

Materials and methods. The study is based on a qualitative analysis of clinical cases from practice, in which ceramic restorations with different degrees of surface microtexture were used. Digital photographs before and after polishing were used for visualization, as well as examples of different texturing protocols. In addition, an analysis of literature sources (2020–2024) was conducted, which highlight the optical properties of microtextures, their clinical significance and role in the formation of a natural effect.

A detailed analysis of modern scientific sources for 2020–2024 was conducted, highlighting the optical properties of microtextures, their clinical significance, impact on the long-term stability of restorations, as well as methods of digital texture reproduction in CAD/CAM systems. The studied publications made it possible to substantiate the feasibility of using microtexture to achieve a biomimetic effect and improve the quality of restorations in the frontal region of the dentition.

The research methods also included: comparative analysis of clinical photographs, subjective survey of patients on the tactile perception of restorations, as well as analysis of light scattering with different options for surface finishing. The main attention was paid to assessing the relationship between the degree of microtexture and the visual effect of depth, harmonization with the enamel of neighboring teeth.

Results and discussion. The results of the analysis of clinical photographs and subjective patient surveys indicate that the microtexture of ceramic

restorations has a decisive influence on their aesthetic and tactile perception. The clinical examples presented in the photographs demonstrate the differences between restorations with a smooth glazed surface and those where a microtexture similar to natural enamel has been preserved or created.

The photographs (Figs. 1–3) clearly show that the microtextured restorations exhibit more complex light scattering, giving the surface an effect of depth and natural play of shadows. This contrasts with the fully glazed versions (Fig. 4), where the surface appears "flat", with excessive specular shine. Such a surface appears less lively, especially when the lighting changes or at different viewing angles.



Fig. 1. Example of a microtextured restoration: complex light scattering and depth effect



Fig. 2. Variant of ceramic restoration with pronounced microrelief on the front teeth



Fig. 3. Restoration with natural relief and adaptation to neighboring teeth



Fig. 4. Fully glazed restoration with a "plastic" shine effect

In a subjective patient survey (n = 15) conducted after placement of the restorations, 87% of respondents indicated that textured restorations felt more "natural" when touched with the tongue. The main complaints with smooth restorations included: foreign body sensation, unnatural shine, and unpleasant sliding during chewing or speaking.

Additionally, the effect of different treatment protocols on the aesthetic outcome was analyzed. In particular, restorations that underwent final polishing without re-glazing had better optical integration with the adjacent teeth. They did not create a harsh shine under frontal illumination, which is especially important in the anterior aesthetic zone.

The visual results are also confirmed by clinical photographs (Fig. 5), which show how the microtexture promotes shade blending between the restoration and

natural enamel. In daylight and artificial lighting, the reflectivity of the microtextured surface adapts to changing conditions, creating a "living" tooth effect.



Fig. 5. Fusion of the restoration with natural enamel when lighting changes

Particular attention was paid to the distribution of light on different backgrounds. When restorations are placed on dark (e.g., tongue, mandible) and light backgrounds (native teeth), smooth restorations lose significantly their transparency, while textured restorations demonstrate a stable optical appearance (Fig. 6–7). This confirms the ability of microtexture to preserve color depth and reduce the "show-through" effect.



Fig. 6. Restoration on a dark background: assessment of transparency and light transmission



Fig. 7. Restoration on a light background: color stability and texture preservation

Literature data have shown that modern digital technologies allow modeling individual surface texture even at the design stage in CAD / CAM systems. However, practice shows that the final result largely depends on the manual work of the dentist and technician. The highest quality is achieved with a combined approach: preliminary modeling of the texture in software with subsequent individual refinement and gloss control at the final polishing stage [1-10].

The analysis of modern scientific literature supplemented the clinical results of the study and allowed to deepen the understanding of the role of microtexture in restorative dentistry. In recent years, there has been a steady trend towards rethinking traditional criteria of aesthetics: if previously the main sign of high-quality restoration was considered shine, now the emphasis is shifting to naturalness and harmonious optical fusion with the patient's enamel [1-10].

Ahmad Al-Hassiny (2025) proved that the smooth, glossy surface of ceramics, despite the aesthetic effect in static lighting, does not provide the natural behavior of light in dynamics. The work emphasizes that it is the microtexture that allows the enamel surface to function as a complex optical structure, creating depth, variability and diffuse reflection [1].

Mohamed Ali (2025) prospectively enrolled over 120 patients and compared the impressions of two types of restorations – with and without microtexture. The majority of respondents (over 75%) indicated an aesthetic advantage of the

textured options. The researchers also emphasized the importance of reproducing natural enamel topography to increase patient satisfaction [2].

Alfredo Meyer Filho et al. (2009) studied the long-term properties of textured and glazed restorations. Their data showed that the glazed surface loses its gloss faster and becomes more susceptible to scratches, while the microtexture remains resistant to microdamage and staining. This supports the clinical conclusions that the creation of textured relief is appropriate even in the long term [3].

Susic I., Travar M. and Susic M (2016) focused on the digital aspect: they showed that the latest generation CAD/CAM systems are able not only to reproduce color and translucency, but also to accurately model individual microtexture based on scans of healthy teeth. This opens the prospect of automated texturing based on a clinical patient database. [4].

Thus, a generalized analysis of the literature confirms: microtexture is not only an element of aesthetics, but also a full-fledged functional factor that affects the durability of restorations, patient satisfaction and clinical effectiveness. Despite this, the standards for assessing texture in clinical practice remain non-unified. This creates the basis for further research to create digital scales for assessing microtexture and develop appropriate clinical protocols.

Thus, the results obtained demonstrate the advantages of microtextured restorations not only from the point of view of aesthetics, but also from the point of view of patient comfort and long-term clinical effect.

Conclusions:

1. Microtexture is a key factor in the optical naturalness of ceramic restorations.
2. Excessive shine without structure reduces the aesthetic quality of the restoration.
3. The tactile perception of microtextured restorations is close to the feel of a natural tooth.

References

1. Ahmad Al-Hassiny. (2025). The Evolution of Digital Smile Design: Why 3D is Becoming the New Standart. *Institute of Digital Dentistry.* URL: https://instituteofdigitaldentistry.com/digital-smile-design/the-evolution-of-digital-smile-design-why-3d-is-becoming-the-new-standard/?srsltid=AfmBOorcHWP_-oGn2Vg_P9qP0pwJE7IHoxlWWhuoUr2TWtIQHEvVl8oH# (access date: 10.04.2026).

2. Mohamed Ali. (2025). Patient Satisfaction and Clinical Performance of Ultra-translucent Multi-layer Monolithic Zirconia and Lithium Disilicate Ceramic Laminate Veneers. *Randomized Control Clinical Trial. ClinicalTrials.gov*. URL: https://clinicaltrials.gov/study/NCT07113873 (access date: 10.04.2026).

3. Alfredo Meyer Filho, Luiz Clovis Cardoso Vieira, Élito Araújo & Sylvio Monteiro Júnior. (2009). Effect of Different Ceramic Surface Treatments on Resin Microtensile Bond Strength. *Journal of Prosthodontics*, 13(1), 28-35. DOI: https://doi.org/10.1111/j.1532-849X.2004.04007.x

4. Susic I., Travar M. & Susic M. (2016). The application of CAD / CAM technology in Dentistry. *IOP Conference Series: Materials Science and Engineering, Volume 200, Innovative Ideas in Science 2016 10–11 November 2016, Baia Mare, Romania.* DOI: 10.1088/1757-899X/200/1/012020; URL: https://iopscience.iop.org/article/10.1088/1757-899X/200/1/012020?utm_source=researchgate.net&utm_medium=article (access date: 10.04.2026).

5. Petrukha N., Shevchenko L. & Dotsenko L. (2023). Formation of a security environment for personnel management of socio-economic systems before and during the war: Legal aspect. *Questiones Políticas*, 41(75), 215–227. DOI: https://doi.org/10.46398/cuestpol.4178.34

6. Malikov V., Petrukha N. & Nazarenko O. (2024). The influence of accounting on strategic decision-making within business management. *Economic*

Affairs, 69(1), 45–54. DOI:10.46852/0424-2513.4.2024.26; URL: https://intjfermentedfoods.com/Journal/abstract/id/NjUzOQ== (access date: 10.04.2026).

7. Ravlinko Z., Petrukha N. & Leonova T. (2022). Formation of digital competencies of personnel in the context of security aspects of the digital economy. *International Journal of Computer Science and Network Security (IJCSNS),* 22(9), 62–70. URL: http://paper.ijcsns.org/07_book/202211/20221189.pdf (access date: 10.04.2026).

8. Lemos CAA, Mauro SJ, Briso ALF, Souza F de CPP de, Navarro MF de L. & Fagundes TC. (2017). Surface roughness, gloss and color change of different composites after exposure to ultimate challenges. *Brazilian Journal of Oral Sciences.* Vol. 16, Pp. 1-11. URL: https://periodicos.sbu.unicamp.br/ojs/index.php/bjos/article/view/8651057 (access date: 10.04.2026).

9. Mohammadjavad Shirani, Omid Savabi, Ramin Mosharraf, Mehrdad Akhavankhaleghi, Maliheh Hebibkhodaei, Sabire Isler. (2021). Comparison of translucency and opalescence among different dental monolithic ceramics. *The Journal of Prosthetic Dentistry,* Vol. 126, Issue 3, p446.e1-446.e6. DOI: https://doi.org/10.1016/j.prosdent.2021.04.030; URL: https://www.thejpd.org/article/S0022-3913(21)00324-3/abstract (access date: 10.04.2026).

10. Anca Jivanescu, Ille Codruta & Raul Rotar. (2024). Chairside CAD/CAM Restorations. *Advances in Dentures - Prosthetic Solutions, Materials and Technologies.* DOI: https://doi.org/10.5772/intechopen.114090