

## Association of custom-made zirconia abutments with emax crowns in implant rehabilitations: case report

Uso conjugado de abutments personalizados em zircônia com coroas emax nas reabilitações com implantes: relato de caso clínico

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### ABSTRACT

Today, the constant search for esthetics by most patients together with the difficulty in obtaining a natural appearance at the anterior area, especially in Implantology, helps to develop new methodologies to solve these problems. The aim of this study was to demonstrate through case report the applicability of custom-made zirconia abutments in association with IPS eMax metal-free crowns. The prostheses at the anterior area of maxilla were made on four teeth and three implants. Implant abutments were customized in zirconia through CAD/CAM system. Metal-free crowns were obtained through IPS eMax system for all elements. The patient was clinically and radiographically followed-up at seven, 15, 30, 60 and 90 post-operative days, when it was observed the aesthetic-functional stability of the case. The final results met the expectations of the patient.

### KEYWORDS

Dental implantation; Denture, partial, fixed; Computer-aided design.

### RESUMO

A busca pela estética constante do mundo contemporâneo que norteiam a maioria dos pacientes nos dias de hoje, aliado a dificuldade de se obter uma aparência natural em região anterior, principalmente quando se envolve implantes osseointegrados, fez com que novas técnicas, materiais e metodologias surgissem a fim de sanar essas dificuldades. Com o objetivo de demonstrar a aplicabilidade do uso de pilares personalizados em zircônia para casos de reabilitação estética anterior, foi descrito um caso clínico onde foi realizada uma reabilitação anterior de 7 elementos, sendo 4 dentes e 3 implantes, sendo os abutments dos implantes personalizados em zircônia pelo sistema CAD/CAM, juntamente com a utilização de coroas metal-free pelo sistema IPS eMax em todos os elementos reabilitados. A paciente após a finalização do caso passou por sessões de controle clínico após 15, 30, 60 e 90 dias onde juntamente com uma radiografia panorâmica, notou-se estabilidade estético-funcional do caso, estando a paciente satisfeita com o resultado final.

### PALAVRAS-CHAVE

Implante dentário; Prótese parcial fixa, Projeto auxiliado por computador.

## INTRODUCTION

With the advent of implantology, the restorative prosthetic planning turned towards a new direction in modern Dentistry. At the beginning of the 70s, with the discovery of osseointegration by Per-Ingvar Brånemark in 1966 [1], Implantology aimed at mainly reestablishing the masticatory function with initial goal of constructing retained implant-supported total prostheses (overdentures). At the beginning of the 90s, with the evolution of the implant systems regarding to shape, surface treatments and prosthetic abutments associated with the aesthetic demanding by patients due to globalization and media, Implantology started to demand much more than function reestablishment. From that moment on, esthetics become essential in prosthetic rehabilitations with osseointegrated implants, in the construction of either single or multiple restorations [2,3].

Ever since, special care has been taken in the construction of implant-supported prostheses on the anterior maxillary area because of their high visibility and influence on facial esthetics. One disadvantage of implant-supported prosthesis rehabilitation using conventional titanium abutments in this area is the presence of thin gingival tissue and/or gingival recessions resulting in a restoration of unpleasant grayish appearance [4,5]. Thus, the appearance of ceramic abutments is an alternative to obtain esthetics in clinical situations where either metallic abutments exhibit limited aesthetic outcome or esthetics is mandatory [6,7].

Currently, dental market displays some aluminum oxide- or zirconium dioxide-based full ceramic abutments, highly resistant and with excellent mechanical and optical properties. The introduction of these ceramic abutments allowed the obtainment of esthetics similar to that of natural tooth as well as the customization of prosthetic abutments specific for each clinical situation [7].

In Dentistry, zirconia has been the material of choice for prosthetic rehabilitation when one desires to associate esthetics with mechanical resistance. However, although ceramics exhibits excellent mechanical and chemical properties, some inherent aspects have been questioned by the literature [3].

In this sense the aim of this study was to demonstrate through case report the applicability of custom-made zirconia abutments in association with IPS eMax metal-free crowns.

## CASE REPORT

Patient ACS, female, Caucasian, aging 41 years-old was referred to evaluation of a partial fixed veneer crown between teeth #12 and #23. The left permanent maxillary central incisor (#21) exhibited a root fracture and it was extracted. The left permanent maxillary first premolar (#24) had a single veneer crown. The patient was at orthodontic finalization stage (figure 1) with later removal of old prosthesis (figure 2).



Figure 1 - Initial case



Figure 2 - Clinical view after the removal of old prostheses

Because of both the aesthetic dissatisfaction and the functional impairment due to root crack and infiltration, the treatment planning comprised the removal of the old prostheses, extraction of tooth #21 and the installation of 3 implants (Sin – Sistema de Implantes, São Paulo, Brazil), on the areas of teeth #12 (3.5 x 13 mm cone Morse), #21 (IH 3.8 x 13 mm) and 22 (3.8 x 13mm).

To achieve a better esthetics and because of large restorations and darkened crown, tooth #13 was prepared for total crown and included in future rehabilitation.

Teeth #13, #11 and #23 were endodontically treated and submitted to the construction of carbon-fiber post and core. The metallic post and core of tooth #24 was maintained because of its good conditions. These teeth were prepared according to the guidelines for metal-free crowns.

After the removal of the old prostheses and the surgical procedures, a pressed provisional prosthesis was installed and supported by teeth #13, #11, #23 and #24. A period of 4 months was elapsed to begin the prosthetic phase.

Then, the implants were re-assessed and new custom-made provisional crowns were constructed promoting the activation of implants and provisionalization of the teeth.

Next, a transfer impression was executed comprising the prepared teeth and implants; the abutments were customized firstly in acrylic resin (figure 3) for trial and then in zirconia through Ceramill Map 400 CAD/ Milling Motion 2 CAM (AmannGirrbach Ltda, Curitiba, Brazil) (figure 4).

After the new trial in the mouth, the copings were constructed through IPS eMax Press system (Ivoclar Vivadent Ltda, Barueri, SP, Brazil), which after new trials and adjustments were transferred through another impression (figure 5).

The copings undergone applications of IPS eMax ceram system for stratification, were



**Figure 3** - View of the functional cast and custom-made resin abutments.



**Figure 4** - View of CAD/CAM system.



**Figure 5** - View of transfer casts and functional cast with zirconia copings.

tried and adjusted inside the mouth again, and submitted to glaze procedure.

The crowns were cleaned with aluminum oxide ( $Al_2O_3$ ) with 1 bar pressure and silanized by 60 s. Then the crowns were cemented with self-etching resin cement (RelyX U100, 3M ESPE/ Sta Paul, MN, USA) (figure 6) without conditioning dental surface.



**Figure 6** - View of the case conclusion after cementation.

Patient was followed-up at 7, 15, 30, 60 and 90 days, and after that, a new follow-up radiographic was taken (figure 7).



**Figure 7** - Follow-up radiographic after 90 days.

## DISCUSSION

To restore aesthetically the space of a single tooth with an implant-supported prosthesis is a challenge. The success depends not only on the osseointegration and functional capacity of supporting the masticatory loads, but also on the harmonious integration of the crown with the tooth arch. In areas with high aesthetic demands, (especially in patients with high smile

line), implant-supported prostheses depend on the ideal positioning of the implant and prosthetic superstructure. Dental implants and prosthetic abutments are generally constructed in commercially pure titanium because of its biocompatibility and excellent mechanical properties. Despite of many improvements in the construction of the metallic abutment designs, risks still exist that some metallic abutments' areas are exposed when these abutments are used. Even when located inside the gingival sulcus (intrasulcular terminus), a dull gray background can result in a bluish appearance of the gingiva. The presence of a gray gingival color can be attributed to a thin gingival tissue around the abutment that is unable to block the light reflection from the abutment [3]. Consequently, to achieve optimum mucogingival esthetics, ceramic abutments have been developed.

Therefore, customized abutments have been increasingly used in Implantology, according to Mesquita et al. [3], because of many advantages, such as: esthetics, because they enable to achieve an emergence profile in accordance with both the contour and support of the gingival tissue and promote an aesthetic substrate (infra-structure) to construct the prosthetic restoration (in the case of ceramic abutments); possibility of correcting situations where screwed prostheses cannot be used because of implant angulation; they are similar to conventional tooth-supported prostheses, which makes the prosthetic work easy; possibility of managing the soft tissue

Considering fracture strength, Butz et al. [8] and Vigolo et al. [9], evaluated the rotational freedom, survival rate, fracture strength and failure mode, among titanium, zirconia and alumina abutments and concluded that zirconia abutments exhibited results similar to those of titanium abutments.

This fact was recently proved by Protopapadaki et al. [10] who also analyzed the fracture strength of customized zirconia abutments by simulating the function in vitro for 6 months and did not obtain any failures.

Taking into account the aforementioned studies [8-10] together with the fact that we used implants at lower risk of abutment screw loosening (internal hexagon and cone Morse), in this present clinical case, temporary cementation was not required for eventual reversibility, at risk of causing everyday inconvenience to the patient. (Considering ceramic crown reversibility in case of abutment screw fracture or loosening for example, discuss why not a temporary cement were not used.)

The bacterial adherence is another important aspect related to the longevity of implant-supported restorations. Scarano et al. [11] reported a degree of biofilm adherence of 12.1% on zirconia abutments compared with 19.3% on titanium abutments. Corroborating these findings, Rimondini et al. [12], in an in vivo study, reported that zirconia abutments adhered a smaller number of bacteria than did titanium abutments, in terms of total number of bacteria and presence of bacteria in relation to their pathogenic potential.

Taking into account these esthetics conditions associated with resistance and biocompatibility, we consider that zirconia abutments should be the material of choice when esthetics is mandatory [3,13], so that this was chosen in this case report, because of the patient exhibited a high smile line.

IPS eMax system was selected in this case report because it has been an excellent alternative for severe clinical cases at the anterior region due to the possibility of reproducing the tooth structure; also, it is a versatile system comprising from injected and milled lithium disilicate-based glass ceramic (respectively e.Max Press and e.Max CAD) to injected and milled zirconium oxide (respectively, e.Max ZirPress and e.Max ZirCAD) [14]. These systems also enable that the four materials of different structures that comprise IPS e.Max system can be stratified with the same veneering ceramics.

With regard to marginal adaptation, values lower than 120  $\mu\text{m}$  have been clinically accepted in relation to longevity [3]. Recently,

a study emphasized that IPS e.Max Press system exhibited values of marginal adaptation lower than 120  $\mu\text{m}$ , which have been totally acceptable when associated with adhesive cementation [15].

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