

## ESTHETIC REHABILITATION WITH ZIRCONIA ON TOOTH AND MORSE TAPER IMPLANT

### *REABILITAÇÃO ESTÉTICA EM ZIRCÔNIA SOBRE DENTE E IMPLANTE CONE MORSE*

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**ABSTRACT:** Among the ceramic materials used in dentistry, Zirconia presents the ideal opacity for cases where the clinical challenge is to neutralize the difference in the colors of the substrates. The "ceramic steel", so called by some authors, guarantees to Zirconia resistance and hardness similar to a metal, but with aesthetic advantages superior to the metal-ceramic restorations, which can exhibit exposure of the metal band over time. This article describes a complex rehabilitation treatment involving dental elements with different substrates: 11 - vital tooth with large crown damage; 21 – endodontically treated tooth and cast metal core; 22 - Morse taper implant. The selection of a completely zirconia-based ceramic system allowed masking the different conditions of substrates, so achieving the esthetic expectations. Moreover, considering the patient's high smile line, excellent gingival esthetics was obtained with an internal connection Morse taper implant associated with an individualized anatomic abutment.

**KEYWORDS:** Dental Ceramics. Esthetic. Dental Implants.

#### INTRODUCTION

The use of metal-ceramic restorations as rehabilitation treatment has been considered the gold standard due to the excellent long-term survival outcomes: 85.4% after 25 years of follow-up (WALTON TR, 2013), 94.7% in 5 years of single crowns follow-up (PJERTUSSON et al., 2007, SAILER et al., 2015), and 94.4% in 5 years of fixed metal-ceramic prosthesis follow-up (PJERTUSSON et al., 2015; SAILER et al., 2007). Besides acceptable esthetics, low cost, and versatility, the metal-ceramic system may be indicated in different clinical situations, from single crowns up to extensive oral rehabilitation. However, its cervical margin may present grayish the periodontal tissue is thin, and/or exposure of the metal margin when gingival recession occurs (PJERTUSSON et al., 2007), which hinders esthetics in anterior regions. Consequently, these factors boosted the development of new ceramics with advantages on physical, esthetic, and biological properties when compared to metal-ceramic prostheses (LAWN et al., 2002).

Ceramics present several forms of classification, according to their basic composition, there are glass-ceramics, alumina-based ceramics, and zirconia-based ceramics. Following this classification and order, the higher the resistance of these materials the lower their translucency (CONRAD HJ, SEONG WJ, PESUN IJ, 2007).

Therefore, the individual factors of each case, such as substrate staining on the tooth to be restored (darkened substrate or metal core), degree of translucency of adjacent teeth, and the region to be restored (anterior or posterior) due to the magnitude of masticatory forces on the restoration (HOLLOWAY JA, MILLER RB, 1997), should be some of the criteria used to select the ceramic system.

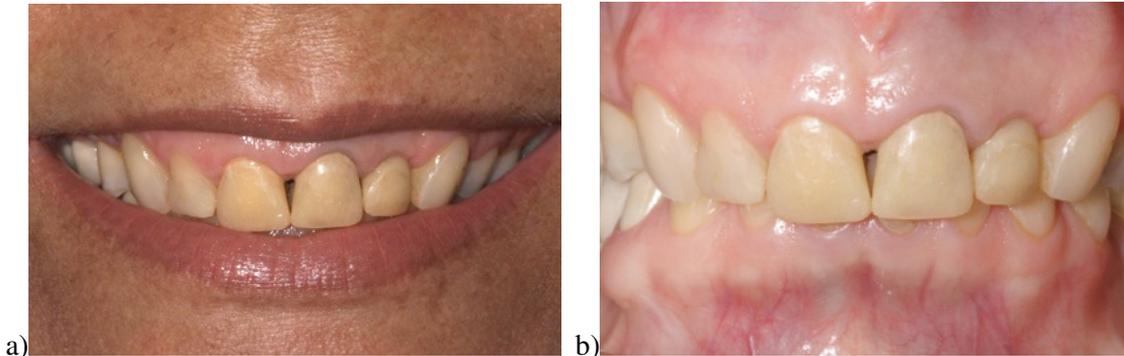
In esthetic regions, where the integrity of gingival architecture is essential for the success of the rehabilitation treatment with fixed prostheses, the Morse taper implants present advantages that place them as a first choice. The indication for 2-mm infraosseous installation and the type of connection ensure greater mechanical stability (MANGANO et al., 2014), gap reduction with less potential for bacterial invasion in the implant-abutment interface, low bone loss potential, and consequently, preservation of integrity of the peri-implant space. Mangano et al. (2014), state that rehabilitation on Morse taper implants present a 98.1% survival rate in 10 years of follow-up.

This study aims to describe an esthetic rehabilitation treatment involving two central incisors with different substrate staining and one lateral incisor with Morse taper implant, wherein three complete crowns with zirconia framework were produced.

**Case Report**

Female patient, 56 years old, presented herself at the Post-Graduation Clinic of Oral Rehabilitation of the School of Dentistry in the city of Bauru, SP, Brazil (FOB-USP), claiming dissatisfaction with the esthetics of her smile. The clinical examination showed the presence of three

temporary acrylic resin crowns on elements 11, 21, and 22, which presented color change and shape deficiency, resulting in the formation of a black space between teeth 11 and 21, thus compromising dentofacial harmony, especially because of the high smile line presented (Figures 1a,b). Tooth 11 was vital and tooth 21 had had a cast metal core (Figure 2).



**Figure 1a):** Smile front view showing acrylic resin crowns on units 11, 21, and 22 with color and shape deficiencies; **Figure 1b):** Inadequate acrylic resin crowns.



**Figure 2.** Acrylic resin crowns were removed, tooth and implant with healthy gingival tissue.

In the region of tooth 22, there was an osseointegrated Morse taper implant (Cone Morse Alvim, Neodent, Curitiba - Brazil, size 3.5 mm x 13 mm) with custom abutment (Figure 3a). The chose to maintain the prosthetic abutment, given the radiographic exam showed the presence of bone

tissue in close contact with it. In the peri-implant region of the custom abutment, a gingival conditioning was performed so to allow hygienization and proper emergency profile, ensuring the homeostasis of periodontal and peri-implant tissues (Figures 3a,b).



**Figure 3a):** Adequate temporary acrylic resin crowns were made and note papillae around the implant abutment; **Figure 3b):** Radiograph implant view, note presence of bone around the abutment.

Clinical limitations such as absence of papilla, presence of high smile line, substrates with different staining, and high esthetic expectations from the patient, the treatment was performed with zirconia framework (IPS e.max ZirCad, Ivoclar Vivadent, Liechtenstein - Germany), and covered in nano-fluorapatite glass ceramic (IPS e.max Ceram, Ivoclar Vivadent, Liechtenstein - Germany). Following the guidelines of these manufacturers, the teeth were reprepared using a flat drilled cylindrical drill bur (3097 and 3097F KG Sorensen, São Paulo - Brazil), achieving the necessary preparation characteristics (uniform wear of 1.8mm and cervical termination in beveled shoulder), in addition, new suitable provisional crowns were made.

In the next session, with healthy gingival tissue, the impression procedure was performed. Custom individual trays were used for impression because the customized abutment presented deep

subgingival cervical margin, which would make molding with retraction cord difficult to apply. The individual trays were produced in clear acrylic resin (Dencor, Clássico - São Paulo, Brazil) internally relieved and relined to copy the gingival margins using red acrylic resin (Duralay™ - Reliance Dental Co, Worth - USA) (Figure 4a). The individual trays were filled with polyether (Impregum™ Soft Polyether Impression Material, 3M United States) and correctly positioned (Figure 4b).

After polyether polymerization, the individual trays positioned in mouth were molded and then removed with light and puty viscosity condensation silicone (Zetaplus Light e Puty - Zhermack SpA, Badia Polesine, Italy) using double mixing technique (Figure 5a). The mold was poured with type IV plaster (Elite Rock - Zhermack SpA, Badia Polesine, Italy) (Figure 5b).



a)

**Figure 4a)** Acrylic resin relined individual trays.



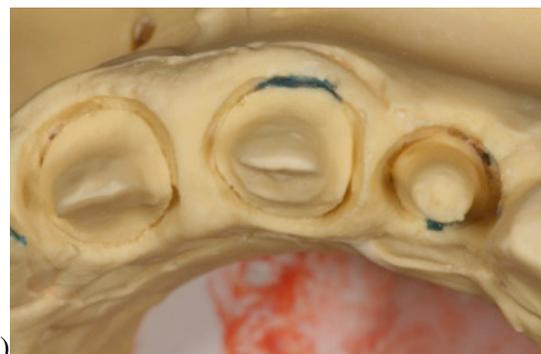
b)

**Figure 4b)** Impression with polyether.



a)

**Figure 5a)** Mold view.



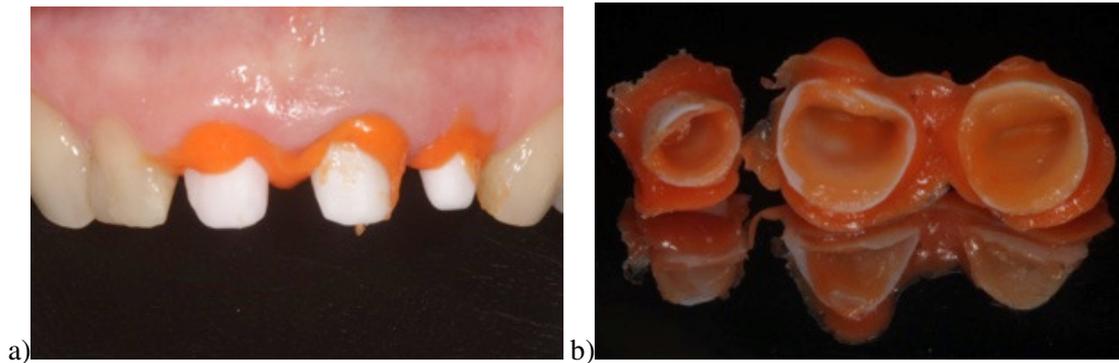
b)

**Figure 5b)** Plaster model close view.

The obtained model was stamped and using the CAD / CAM system (Cerec inLab - Sirona Technology - Local) the upper and lower models were scanned and zirconia copings (e.max ZirCAD, Ivoclar Vivadent, Liechtenstein - Germany) were designed and milled. Then, they were clinically

evaluated for marginal and internal adaptation, as also interocclusal area.

Verification of the settling and internal adaptation was performed by introducing a thin layer of light silicone on the entire internal surface and leading them to position (Figures 6a e 6b).



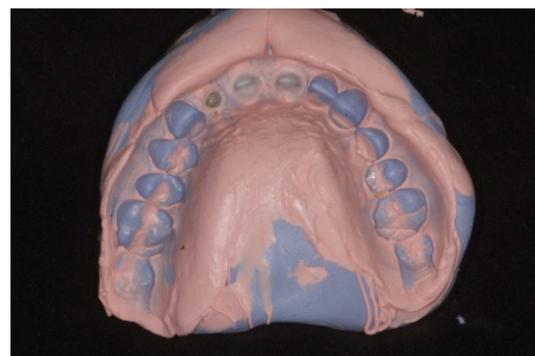
**Figure 6.** a) Assessment of the adaptation of copings with condensation silicone inside the framework, view of individual trays in position with the silicone. b) Observe the presence of a thin and uniform layer with no contacts inside all surfaces.

The coping interocclusal records was performed with Duralay™ acrylic resin (Reliance Dental Co, Worth - USA) (Figure 7) and the reassembling of plaster models was performed after the copings were molded and removed with condensation silicone (DupliKA™ - Microdont Micro Usinagem de Precisão Ltda, São Paulo -

Brazil) (Figure 8). The mold was assembly in semi-adjustable articulator. Reassembling is essential to secure the relationship of copings with adjacent and antagonist teeth, as also with the gingival tissues. In the same clinical session, ceramic color was selected.



**Figure 7.** Interocclusal registration.



**Figure 8.** Mold with framework in position.

The copings received veneer feldspathic nano-fluorapatite glass ceramic (IPS e.max Ceram - Ivoclar Vivadent, Liechtenstein - Germany) applied by conventional stratification manufacture

technique. Laboratorial and clinical adjustments were made, evaluating interproximal areas, marginal adaptation, occlusion and esthetics (Figure 9a, 9b e 9c).



**Figure 9** a) Veneer ceramic applied. b) Interposition of carbon paper for proximal adjustment c) Use of dental floss to assess the proximal contact.

For cementation procedure, teeth were cleaned with pumice stone and brush, washed and dried maintaining the dentine wet, and the internal surfaces of the zirconia were cleaned with 70%

alcohol. The cementing was performed with resin modified glass ionomer cement RelyX Luting 2 (3M Espe - USA), considering that zirconia is an acid-resistant ceramic. The external surfaces of ceramic

restorations were isolated with vaseline to facilitate the removal of excess cement, and with the help of a brush, a thin layer of cementing agent was applied in the restoration internal surfaces.

The selection of a zirconia-based ceramic system allowed masking the different conditions of substrates, so achieving the esthetic expectations. Considering patient's high smile line, excellent

gingival esthetics was obtained with an internal connection Morse taper implant associated with an individualized anatomic abutment, achieving functional and esthetic expectations (Figure 10a e 10b). Figure 10c shows the stabilization plate in position after 1-year control. Figures 10d e 10e correspond to the radiographic controls made in both periods.



**Figure 10.** a) Crowns after cementing; b) Smilingly after 1-year control; c) Stabilization plate in position; d) Control radiographs after cementing and e) 1-year control.

## DISCUSSION

New ceramic systems, although allowing different restorative treatments (REKOW D, THOMPSON VP, 2007), cannot correctly mime the nature of color, texture, and other elements of natural dentition. Thus, correctly selecting the ceramic material is a great challenge in restorative and esthetic dentistry.

Zirconia-based ceramics may be indicated as single and fixed prostheses in anterior and posterior regions (RAIGRODSKI et al., 2012; NAKAMURA et al., 2010) on teeth or implants. They present greatest mechanical properties (RAIGRODSKI, A. J, 2004; GUAZZATO et al., 2004) such as excellent biocompatibility (VAN BRAKEL et al., 2011; SALIHOGLU et al., 2011), small thickness (0.3 mm anterior; 0.5 mm posterior) (BINDL, A.; LÜTHY, H.; MÖRMANN, W. H; 2006 ; KIM et al., 2012), good marginal adaptation even after the sinterization process (RAIGRODSKI

et al., 2006), smaller connectors in fixed prostheses (BALDISSARA et al., 2010), acceptable light transmission (YOSHIDA, A.; ISHIKWA-NAGAI, S.; DA SILVA, J., 2010), ability to mask darkened teeth (YOSHIDA A, ISHIKWA-NAGAI S, DA SILVA J, 2010; HEFFERNAN et al., 2002), and agility and ease of production through CAD/CAM process (LARSSON, C.; WENNERBERG, A.; 2014). Some studies suggest the survival rate of prostheses on implant and/or teeth with zirconia is comparable to metal-ceramics (LARSSON, C.; WENNERBERG, A., 2014).

In prostheses on implants, correctly selecting the type of implant and ceramic connection is essential to obtain a good esthetic result. In the present case, the patient sought treatment with temporary crowns in teeth 11 and 21, and a Morse taper implant replacing tooth 22. Mangano et al., 2014, stated that Morse taper connections have a high success rate of 98.7% for complete and partial oral rehabilitation, besides

minimum bone loss and high mechanical stability (NENTWIG, G. H., 2004; DIBART et al., 2005).

Given the abutment was well positioned and had correct shape, the gingival contour and the presence of papillae provided an enhanced similarity to the crowns and adjacent teeth. We chose to produce a cemented ceramic crown so to eliminate the access orifice of the bolt, which is best indicated for an esthetic region (DBRADOVIĆ-DJURICÍĆ et al., 2013).

Since zirconia is an acid-resistant ceramic, conventional cementing was used with glass ionomer cement modified by RelyX Luting 2 resin (3M Espe - USA), of which a thin layer was applied with a brush. Moreover, as affirmed by Obradović-Djuričić K et al., 2013, if preparation presents proper retention shapes and stability, the crowns produced in zirconia may be cemented with conventional cements.

The success of a restorative treatment is directly related to the importance of respecting the basic biomechanical principles of restorative materials, understanding their limitations and clinical indications that are specific to each material, as well as correctly using the production techniques and following manufacturer's instructions.

## CONCLUSION

The longevity of a rehabilitation treatment relies on the accurate choice of restorative material, good performance of all clinical and laboratory procedures, and proper oral hygiene of the patient. The choice of zirconia-based ceramic to produce the crowns of this clinical case showed to be correct due to the change of substrate colors.

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**RESUMO:** Dentre os materiais cerâmicos utilizados na Odontologia, a Zircônia apresenta a opacidade ideal para os casos em que o desafio clínico é neutralizar a diferença nas cores dos substratos. O “aço cerâmico”, assim chamado por alguns autores, garante à Zircônia resistência e dureza semelhantes a um metal, mas com vantagens estéticas superiores às restaurações metalocerâmicas, as quais podem apresentar exposição da cinta metálica ao longo do tempo. Este artigo descreve um tratamento reabilitador complexo, envolvendo elementos dentários com diferentes substratos: 11 - dente vital com ampla destruição coronária; 21 - dente com tratamento endodôntico e núcleo metálico fundido; 22 - ausente, reabilitado com implante do tipo cone morse. A seleção do sistema totalmente cerâmico à base de zircônia, permitiu mascarar as diferentes condições dos substratos atingindo as expectativas estéticas. Além disso, diante do sorriso alto gengivoso presente neste caso, a excelência na estética gengival foi obtida utilizando implante com conexão interna do tipo cone morse associado a um pilar anatômico individualizado.

**PALAVRAS-CHAVE:** Cerâmicas. Estética. Implantes Dentários.

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