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Comparison Of Prosthetic Constructions Made By Metal-Ceramic And Prosthetic Constructions Made By Zirconium Oxide

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Abstract:
In the process of producing prosthetic constructions, the most common choice is a metal-free ceramic material. Besides, the better aesthetic characteristics achieved by zirconium oxide ceramics than by metal ceramics, the zirconium oxide ceramics also have excellent mechanical characteristics and can be used in areas with strong chewing pressure. The metal-ceramics material has good mechanical aspects, satisfactory aesthetics, and a more affordable price for the patient. We have a case report of two patients. In the first patient, we have prosthetic construction made by metal-free ceramics, namely zirconium oxide, while in the second patient, we have prosthetic construction made by metal-ceramics. In both cases, satisfactory functional- aesthetic reconstruction is performed.

Keywords: *metal-free zirconium-oxide ceramics, metal-ceramics.*

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I. Introduction

Metal-ceramic prosthetic constructions consist of two materials: a metal substructure and a ceramic material applied in layers. They have been used in dentistry since the 1950s and have long been considered the gold standard in prosthetics [1]. The metal substructure provides strength and durability to the restoration, while the ceramic layers provide aesthetics widely accepted by patients [2,3]. Optimal aesthetics cannot be achieved in the labiolingual margin area, studies have shown darkening in the marginal gingival area [4]. Metal-ceramics still have a wide field of use in the following specific indications: cases in which we have already placed a metal-ceramic construction on the adjacent teeth, in which case we will get better aesthetics with this material because we will achieve completeness. Other indications are wide spacing between the carrier teeth and/or lack of vertical height, dark shadows on the teeth that would be visible through transparent metal-free ceramics, cast superstructures, and preparations with metal leucodental obstacles for the fabrication of a wironit denture with a metal skeleton [5.6,7].

Prosthetic constructions made from zirconium oxide are monolithic constructions. Yttrium oxide is incorporated into zirconium oxide to stabilize its tetragonal phase, thereby producing yttria-stabilized zirconia, which is characterized by a high degree of elasticity, remarkable hardness, and a reduced level of brittleness. These properties render the material particularly indicated for use in posterior regions, where masticatory forces and occlusal pressure are considerably greater. [8]. The monolithic structure ensures uniform strength throughout all areas of the restoration, thereby overcoming the problems of delamination and chipping that are frequently encountered in metal–ceramic restorations. Zirconia restorations are typically fabricated using CAD/CAM technology, employing either hard-milling or soft-milling processing [11].

Zirconia may be used in the fabrication of single-unit or block crowns, fixed dental bridge constructions, veneers, inlays, and onlays. This material is frequently selected due to its superior aesthetic qualities, the greater preservation of dental hard tissue during tooth preparation when compared with metal–ceramic restorations, its minimal tissue reactivity, and the reduced inflammatory infiltrate and bacterial adhesion associated with its use. Consequently, zirconia demonstrates marked superiority in terms of biocompatibility relative to other restorative materials. [12].

II. Case Report

A 32-year-old man with extracted upper left central incisor and upper left first and second premolars. The patient came primarily for aesthetic reconstruction in the anterior region; however, to achieve complete aesthetic and functional harmony, it was decided that the bridge construction should cover the region from the right central incisor to the upper left first molar. A dental bridge made of zirconium oxide (metal-free ceramic) was made.

Case 1:

Figure 1: Completed tooth preparation.

Figure 2: Cemented zirconium-oxide metal-free bridge construction.

Case 2:

A 68-year-old woman with bilateral terminal toothlessness, with the anterior teeth preserved.

A treatment plan was made for the anterior region (from the upper left canine to the upper right canine) to fabricate a metal–ceramic construction with precision attachments, onto which a skeletal removable partial denture (Vizil denture) will later be attached. In this way, we aim to achieve a construction that satisfies both aesthetic and functional requirements.

Figure 1: The condition of the dentition before fabrication of the dental construction.

Figure 2: Placed metal–ceramic construction with dental bars

III. Discussion

Metal-free ceramic, in our case the zirconium-oxide ceramic, has numerous advantages compared to metal–ceramic restorations. With metal-free ceramic, we achieve better aesthetics, generally faster fabrication, preservation of tooth structure during preparation, reduced gingival irritation, and many other benefits. However, in our second presented case, where we have a Kennedy Class I situation, our choice was to fabricate a metal–ceramic construction because we aimed to achieve complete oral rehabilitation, that is, a combination of fixed and removable prosthetic treatment.

IV. Conclusion

The properties of dental materials are constantly being improved, which allows us to provide increasingly better aesthetic and functional solutions for our patients. We are progressively striving to use metal-free ceramic constructions due to their numerous advantages, however, as seen above, in certain cases, metal– ceramic constructions represent a more appropriate solution and therefore remain our treatment of choice.

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