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**IMPLICATIONS OF NON-METALLIC PROSTHETIC
APPROACHES IN THE FORMATIVE ASPECTS OF DENTAL
MEDICINE**

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Abstract

Introduction. Contemporary dentistry is governed by special aesthetic demands based on avant-garde techniques and technologies in conjunction with the type of biomaterials used, all these aspects tailored to the particularities of each clinical case, with the ultimate goal of conferring the individuality of each prosthetic restoration. **The purpose of this study** is to establish the performance criteria in the formative implementation of non-metallic prosthetic theoretical dental medicine, current therapeutical trajectories, the therapeutic decision materializing in a synthesis of an analysis of local, loco-regional and general factors. **Material and method.** Analysis of prosthetic rehabilitation possibilities through non-metallic materials and quantification of the impact of training in dental medicine. **Results and discussions.** The achievement of the aesthetic and functional desires in the nonmetallic prostheses is in full agreement with the specific prosthetic rehabilitation of each clinical case, the importance of knowledge and transposition in the current practice has a decisive role in the formative aspects of dental medicine. Occlusal rehabilitation is a mandatory stage for an optimally established fixed prosthetic therapy and clinically-technologically adapted to each clinical case. Zirconia frameworks can be produced according to two different CAD/CAM techniques. In soft machining technique, CAD/CAM systems shape pre-sintered blocks, which involves machining enlarged frameworks in a so-called green state. **Conclusions.** Non-metallic prosthesis is materialized in a complex approach that brings together both aesthetic, biomechanical and biological aspects, with a spectacular evolution currently in full agreement with the types of biomaterials and technologies, with the permanent face-to-face approach of analogy to digital.

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1. Introduction

Prosthetic treatments have traditionally sought to restore lost function (mastication, phonation, swallowing), while offering aesthetics that meet the criteria of attraction. The requirement for optimal aesthetics is conditioned by both social pressure and dental care. Just a few decades ago, some types of dental restorations, such as fenestra crowns or partial envelope crowns, have been described as aesthetic and, to some extent, the requirement for these restorations remains high. However, at present, the term "aesthetic restorations" refers to ceramic restorations, and in particular to non-metallic ceramic restorations (Aboushelib, Feilzer, Jager, & Kleverlaan, 2008; Bonfante et al., 2009; Cehreli, Kokat, & Akca, 2009). Towards the end of the last century, a dentist and dental industry have a climate of non-acceptance of metal alloys in the oral cavity, and given the growing demand for aesthetic treatments, these factors have led to the development of new re-growth total ceramic prosthetic. For this reason, recent studies have focused on ceramics, seeking restorations to provide optimal aesthetics as long as replacement of ceramic restorations with whole ceramic restorations have similar mechanical strength. Zirconia is a restorative material that exhibits aesthetic properties and satisfactory functionality. Despite manufacturers' efforts to improve its translucency, zirconium transmission does not yet equal that of lithium disilicate. More research is needed to enhance the translucency of the material so it can be used as aesthetic material for crowns made entirely of zirconium (Coelho, Bonfante, Silva, Rekow, & Thompson, 2009; Donovan, 2009; Huang, Thompson, Rekow, & Soboyejo, 2008). Contemporary dentistry is governed by special aesthetic demands based on avant-garde techniques and technologies in conjunction with the type of biomaterials used, all these aspects tailored to the particularities of each clinical case, with the ultimate goal of conferring the individuality of each prosthetic restoration.

2. Problem Statement

Choosing the most powerful material that meets the minimal aesthetic need of the patient simply acquires meaning. Knowing the excellent adaptation, versatile performance and widespread popularity of new generation ceramics, such as lithium disilicate, when the use of monolithic zirconium is most desirable?

Hinged monolithic zirconia crowns (without stratified porcelain) have the potential to last longer than others such as porcelain-fused-to-metal (PFM), as there is no decorative porcelain to delaminate, chip or fracture. Layer porcelain can be added to the brim of zirconium to enhance aesthetics, but the poor adherence of overlapping or pressed layers is an area of clinical failure during the fabrication of the veneer (as is the case with the traditional MFP crown) (Kim, Kim, Myoung, Pines, & Zhang, 2008a; Kim, Kim, Janal, & Zhang, 2008b; Kohorst, Dittmer, Borchers, & Stiesch-Scholz, 2008). The zirconia advances have made the material becomes less opaque and has a more aesthetic appearance than in previous years times. This material cannot be as aesthetic as a high quality PFM restoration made by a skilled ceramist but improvements in aesthetics with zirconia (such as opacity and shades) have enabled zirconium restorations to become an acceptable clinical option in all cases, but also in the most aesthetically difficult situations (Larsson Vult von Steyern Sunzel, & Nilner, 2006; Marchack, Futatsuki, Marchack, & White, 2008). With patients with parafunctional habits for whom there is a doubtful occlusal scheme or signs of occlusal overload may indicate zirconia crowns with total contours, especially when moderate aesthetics are acceptable.

3. Research Questions

The first question that governs this study is represented by :What are the criteria underlying the choice of non-metallic prostheses? Followed by two other key questions, to what extent the formative impact of these prosthetic methods will lead to a performing dental medical practice, namely to what extent can we consider the other types of standard therapies on the verge of extinction

4. Purpose of the Study

The purpose of this study is to establish the performance criteria in the formative implementation of non-metallic prosthetic theoretical dental medicine, current therapeutical trajectories, the therapeutic decision materializing in a synthesis of an analysis of local, loco-regional and general factors.

5. Research Methods

Analysis of prosthetic rehabilitation possibilities through non-metallic materials and quantification of the impact of training in dental medicine. The algorithm of the therapeutic decision anchored in the register of non-metallic rehabilitations is based on a thorough clinical and paraclinical analysis of the local, clinical, biological and odonto-periodontal mucous bony indices, in the context of the assessment of the static and dynamic occlusion, as well as of the particularities of the mandible – cranial relationships. All these elements are correlated with the principles that govern the current esthetic, linking the facial shape, the type of smile and the tooth morphology. In view of optimizing the didactic process and in an attempt to familiarize oneself with the theoretical and practical knowledge of modern methods of functional and esthetic rehabilitation materialized in full ceramic prostheses or ceramic prostheses on zirconium support, a 10 questions questionnaire was elaborated, focused on the maneuvers that arise the student's interest, as well as on the teaching and implementation method used.

6. Findings

The achievement of the aesthetic and functional desires in the nonmetallic prostheses is in full agreement with the specific prosthetic rehabilitation of each clinical case, the importance of knowledge and transposition in the current practice has a decisive role in the formative aspects of dental medicine. Occlusal rehabilitation is a mandatory stage for an optimally established fixed prosthetic therapy and clinically-technologically adapted to each clinical case. In the questionnaires addressed to the students of the five and six years of the faculties of dentistry, over 70% consider particularly the importance of knowledge of rehabilitation methods and techniques through non-metallic restorations, to classical restorations, prompting them to know very well the techniques that practice the actual dental practice, offering added aesthetics and functionality that meet the exigencies of today's society. One significant advantage of full-contour monolithic zirconia restoration is that the preparation can be more conservative than other all-ceramic or even metal-ceramic restorations, with a preparation design similar to that of a full cast gold crown. The amount of space required will vary slightly depending on the detail of occlusal morphology expected in the outcome. The recommendation of specialists for the configuration of the zirconia framework is modifying it by thickening the marginal area. All the recent results indicate that choosing the

zirconia framework in detriment to the classic metallic alloys is the right choice for modern dental practices. Zirconia frameworks can be produced according to two different CAD/CAM techniques. In soft machining technique, CAD/CAM systems shape pre-sintered blocks, which involves machining enlarged frameworks in a so-called green state. The enlarged pre-sintered zirconia frameworks are then sintered in a sintering furnace to their full strength that is accompanied by shrinkage of the milled framework by 25% to the desired dimensions. An eloquent clinical case, illustrated in Figure 01, is the rehabilitation of the frontal area of a 25-year-old patient with carious odon lesions at levels 12,11, 21, 22, in a first stage the wax-up of the future prosthetic rehabilitation was carried out, followed by demock -up, and defend the final rehabilitation of the patient. In the framework of non-metallic rehabilitation, a high degree of difficulty rests with the rehabilitation at the one-sided level, regarding the integration of the future prosthetic restoration at the level of morphology and color integration.



Figure 01. Aspects of non-metallic fixed restauration ceramic on zirconia

Figure 02 offers a clear image of the requirements for restoring a single incisor. Aesthetic expectations of patients are usually very high and the end result is entirely dependent on the dental technician. It is usually necessary for the technician to spend some time with the patient at different stages during the crown making and it is not unusual when the crown is restored if the aesthetic lens is not fulfilled. This factor prolongs the duration of treatment and the patient needs to be aware of this from the beginning. The dentist must understand the technical difficulties and the talent needed to fit a unique crown into a natural underlying tooth as well as the high costs. In addition to preparing dental tissue for the crown, the dentist should facilitate the opportunity of meeting the dental technician with the patient once or more times if necessary. The appointment between the patient and the technician must be at the same time as the patient's appointment. This eliminates any insignificant discussion between the three parties.



Figure 02. Aspects of rehabilitation of single teeth using ceramic on zirconia crown

Another important factor for success in these cases is the provisory crown. A very good temporary crown will immediately satisfy the aesthetic, functional and biological needs of the patient and the dentist. Once this has become accomplished, time becomes a friend and not an enemy and can be used by the dentist and technician to ensure all aspects of the final restoration - good things take time. To use the provisional crown to its full potential, the dentist must ensure that this is the best option in the situation. Failure to do so will be detrimental to treatment and will increase patient anxiety, reduce dental confidence and limit the time available for treatment. Of this the dentist should be able to create a provisional crown with good shape, functionality and colour and be qualified to use materials to allow this.

Another case of grafting as non-metallic prostheses, illustrated in Figure 03, is representative of lateral anodontia . Thus, a representative clinical case is the use of whole ceramic restorations at the level of the canines and they will be transformed laterally through ceramic restorations.



Figure 03. Aspects of rehabilitation of lateral anodontia using all-ceramic crowns

The effort to replace metal in high - strength ceramic metal - ceramic restorations began at the end of the 20th century and have not yet reached a conclusion. Currently, zirconia is the main objective of research and clinical trials. The main features that favour its use as a biomaterial are chemical and dimensional stability, mechanical strength, hardness, and a modulus of elasticity of the same order as stainless steel. Zirconium oxide is f began in 1960. From the beginning, its promising in vitro properties attracted the attention of dental scientists, and in the last decade it has gained increasing importance.

The properties that favor its use in dentistry are biocompatibility, low thermal conductivity, corrosion resistance and high fidelity due to its crystalline microstructure. However, being opaque, it needs to be covered with better ceramic translucency, to improve aesthetics. When the function of both ceramic and metal - ceramic restorations are evaluated over normal time, there are two concepts that are often considered synonymous: success and survival.

Surviving a restoration means that it performs its function in the oral cavity even if it has suffered some additional damage. Success can be defined as a restoration in which it maintains the qualities of the surface maintained intact, the anatomical shape and function, as well as the optimal aesthetics. In fixed zirconium dentures, despite the high fracture resistance of the material, plaque can be fractured during mastication and this is a frequent problem. This complication generates some uncertainty as to the long-term performance of the material in dental restorations. Factors that reduce the resistance of plated ceramic-zirconium restorations and thus increase the risk of fracture are:

- Residual stress due to differences in thermal expansion coefficient (CTE) between zirconium and plated ceramics
- Poor elasticity of the plated ceramics, driving to the engagement of the materials and a low micromechanic concentration
- faulty fabrication (Griffith defects).

In this way, a greater number of mechanical failures arise for: a traditional manual layering of ceramics in place of thermally pressed ceramics, fixed partial prosthesis instead of one-piece prostheses, pre-fabricated restoration. The current literature attends the idea that a zirconium infrastructure should adequately support the ceramic facade.

7. Conclusion

1. Non-metallic prosthesis is materialized in a complex approach that brings together both aesthetic, biomechanical and biological aspects, with a spectacular evolution currently in full agreement with the types of biomaterials and technologies, with the permanent face-to-face approach of analogy to digital, having profound implications at the formative level.

2. Contemporary non-metallic aesthetic restorations represents an avant-garde field that brings together the current evolutionary trends of dental medicine in terms of new techniques and technologies in conjunction with the type of biomaterials used, all these aspects adapted to the particularities of each clinical case, with the ultimate goal of conferring individuality.

3. Non-metallic prosthetic restorations offer optimal aesthetics and functionality.

4. They are in full agreement with modern fingerprinting techniques, as well as CAD-CAM technologies.

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