

# The implications of modern technological methods of building metal-ceramic prosthesis for teaching performance

Irina Grădinaru, Cristina Gena Dascălu, and Magda Ecaterina Antohe

**Abstract**—The teaching activity of training of the students has a decisive role in the medical activities developing a competitive future for the dental practitioner. The modern restorative dentistry is developing the natural in all aspects, integrating the substitute, the flawless into the dental - somato - facial equilibrium. These issues are analyzed in terms of options for aspects of classic or modern metal-ceramic prosthesis building that students have, this territory is essential to improve formative training in a field of a great practical importance. To better carrying out the teaching performance in clinical and technological territory of metal-ceramic prosthesis for students of Dentistry Faculty in Iasi we conducted a survey targeting the main aspects that influence the final results of metal-ceramic prosthetics. From the results of the questionnaire it is very clear what is the students' orientation to vanguard methods of the fixed metal-ceramic restorations reflected in terms of technology, while the importance of preparing dental and classical methods of making fixed metal-ceramic prosthetic is being taken into account.

**Keywords**— Metal-ceramic restoration, edentulous, technology, dental lab scanner, questionnaire.

## I. INTRODUCTION

**T**HE modern restorative dentistry is developing the natural in all aspects, integrating the substitute, the flawless into the dental - somato - facial equilibrium [1, 2].

In full agreement with the biomaterials used, high performance technology chains were developed, resulting in a considerable improvement of the metal ceramic fixed restorations, giving them flexibility, individuality and an excellent integration into the balance of the stomatognathic system [3, 4].

Progress in the development of these types of restoration structures give patients a high degree of comfort, alleviating a whole suite of dysfunction caused by edentation, provoking the doctor and technician to manage to pick them up at an art of

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prosthetic these prosthetic buildings while respecting the rules that give precision [5,6,7].

Currently we face a wide range of biomaterials, which correlated with the current technologies, lead to substantial improvements in the structure of the fixed prosthesis.

The teaching activity of training of the students has a decisive role in the medical activities developing a competitive future for the dental practitioner [8].

Therefore, how to attract students to achieve excellent results in this area is particularly important to balance the inclination or the applying of classical or modern – a special emphasis on the individualization of returning the applying of these methods depending on the particular clinical situation [9, 10, 11].

## II. AIM

The present study aims to analyze the clinical and technological aspects that decisively influence the clinical purpose reflected in a representative number of clinical cases diagnosed with partial edentation as therapeutically solutions being anchored in the territory of metal-ceramic restorations. These issues are analyzed in terms of options for aspects of classic or modern metal-ceramic prosthesis building that students have, this territory is essential to improve formative training in a field of a great practical importance.

## III. MATERIAL AND METHOD

The factual material was represented by a number of 30 clinical cases diagnosed with partial edentation, bringing together therapeutic building solutions to fixed metal-ceramic prosthetic. To better carrying out the teaching performance in clinical and technological territory of metal-ceramic prosthesis for students of Dentistry Faculty in Iasi we conducted a survey targeting the main aspects that influence the final results of metal-ceramic prosthetics: the parallelism of the preparation of the dental- an essential aspect in achieving the biomechanical preparation of the pack, ways of evaluation of these issues by classical or modern methods, there were also questions about the metallic framework for evaluating the accuracy of execution, the contribution that brings it towards the modern or classical technology reflected throughout the whole technological algorithm, a special attention being paid to rules

for recording colour and their subsequent materialization.

#### IV. RESULTS AND DISCUSSIONS

Later on, after the evaluation of the questionnaires to 98 students from the Faculty of Dentistry Iasi following results were quantified:

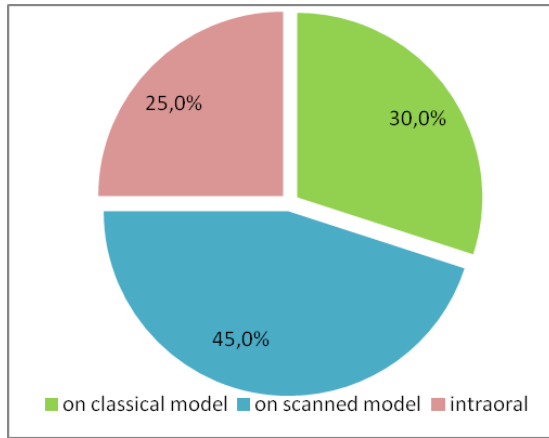


Fig. 1 The efficiency in the parallelism evaluation of dental preparation

The first question had made the assessment of parallelism of the units with dental preparations, a percentage of 30% of students felt that they can achieve performance and can assess the strictness of preparation by analyzing the pattern, the classical method, 45 % have agreed that the vanguard methods respective scanning patterns offer to the preparation a clear picture of parallelism, 25% resting to those who believe that intraoral assessment is sufficient.

The efficiency in evaluation the parallelism of dental preparation is presented in figures no. 1, 2 and 3.

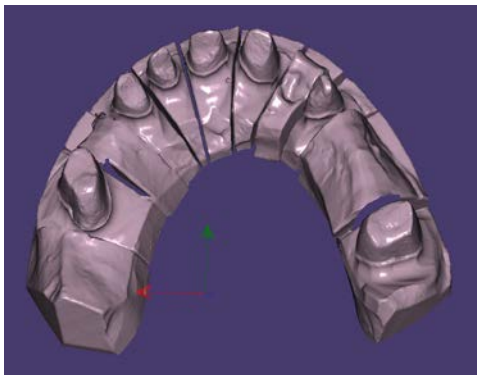


Fig. 2 Modern aspect of scanned model

Regarding the rigors of preparation it is very important to observe that opponents of stump walls thrust will have a minimum occlusal convergence.

The principle of preservation of tooth structure means more than simply avoiding excessive preparation stump. Restoration will be designed to strengthen and protect enamel and outstanding dentine.



Fig. 3 Classical aspects of model

Regarding the second question on adaptation to pack the metal frame, 50% of participants in the survey agreed that the use of modern type processing to pack the metal frame of the restorations, ceramic and metal, lead to an optimal adaptation, 25% felt that a correct preparation, followed by a corresponding indentation is a definite good condition to adept to pack, 25% felt that classical methods lead to very good results (fig. 4, 5, 6).

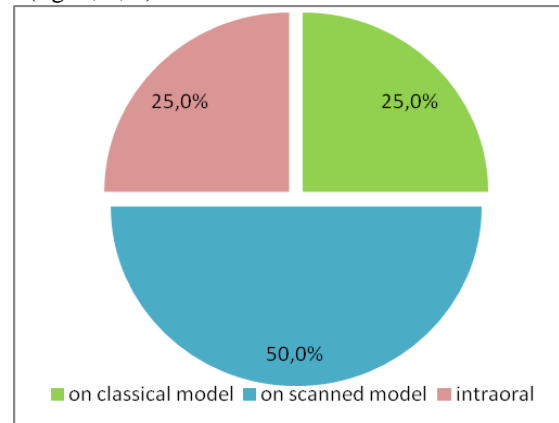


Fig. 4 The evaluation of metallic framework correctness

Dental preparation threshold ensures the best closing and a marginal and highest stability during ceramic firing but has an aesthetic inconvenience due to the blue-gray coloration of the free gum.

- The right threshold provides a metal-ceramic junction head-to-head;
- The chanfrein preparations indicated for teeth with long clinical crowns at the level of the neck of teeth.



Fig. 5 Intraoral aspects of framework

It is clear that the precision of the machining of pack metal frame by laser leads to a very good adjusting given a proper preparation in the pack. It outlines clearly the idea as the cutting edge methods in technologically attract, motivate, but cannot be a substitute for the correctness of the preparation of the pack.

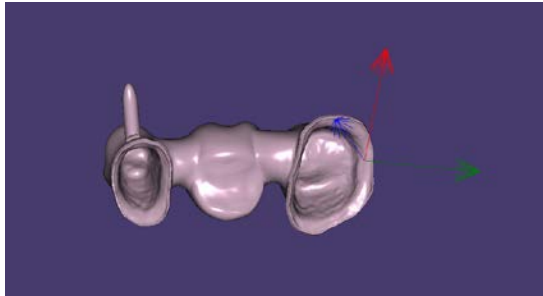


Fig. 6 Aspect of scanned framework

The third question in the questionnaire is focused on how to adapt the metal frame pattern. The 60% of the students pleaded for an evaluation after scanning the model, a total of 20% were partisans of the evaluation of the accuracy of executing the metal frame model based on known criteria, 20% felt that the application of clinical criteria of the evaluation of the metal frame is sufficient (fig. 7, 8).

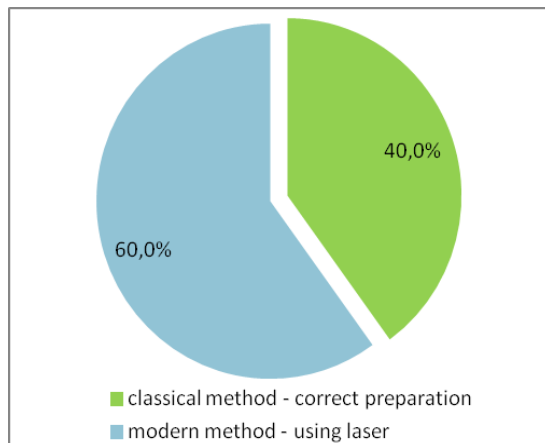


Fig. 7 The evaluation of the adaptation of metal-ceramic prosthetic restoration at the dental neck

This stage of the clinical and technological algorithm is particularly important to conduct the following steps.

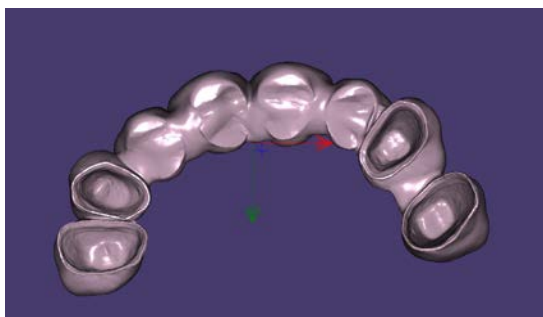


Fig. 8 Aspects of modern method using lab laser

The next question in the questionnaire aims to a classical contribution in the fairness of the final metal-ceramic restorations versus the vanguard methods (fig. 9).

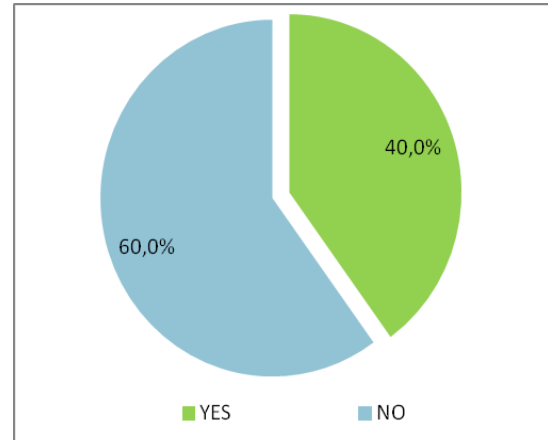


Fig. 9 The vanguard technologies can replace the correct preparation and imprint

Modern methods through the precision and the spectacular aspect caused a 60% to consider them essential in the final success, a percentage of 40% students being convinced of the correctness of the conventional system.

Regarding the clinical and technological algorithm, a percentage of 55% were located modern methods first, while a percentage of 45% have considered that the classical algorithm finds insertion into medical practice dentistry, leading to good results if properly applied (fig. 10).

The notions which are learned the easiest come from:

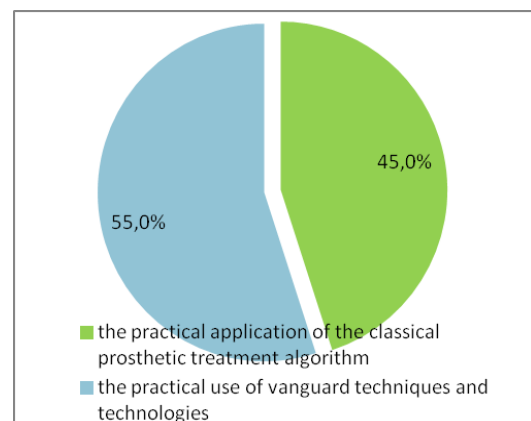


Fig. 10 The prevalence of classic or modern application

Regarding the color determination, this can be achieved in a conventional manner by using color keys and the placement of the identification mark or color of the teeth by computing methods for determining the colors.

The computerized methods are very easy but they have their limits determined by the fact that no corresponding color of the natural teeth can correspond fully to the restorative materials and do not allow quantification of opalescence, fluorescence, which means the requirement of the ability to detect clinically color insertion details that will be

subsequently materialized in the laboratory (fig.11).



Fig. 11 Modern method for color evaluation

Colors characteristics in metal-ceramic technology is represented by three parameters, particularly important that give individuality to any restorations, students must understand and pay special attention to these issues: shade: expresses the family to which the color belongs (red, orange, yellow, green, blue, indigo, violet). In young teeth with permanent dentition, hue tends to be the same for all teeth. With the age, the shade variations occur frequently due to intrinsic and / or extrinsic stain, these individual elements must reproduce in the restoration intensity, it is correlated with nuance and represents its saturation of the capacity, these increasing with the age (fig.12).



Fig. 12 Aspects of color composition

The brightness relatively represents the content in black or white color. The brightness is the most important factor in choosing the color; if it is appropriate, small variations in hue and saturation will go unnoticed.

From the results of the questionnaire it is very clear what is the students' orientation to vanguard methods of the fixed metal-ceramic restorations reflected in terms of technology, while the importance of preparing dental and classical methods of making fixed metal-ceramic prosthetic is being taken into

account, but awareness is essential for students applying individual approach in classical and modern methods of treatment in agreement with the particulars, non-standard of each clinical case.

## V. CONCLUSIONS

Biomaterials and high technology requirement make a decisive contribution in choosing and developing fixed metal-ceramic prosthesis.

A preparation in a didactic performance in the fixed metal-ceramic prosthesis equally requires both knowledge and applying methods of the modern classics as well as treatment.

Essential aspects in the best fixed metal-ceramic restoration mean an individualization of all clinical and laboratory elements related to the basis of clinical and technological choice of an algorithm adapted to the clinical peculiarities.

## REFERENCES

- [1] M. Contrepolis, A. Soenen, M. Bartala, O. Laviolle, "Marginal adaptation of ceramic crowns: a systematic review", *J Prosthet Dent*, vol. 110, pp. 447-454, 2013.
- [2] D.H. Lee, B.J. Lee, S.H. Kim, K.B. Lee, "Shear bond strength of porcelain to a new millable alloy and a conventional castable alloy", *J Prosthet Dent*, vol. 113, pp. 329-335, 2015.
- [3] J.T. Colpani, M. Borba, A. Della Bona, "Evaluation of marginal and internal fit of ceramic crown copings", *Dent Mater*, vol. 29, pp. 174-180, 2013.
- [4] N. Forna, *Prosthetic Dentistry*, Enciclopedica, Bucharest, 2011.
- [5] J.C. Wataha, "Alloys for prosthodontic restorations", *J Prosthet Dent*, vol. 87, pp. 351-363, 2002.
- [6] H. Nesse, D.M. Ulstein, M.M. Vaage, M. Oilo, "Internal and marginal fit of cobaltchromium fixed dental prostheses fabricated with 3 different techniques", *J Prosthet Dent*, vol. 114, pp. 686-692, 2015.
- [7] D. Xu, N. Xiang, B. Wei, "The marginal fit of selective laser melting-fabricated metal crowns: an in vitro study", *J Prosthet Dent*, vol. 112, pp. 1437 - 1440, 2014.
- [8] L. Zeng, Y. Zhang, Z. Liu, B. Wei, "Effects of repeated firing on the marginal accuracy of Co-Cr copings fabricated by selective laser melting", *J Prosthet Dent*, vol. 113, pp. 135-139, 2015.
- [9] K.B. Kim, W.C. Kim, H. Y. Kim, J. H. Kim, "An evaluation of marginal fit of three unit fixed dental prostheses fabricated by direct metal laser sintering system", *Dent Mater*, vol. 29, pp. 91-96, 2013.
- [10] S.H. Suleiman, P. Vult von Steyern, "Fracture strength of porcelain fused to metal crowns made of cast, milled or laser-sintered cobalt-chromium", *Acta Odontol Scand*, vol. 7, pp. 1280-1289, 2013.
- [11] K.B. Kim, J.H. Kim, W.C. Kim, J.H. Kim, "Three-dimensional evaluation of gaps associated with fixed dental prostheses fabricated with new technologies", *J Prosthet Dent*, 2014.