



AESTHETIC REQUIREMENTS REGARDING PROSTHETIC RESTORATIONS MADE OF CERAMIC MASSES - PRACTICAL ASPECTS

CAMELIA IONESCU¹, VIOREL PERIEANU², MĂDĂLINA ADRIANA MALIȚA³, MAGDALENA NATALIA DINA⁴, IULIANA BABIUC⁵, IOANA-CRISTINA NEAGOE⁶, CLAUDIA CAMELIA BURCEA⁷, MIHAI BURLIBAȘA⁸, RADU COSTEA⁹, OANA EFTENE¹⁰, RALUCA COSTEA¹¹, SERGIU DRAFTA¹²

^{1,2,3,4,5,7,8,9,10,12} "Carol Davila" University of Medicine and Pharmacy Bucharest, ⁶University of Pitești, ¹¹Private Office Bucharest

Keywords: pressed ceramics, veneers, aesthetic requirements
Abstract: Ceramic masses are the first choice of patients, who want prosthetic restorations to be as close as possible to the physiognomic appearance of natural teeth, but also to their physical and chemical properties. Thus, in this material we tried to present a series of aesthetic requirements, in terms of not only the use, but also the manufacture of fixed prosthetic restorations made of pressed ceramics.

INTRODUCTION

In the last two decades, numerous scientific researches carried out in the dental technology field have led to the elaboration of new biocompatible materials, which satisfy both the requirements of dentists, but also of dental technicians and last but not least of patients.(1-15)

The main purpose of fixed prosthetic restorations is to restore the functions of the dento-maxillary system, but often, for patients, the aesthetic aspect becomes paramount. In modern society, the smile is becoming more and more important. A beautiful smile gives a more pleasant appearance, can rejuvenate a person and significantly influences the first impression. For this reason, the aesthetic aspect of the smile has become essential for patients.(1-6)

A material that meets the aesthetic requirements is represented by ceramic masses, which with their introduction in the dental laboratory, have found more and more frequent use in prosthetic practice.

Ceramic masses are the first choice of patients, who want prosthetic restorations to be as close as possible to the physiognomic appearance of natural teeth, but also to their physical and chemical properties.(1-15)

Thus, in this material we tried to present a series of aesthetic requirements, in terms of not only the use, but also the manufacture of fixed prosthetic restorations made of pressed ceramics.

CASE PRESENTATION

Patient X.N. presented in the dental office, in order to solve some exigencies with a pronounced aesthetic character. The patient wanted a more faithful and harmonious reconstruction of her smile. After performing the clinical examination, the dentist together with the patient, decided that the upper front teeth (1.3 - 2.3) should be restored prosthetically with the help of six E-max ceramic veneers, thus preserving the vitality of the teeth (figures no. 1-3).

Figure no. 1. Appearance of teeth to be prosthetically restored by dental veneers (1.3 - 2.3) - frontal view



Figure no. 2. Study models that present the initial situation of the patient



In the next stage, the actual prosthetic restorations are made, namely the 6 pressed ceramic veneers on 1.3 - 2.3. First, the functional impression of the prosthetic field is made, more precisely of the upper jaw, impression made in a standard tray in 2 stages, with the help of an addition silicone materials of double consistency (figure no. 4).

¹Corresponding author: Viorel Perieanu, Str. Plevnei, Nr. 19, Sector 1, București, România, E-mail: mburlibasa@gmail.com, Tel: +04723 472632
Article received on 11.08.2022 and accepted for publication on 02.09.2022

CLINICAL ASPECTS

Figure no. 3. Diagnostic wax-up performed in the dental laboratory by the method of wax addition



Figure no. 4. Functional impression for making of the 6 dental veneers (1.3 -3.3)



For the best possible control over the marginal closure, a sectional model was made, using the Pindex technique (figure no 5).

Figure no. 5. The appearance of the sectional working model made by the Pindex technique



After the completion of the working model, the actual prosthetic restoration was carried out. The abutments were covered with a layer of colorless spacer, and later the modeling of the wax pattern of the future ceramic veneers was started (figure no. 6).

Figure no. 6. The final appearance on the wax patterns of the future ceramic veneers on the working model



The preparation of the wax pattern for investing was done by positioning wax rods on the vestibular face of the wax

patterns. The diameter of the rod must be between 2.5 and 3 mm, and its length must be a maximum of 6-8 mm. There must be an angle of 45-60° between the rod and the crucible former used for investing. It is recommended that there be a distance of at least 3 mm between the wax patterns of the future ceramic veneers (figure no. 7). Before being placed on the crucible former, the wax patterns are weighed to know exactly how many E-max ceramic ingots are necessary for the press process. At the same time, the specific refractory investment material for pressed ceramics was chosen and used according to the manufacturer's instructions.

Figure no. 7. Placing wax patterns on the crucible former



After setting of the investment material, the mold is placed in the burnout furnace, following the instructions of the manufacturer of the investment material. After pressing process, the mold it is left to cool at a slow pace and the veneers are de-vested using the sandblasting machine (figures no. 8-10).

Figure no. 8. The appearance of de-vested veneers



Figure no. 9. Sectioning of the prosthetic parts from the main rod



CLINICAL ASPECTS

Figure no. 10. Creating internal makeup of veneers



Internal makeup easily reproduces the appearance of natural teeth, and the color is visible before firing and can be controlled. The next step after makeup is to apply the first layer of dentin and build the growth lobes, and between them was added a ceramic mass to highlight them.

The veneers were subjected to firing using the dentin program, at a temperature of 790°C (figures no. 11-12).

Figure no. 11. Appearance of dentinal mass before firing



Figure no. 12. Appearance of dental veneers, after firing of the dentin ceramic mass



During the firing process there are contractions of the ceramic mass, therefore corrective burns will be performed (figure no. 13).

Figure no. 13. Corrective ceramic applied



Using diamond burs, a mechanical texture was applied to veneers. The final stage of creating of prosthetic restorations consists in applying the glaze (figure no. 14).

Figure no. 14. The final appearance of veneers on working model mounted in an average value articulator



DISCUSSIONS

Fixed prosthetic restorations are prosthetic parts made with the help of the dental laboratory, in order to restore the morphology and functionality of a tooth. Among the most important functions that a fixed prosthetic restoration must perform are the following:(16,17)

- to participate in obtaining of multiple, symmetrical and simultaneous occlusal stops, simultaneously and together with the rest of the natural teeth (if applicable);
- to contribute to the efficient sectioning and crushing of food during chewing;
- through the design and quality of their surfaces, to protect the marginal periodontium and to facilitate self-cleaning;
- contribute to maintaining the vertical dimension of the occlusion;
- not to disturb the stopping of the terminal movement of the mandible, during the dental contacts in centric relation;
- meet all requirements, especially at the level of support areas;
- to contribute to maintaining of the shape of dental arches, where they are inserted or which they completely reconstruct,
- to restore the physiognomic aspect etc.

Next, we will present the accomplishment of a prosthetic rehabilitation with the help of dental veneers made of pressed ceramics, insisting mainly on the technological aspects of their manufacture.(18)

Dental veneers made of pressed ceramic are currently an ideal alternative, in situations where the aim is to obtain aesthetic effects as close as possible to the natural. Consequently, they represent the treatment of choice in the case of coronary lesions of the teeth, in the frontal region of the dental arches.(16-18)

In recent years, with the development of modern ceramic masses with superior mechanical parameters, more and more emphasis has been placed on improving the aesthetic appearance (special kits for individualizing restorations), marginal closure, adhesion to hard dental structures and behavior in the mouth.(19,20)

Ceramic masses with increased strength allow a lower thickness of the material and, consequently, a lower sacrifice at the level of dental tissues. Some authors argue that, by a proper relationship between the size of the opaque core and that of the ceramic masses, the optimal combination of strength and aesthetics can be obtained.(20,21)

CONCLUSIONS

Physical appearance occupies an important place nowadays. Therefore, the dental aesthetic requirements have increased and diversified. With the help of technology that has evolved enormously in recent years, we try to reach the beauty standards of patients.

An aesthetic prosthetic restoration requires the

completion of certain steps, such as recording intermaxillary relationships with a facial arch and mounting the models in the articulator, performing a wax-up, followed by mock-up.

The success of an aesthetic prosthetic restoration depends very much on the endowment of the dental laboratory, on the training of the dental technician and the dentist, but also on their good collaboration.

In carrying out the treatment plan and choosing a certain type of prosthetic restoration, certain factors are taken into account, such as: clinical requirements, strength, degree of abrasion of the material, aesthetic appearance etc.

Acknowledgement:

The authors 1, 3, 5, 8 have equally contributed to the work.

REFERENCES

- Gligor MR, Malița MA, Perieanu VS, Costea RC, Beuran IA, Burlibașa M. Aspecte teoretice și practice în tehnologia protezelor unidentare – Parte I. În: *Tendințe moderne în științele biomedicale*, Vol. XX, coordonatori: Gligor MR, Malița MA, Perieanu VS, Costea RC, Beuran IA, Burlibașa M. Editura Matrix Rom, București; 2021. p. 9-153.
- Gligor MR, Malița MA, Perieanu VS, Costea RC, Beuran IA, Burlibașa M. Aspecte teoretice și practice în tehnologia protezelor unidentare – Parte II. În: *Tendințe moderne în științele biomedicale*, Vol. XX, coordonatori: Gligor MR, Malița MA, Perieanu VS, Costea RC, Beuran IA, Burlibașa M. Editura Matrix Rom, București; 2021. p. 154-336.
- Bratu D, Nussbaum R. *Bazele clinice și tehnice ale protezării fixe*. 3rd ed. București: Ed. Medicală; 2011.
- Lăzărescu F. *Incursiune în estetica dentară*. Societatea de Stomatologie Estetică din România, București; 2013.
- Cristache CM, Burlibașa M, Cristache G, Drafta S, Popovici IA, Iliescu AA, Zisi S, Burlibașa L. Zirconia and its biomedical applications, *Metalurgia International*. 2011; Vol XVI (2011), No. 7, p. 18-23.
- Mocuța D, Popovici IA, Burlibașa L, Cristache G, Sfeatcu R, Bodnar T. Impact of the living conditions on population health. *Metalurgia International*. 2009;14:17-19.
- Burlibașa L, Chifiriuc MC, Lungu MV, Lungulescu EM, Mitrea S, Sbarcea G, Popa M, Marutescu L, Constantin N, Bleotu C, Hermenean A. Synthesis, physico-chemical characterization, antimicrobial activity and toxicological features of Ag-ZnO nanoparticles, *Arabian Journal of Chemistry*. 2020;13(1):4180-4197.
- Burlibașa M, Cernușcă-Mițariu M, Cernușcă-Mițariu S, Mițariu M, Malița M. Theoretical and practical aspects related to biomaterials decontamination in dental medicine (with reference to dental prosthetics). *Metalurgia International*. 2013; Vol. XVIII, No. 4, p. 261-267.
- Mocuta D, Popovici LR, Dumitriu AS, Burlibașa L, Ionescu CA, Sfeatcu R. Life quality-condition of social welfare. *Metalurgia International*. 2009;14:62-64.
- Burlibașa M, Muntianu L, Tănase G, Bucur MB, Comes CA, Ionescu CA. Study on microbial contamination of biomaterials in medical practice. *Metalurgia International*. 2010; Vol. XV, Spec. Issue No. 2, p. 163-166.
- Ispas DC, Eftene OA, Burlibașa M, Bucur MB, Tănase G, Cristache CM. Implications of titanium in orthodontics and dental facial orthopedics. *Metalurgia International*. 2011; Vol. XVI, Issue No. 10, p. 72-74.
- Tănase G, Burlibașa M, Muntianu L, Simion I, Bucur MB, Ionescu CA. Testing the antibacterial potential of biomaterials in medical practice. *Metalurgia International*. 2010; Vol. XV, Spec. Issue No. 2, p. 160-162.
- Burlibașa M, Tănase G, Muntianu L, Murgu AI, Teodorescu E, Malița C. Quality of life, a multidisciplinary concept with economic and social impacts in medical practice. *Metalurgia International*. 2010; Vol. XV, Spec. Issue No. 4, p. 88-90.
- Eftimie Totu E, Cristache CM, Isildak I, Yldirim R, Burlibașa M, Nigde M, Burlibașa L. Citotoxicity and genotoxicity assessment of the PMMA-TiO₂ nanocomposites for stereolithographic complete dentures manufacturing. *Revista de Chimie*. 2018; Vol. 69, No. 5, p. 1160-1165.
- Eșian D, Man A, Burlibașa L, Burlibașa M, Perieanu MV, Bică C. Salivary level of *Streptococcus mutans* and *Lactobacillus spp.* related to a high risk of caries disease. *Rom Biotechnol Lett*. 2017; Vol. 22, No. 2, p. 12496-12503.
- Revilla-León M, Sánchez-Rubio JL, Besné-Torre A, Özcan M. A report on a diagnostic digital workflow for esthetic dental rehabilitation using additive manufacturing technologies. *Int J Esthet Dent*. 2018;13(2):184-196.
- Abrera-Crum L, D'Affronte LC, Platia CL, Yimer LK. Challenges in the workflow of a digital diagnostic wax-up: A case report. *Gen Dent*. 2020;68(5):56-60.
- Grabriel JC. Transitional bonding for segmented treatment: A two-phase restorative approach. *Compend Contin Educ Dent*. 2015;36(4):266-73.
- Giannuzzi NJ, Motlagh SD. Full mouth rehabilitation determined by anterior tooth position. *Dent Clin North Am*. 2015;59(3):609-21.
- Calamia V, Pantzis A. Simple case treatment planning: Diastema closure. *Dent Clin North Am*. 2015;59(3):655-64.
- Burlibașa M, Cernușcă-Mițariu M, Burcea CC, Mițariu M, Ferechide D. Halogen compounds – theoretical, physiological and practical aspects regarding the decontamination, disinfection and sterilisation of instruments and biomaterials in dental medicine practice. *Metalurgia International*. 2012; Vol. XVIII, Spec. Issue No. 3, p. 54-57.