

USE OF LITHIUM DISILICATE VENEERS AND CROWNS IN ELDERLY PATIENTS: CASE REPORT

Uso de facetas e coroas de dissilicato de lítio em pacientes idosos: relato de caso

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ABSTRACT

Introduction: Dental planning is fundamental in complex rehabilitations, restoring function and aesthetics through fixed metal-free restorations. **Objectives:** The objective of this study was to report an aesthetic and functional biological approach to a complex clinical case, restoring function and aesthetics, reestablishing the vertical dimension of occlusion by replacing tooth loss and an integrative review of the literature. **Case report:** Patient GEF, 70 years old, male, was admitted to the Dental Prosthesis clinic - Funorte, and his main complaint was "my teeth are small and worn out". After undergoing clinical evaluation and carrying out complementary imaging exams (panoramic radiography), the following plan was proposed: upper wax-up; lower removable partial denture (RPD) – increase and restoration of the vertical dimension of occlusion (DVO); single crowns made on dental elements 14, 15, 21, 22, 23, 24 and 25 and Fixed Partial Prosthesis with 3 elements on teeth (11 to 13) Installation of fiberglass posts on elements 13 and 14; Filling and preparation core for full crown and inter-occlusal registration, impression with dense addition silicone followed by fluid addition silicone, wax try-in and cementation. **Conclusion:** Dental planning is essential to achieve favorable results, increasing OVD can be carried out successfully, as long as there is correct diagnosis and planning, the use of metal free prostheses have excellent aesthetic properties, which allows achieving a more natural result .

Keywords: Metal-free prostheses, oral rehabilitation, dental aesthetics.

RESUMO

Introdução: Um planejamento odontológico é fundamental em reabilitações complexas devolvendo função e estética através de restaurações fixas metal free. **Objetivos:** O objetivo deste estudo foi relatar uma abordagem biológica estética e funcional de um caso clínico complexo, devolvendo função e estética, restabelecendo a dimensão vertical de oclusão a partir da substituição das perdas dentárias e uma revisão integrativa da literatura. **Relato de caso:** Paciente G. E. F., 70 anos, sexo masculino, foi admitido na clínica de Prótese Dentária - FUNORTE, e apresentava como queixa principal "meus dentes são pequenos e desgastados". Após ser submetido a avaliação clínica e realizar exames complementares de imagem (radiografia panorâmica) foi proposto o seguinte planejamento: enceramento superior; prótese parcial removível (PPR) inferior – aumento e restabelecimento da dimensão vertical de oclusão (DVO); confecionadas coroas unitárias nos elementos dentais 14, 15, 21, 22, 23, 24 e 25 e Prótese Parcial Fixa de 3 elementos nos dentes (11 ao 13) Instalação de pinos de fibra de vidro nos elementos 13 e 14; Núcleo de preenchimento e preparo para coroa total e registro inter-oclusal, moldagem com silicone de adição densa seguido de silicone de adição fluida, prova em cera e cimentação. **Conclusão:** O planejamento odontológico é fundamental para se alcançar resultados favoráveis, o aumento da DVO pode ser realizado com sucesso, desde que haja um correto diagnóstico e planejamento, o uso de próteses metal free possuem excelentes propriedades estéticas, que permite alcançar um resultado mais natural.

Palavras-chave: SPróteses livres de metal, reabilitação oral, estética dentária.

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INTRODUCTION

Fixed prosthetic treatment such as crowns, fixed dentures, full arch dentures involve the use of several different materials to replace lost tooth structure. Traditionally, all-metal or metal-ceramic structures have been used and recently metal-free prostheses have become common and allowed professionals to better reproduce the natural shape and color of teeth¹.

Following improvements in restorative materials, manufacturing, bonding and cementation techniques, most dentists replaced metal-ceramic crowns with metal-free, composite resin or ceramic restorations².

With the advancement of the development of ceramic materials in the area of dental restoration, their use has increased. Ceramic materials have advantages such as their optical properties, biocompatibility, low thermal conductivity, color stability and mechanical properties. Therefore, dental restoration materials have gradually changed from metal restorations to ceramic materials. Ceramic materials are suitable for dental implants and various restorations, and are used with long-term clinical success. The most commonly used ceramics in the field of dental prosthetics are feldspar porcelain, glass ceramic and lithium disilicate ceramic³.

The introduction of the new generation of particle-reinforced and high-strength ceramics in the last decade has offered an extensive range of dental materials expanding clinical indications

in fixed prosthodontics. Furthermore, in recent years there has been an increase in demand for non-metallic materials by patients⁴. All-ceramic systems, especially zirconia and reinforced glass-ceramic, have a promising future to satisfy both professionals and patients. Technical and biological complications need to be taken into account when deciding to treat edentulism in the posterior areas⁵.

Considering the characteristics and clinical use of metal-free restorations, the objective of this study was to discuss the advantages of metal-free restorations based on a case report and an integrative literature review.

CASE REPORT

Patient GEF, 70 years old, male, was admitted to the Dental Prosthesis clinic – Funorte - MG, and his main complaint was “my teeth are small and worn out”. After taking the anamnesis, the intra-oral clinical examination (Fig. 1) diagnosed the absence of several dental elements, tooth extrusion, attrition, erosion, abrasion with extensive coronal tooth loss in several elements, pathological migration of teeth, loss of the vertical dimension of occlusion demonstrating an occlusal collapse.

Other oral structures covered by keratinized oral epithelium or not, presented normal aspects. Therefore, the following planning was proposed: upper waxing; lower removable partial denture (RPD) – increase and restoration of the vertical dimension of occlusion (DVO);

single crowns made on dental elements 14, 15, 21, 22, 23, 24 and 25 and Fixed Partial Prosthesis with 3 elements on teeth (11 to 13) Installation

of fiberglass posts on elements 13 and 14; Filling and preparation core for full crown and inter-occlusal registration.



Fig. 1 left side view, center and right side view

After initial clinical evaluation, a radiographic examination was requested (Fig. 2) which confirmed the intra-oral clinical findings



Fig. 2 panoramic radiography

The impressions were made with dense silicone followed by fluid addition silicone after removal with gingival thread (Fig. 3), with wax

testing performed for subsequent metal-free and definitive cementation of prostheses..



Fig. 3 Coronary preparations, reestablishing the DVO and retractor wire prior to the impressions

DISCUSSION

Evaluating the effects of metal-free materials for prosthetic restorations compared to metal-ceramic or other conventional all-metal materials, a systematic review state that there is insufficient evidence to support or refute the effectiveness of metal-free materials for fixed prosthetic treatment under metal-ceramic or other standard restorations and dental surgeons should base decisions about which material to use for fixed prosthetic treatment on their own clinical experience, taking into account the individual circumstances and preferences of their patients¹.

Çöttert et al² state that the science and art of dentistry have progressed at breakneck speed and that restorative and prosthetic dentistry can be considered the fastest growing branch due to its close interactions with materials science, chemistry, engineering and computer science.

A systematic review of ceramic materials, conclude that, due to their excellent chemical and mechanical characteristics, they can be used in a wide range of clinical situations with superior aesthetic characteristics to those of other dental restorative materials, but highlight that all ceramic dentures are not recommended when the patient has poor oral hygiene or periodontal disease³.

Zarone et al⁴, in a narrative review of the state of the art in the area of popular ceramic materials, demonstrate that regarding their physical-chemical, mechanical and optical properties, as well as suitable dental applications, through analysis of scientific literature and using their own clinical experience as a reference, they

state that silicate and zirconia-based ceramics are among the most versatile metal-free materials available for the “digital prosthetic environment” and for a rational restorative use, focused on the advantages taking into account the mechanical, optical and biological properties.

Ispas et al⁵ in a bibliographical review of RCTs, prospective cohort studies to evaluate the survival rate and biological and technical complications of all-ceramic and metal-ceramic fixed partial dentures state that all-ceramic systems, especially zirconia and glass-ceramic, have a promising future, however, technical and biological complications need to be taken into consideration when deciding to treat edentulism in posterior areas.

Agustín-Panadero et al⁶ analyzed in vitro the mechanical behavior of five types of full coverage crowns manufactured with different materials and all crowns were subjected to in vitro fatigue by dynamic loading in humid conditions to simulate the chewing forces to which the prosthetic materials are subject to the oral environment. Lastly, fracture resistance was evaluated by static compression tests. They concluded that yttrium-stabilized tetragonal zirconia was the only other material used that matched the fracture resistance achieved by the metal-ceramic control group.

A systematic review and meta-analysis aimed at evaluating the clinical performance in terms of biological, technical and aesthetic aspects and the survival and success rates of single-unit full crowns (SFCs) and fixed partial dentures (FPDs) manufactured by CAD/CAM and conventional techniques and according to

the materials used (zirconia and lithium disilicate) suggest that the biological, technical and aesthetic behaviors presented similar clinical results, with more biological, technical and aesthetic complications being observed in the CAD/CAM group. CAM than in the conventional group with significant difference only in the aesthetic aspects where the limitations of the software in CAD/CAM must be considered to explain the reasons behind the clinical complications⁷.

The clinical performance of SFCs was superior to that of FPDs, and these comparisons were significant for both groups. Both the survival and success rates of the biological, technical and aesthetic aspects for SFCs were higher than for FPDs, and these comparisons were significant for both groups. The clinical performance of lithium disilicate (LD) in all biological, technical and aesthetic aspects was significantly better than that of zirconia (ZC).

Therefore, LD can be a good alternative, but its intermediate or persistent biological, technical and aesthetic complications need to be evaluated and considered when approaching dental restorations. Altogether, currently, zirconia and CAD/CAM techniques must evolve further to surpass the conventional techniques used in the fabrication of SFCs and FPDs. However, more randomized controlled trials and prospective cohort studies are needed to strengthen study results.

Kongkiatkamon et al⁸ with the aim of presenting an overview of recent zirconia dental biomaterials demonstrate that zirconia can be of various types based on yttria content, uniform or hybrid composition, monochromatic

or polychromatic, and monolayer or multilayer. Increased yttria content in zirconia results in greater translucency but reduces strength. Zirconia with lower yttria has better mechanical properties and less translucency.

García-Engra et al⁹ evaluated in vitro the fracture resistance and type of fracture of computer-aided design and manufacturing (CAD-CAM) materials. Discs (10 × 1.5 mm) were made from four test groups (N = 80; N = 20 per group): lithium disilicate (LDS) group (control group): IPS e.max CAD®; zirconium-reinforced lithium silicate group (ZRLS): VITA SUPRINITY®; group of ceramic networks infiltrated with polymers (PICN): VITA ENAMIC®; resin nanoceramics (RNC) group: LAVA™ ULTIMATE. They concluded that the resistance of CAD-CAM materials depends on their composition, with lithium disilicate being more resistant than hybrid materials.

A systematic review evaluated the importance of prosthetic restorative materials in the condition of the periodontium, the changes that occur in the composition of the subgingival microbiota and the levels of inflammatory markers in the gingival crevicular fluid and state that ceramic prostheses free from metal induces less inflammatory response regardless of the manufacturing method; however, it is recommended to use CAD/CAM systems for manufacturing. Furthermore, metal-ceramic prostheses induce changes in the composition of the subgingival microbiota, producing a more dysbiotic biofilm with a greater prevalence of periodontopathogenic bacteria¹⁰.

Alshouibi e Alaqil¹¹ evaluating the masking of cast metallic cores using high opacity e.max ceramic coping in a case report state that the final aesthetic result of all-ceramic restorations is influenced by the underlying color of the abutment, and in cases of metallic cores Using all-ceramic restorations represents a major clinical challenge. In clinical procedures, using the e.max coping to mask the metal core material improves the final aesthetic result and obtains a pleasant smile for the patient.

Nistor et al¹² reviewing current knowledge and scientific data on the use of zirconia in dentistry in order to compare zirconia-based dental restorations with metal-ceramics and also the two types of zirconia-based dental restoration, zirconia veneer or monolithic zirconia, used worldwide to replace metal-ceramic restorations, state that monolithic zirconia restorations demonstrate better mechanical properties, but offer limited reproduction of tooth color, while the final state of the surface and wear behavior still raise some questions, Therefore, further studies and research are needed to improve the wear behavior and optical characteristics of zirconia prosthetic structures to minimize the risk of low-temperature degradation in vivo.

Tasaka et al¹³ present a clinical case of manufacturing a removable dental prosthesis with a double crown combining a composite reinforced with zirconia and fiber using digital technology. The authors describe that the use of digital technologies has provided many advantages, including: 1) efficient fabrication of double crowns during prosthetic fabrication, 2) reduced material costs, 3) increased biocompatibility, and

4) improved aesthetics due to use of metal-free materials.

Cenci et al¹⁴ presented a clinical case of an oral rehabilitation where the treatment considered the loss of hard and soft tissues for a complex rehabilitation with a fixed partial denture (PPF). The six-element all-ceramic PPF was fabricated using a computer-aided design/manufacturing system with zirconia framework, veneered with leucite-reinforced ceramic. They state that although all-ceramic PPFs are widely used in clinical practice, dentists have to consider several aspects of the material to overcome its limitations while taking advantage of its advantages. All ceramic rehabilitations are widespread worldwide, with improvements being launched frequently, requiring further studies to confirm them based on evidence that allows clinical use.

Nayar, Aruna e Bhat¹⁵ demonstrate the successful aesthetic and functional application of this exciting computer-aided design/manufacturing digital zirconia-based system, the authors state that the patient's oral and facial expression depends on the dentist's ability in replacing missing teeth, both in contour and color, especially for anterior teeth.

Walia et al¹⁶ presents a case report where the Procera alumina system was used. The authors conclude that the short-term results achieved in this case indicate the potential value of the Procera system in creating restorations with excellent marginal and aesthetic fit. However, more long-term clinical data will be needed to support this preliminary conclusion.

Ozkurt, İşeri e Kazazoğlu¹⁷ present in the study data on retention, fracture resistance, microleakage, light transmission, aesthetic advantages and radiodensity of intra-radicular zirconia posts and state that zirconia has the advantages of translucency in the color tone of the tooth, making the material usable with all-ceramic crowns in the anterior region and is indicated for teeth with severe coronal destruction, but its greater rigidity in intra-radicular pins can be a predisposing factor for vertical root fractures and is not indicated for patients with bruxism, for Therefore, prospective controlled five-year follow-up studies must be

performed before zirconia posts are widely used and in clinical practice.

Few clinical cases have been published in the PubMed database in recent years, this is probably due to the low value in the evidence pyramid of this type of publication. Considering the treatment options with single or multiple restorations using metallic, hybrid or all-ceramic restorations, several laboratory studies and some clinicians state that ceramic restorations, due to their clinical characteristics, will occupy a prominent place in the restorative clinic. Data from clinical articles can be found in Table 1.

Table - Data from clinical articles included in the study

Author/date/study type	Single prosthesis multiple	Type of material used	Cad-cam/ conventional	Fixed/implant supported/removable prosthesis	Outcome
Tasaka et al 2022/case report	Double crown	Zirconia + fiber reinforcement	Cad-cam	Removable prosthesis	Techno dig. advantages: efficient manufacturing; low cost; biocompatibility; aesthetics.
Cenci et al/ 2017/ case report	Multiple prosthesis	Zirconia structure coated with reinforced ceramic	Cad-cam	Fixed prosthesis	Consider aspects material overcome its limitations and take advantage of its advantages.
Nayar, Aruna, Bhat /2015 / case report	Multiple prosthesis	Zirconia	Cad-cam	Fixed anterior prosthesis. sup.	Patient oral/ facial expression depends on the dentist's ability to replace missing teeth, contour, color, especially for the anterior ones.
Walia et al. 2009/case report	Multiple prosthesis	Aluminum oxide coated with feldspathic ceramic	System. Procera Cad-cam	Fixed anterior prosthesis. sup.	System. Procera creates excellent marginal and aesthetic fit restorations. More long-term clinical data will be needed to support this conclusion.
Ozkurt, İşeri, Kazazoğlu /2010/ case report	Single prosthesis + intra-radicular post	Zirconia (crown and pin)	o Mad/man (Manual Aided Design/Manual Aided Manufacturing) (Zirkonz)		Zirconia: anterior all-ceramic crowns translucency, severe coronal destruction, stiffness of zirconia posts a factor for vertical fractures Prospective studies control. 5 years before zirconia posts are used in the clinic.

Clinical cases demonstrate that oral rehabilitation is mostly multiple, in line with the clinical case presented due to various dental defects. Most authors used one of several computer systems to create and manufacture prosthetics, as this technology uses efficient and low-cost manufacturing^{14,16,17}, which does not prevent good results from being achieved conventionally (Fig.4).

The most used material for making prostheses was zirconia, which has good aesthetics, translucency and biocompatibility¹⁴, and the dental surgeon must overcome its limitations as a restorative material and take advantage of its clinical advantages¹⁵.

In this work, lithium disilicate was used as a restorative material, being suitable for making prosthetic restorations³ and one of the most resistant⁹.

Even without using computerized systems to perform restorations, the dental surgeon is able, through conventional means, to achieve good clinical results¹⁶ where the patient's oral and facial expression depends on the dentist's ability to replace missing teeth, contour, color, especially for the anterior elements (Fig. 5).

Intra-radicular fiberglass posts were also installed in elements 13 and 14 for subsequent creation of filling cores and full crowns, as the literature shows that zirconia root posts can contribute to vertical fractures due to their rigidity¹⁷.



Fig. 4 left side view, central view and right side view after making the prostheses



Fig. 5 Initial and final aspects

CONCLUSION

Dental planning is essential to achieve favorable results, increasing OVD can be carried out successfully, as long as there is correct diagnosis and planning, the use of metal free prostheses have excellent aesthetic properties, which allows a more natural result to be achieved. Furthermore, periodic maintenance and installation of a stabilizing plate are important to avoid pain and injuries to the temporomandibular joint.

CONSENT

In accordance with international or university standard, written patient consent was collected and preserved by the authors.

This study was carried out in the Postgraduate Course in Dental Prosthesis at the Postgraduate Center Faculdades Unidas do Norte de Minas – Funorte.

The authors declared that there are no conflicts of interest.

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