CASE SERIES

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The influence of the prosthetic abutments colour in the aesthetics of the frontal teeth. A case report.

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Abstract

Introduction: Prosthetic restorations in the frontal teeth, in addition to functional and prophylactic requirements, must respond in a special way to aesthetic needs. This desideratum is a challenge, especially when the support for the future prosthetic parts is not characterized by a uniformity of color. This paper wants to highlight the importance of the color of prosthetic abutments, in the case of single restorations, for the frontal teeth. Case presentation: This manuscript presents the clinical case of a patient, with different prosthetic abutments, namely: a hybrid implant abutment - titanium and zirconium (lateral incisor - 1.2), nonvital natural teeth (central incisors – 1.1 and 2.1) and a vital natural tooth (lateral incisor – 2.2). Three single ceramic crowns on zirconium were confectioned, one with implant support and the other two on dental support, and a veneer for the vital lateral incisor. Conclusions: The prosthodontist must develop the best prosthetic solution for each individual case, together with the technician, so that the aesthetic results are not negatively influenced by the different colors of the existing prosthetic abutments.

Keywords: aesthetics, mixed abutments, anterior area, single crowns, case report.

Introduction

Over the years, numerous implant systems, implant abutments and types of prosthetic restorations have been introduced, with the aim of providing functional and aesthetic results as natural as possible, in cases of single teeth [1]. The use of implants in the aesthetic area is well documented in the specialized literature. Numerous studies have reported a success rate of implants inserted in this area, compared to those inserted in other segments of the maxillary bones [2]. The criteria underlying the success of an implant over time include: its biological integration, the absence of mechanical complications, and the aesthetic integration of the restoration with the adjacent teeth [2,3].

High demands and expectations are challenges for implant restorations in the aesthetic area [4]. Choosing the most suitable type of implant abutment is a critical step for the success of the final results. Titanium abutments have demonstrated longevity based on excellent biocompatibility and increased mechanical strength, although they often result in gray discoloration of the peri-implant mucosa [3,5]. Aesthetic requirements and high expectations are real challenges for prosthetic rehabilitation. Esthetic results have been improved by the development of ceramic oxide abutments, such as aluminum oxide and zirconium oxide, which have even better strength than titanium abutments [6]. Systematic studies comparing ceramic abutments with titanium abutments have not revealed significant differences in mechanical complications or their survival rate [7]. In terms of aesthetic results, zirconium abutments obtained better values than other materials [1] and a better color match was observed for ceramic restorations, although a color change of the mucosa could be highlighted for both types of materials [8]. Ytrium-stabilized zirconia for CAD-CAM technology has increased mechanical strength compared to alumina and biocompatibility comparable to that of titanium [9].

Regarding the influence of the type of crown retention: screwed or cemented, on the aesthetic results, in zirconia abutments, no significant differences were revealed between the two groups [10].

The aesthetic results of different types of implant abutments were also evaluated according to the degree of patient satisfaction.

Most comparative studies between ceramic and titanium have not revealed significant differences in this regard [7,11]. Most of the time, however, when patients were dissatisfied, the main reason reported was related to the color of the dental crowns and their morphology [12].

The aim of this paper was to compare the aesthetic results obtained in the anterior area, when single multilayered ceramic crowns were made on zirconium support, also when the prosthetic substrate was different, both in color and in structure, such as: an implant abutment, dental abutments, next to a vital tooth, prepared for a ceramic veneer.

Case presentation

This case was conducted by a specialist in Prosthodontics with a clinical experience of more than 15 years (D.T.S.). In addition, the technical part was carried out by a dental laboratory, run by a technician with more than 10 years of experience.

A 26-year-old patient presents to a private dental clinic from Oradea, for specialized treatment in the maxillary frontal area, the main complaint being the dissatisfaction related to the color differences at the level of the upper incisors and therefore the unaesthetic smile. Following a thorough clinical examination and radiological investigations, it was found that tooth 1.2 (upper right lateral incisor), covered with a metal-ceramic crown, had a periapical granuloma, as a recurrence following an apical resection. For these reasons, it was decided to extract and replace it with an implant.

Tooth 1.1 (upper right central incisor) had an inadequate filling with secondary caries and a negative response to the vitality test, so an endodontic treatment was recommended. The upper left central incisor (tooth 2.1), already had an appropriate endodontic treatment, as a result, two crowns were proposed for both central incisors. For tooth 2.2 (upper left lateral incisor), being vital and without dental diseases, besides a slight rotation, the application of a dental veneer was recommended to improve the aesthetic effect in this area.

Figure 1 shows the dental and periapical status when the patient arrived in the dental office.

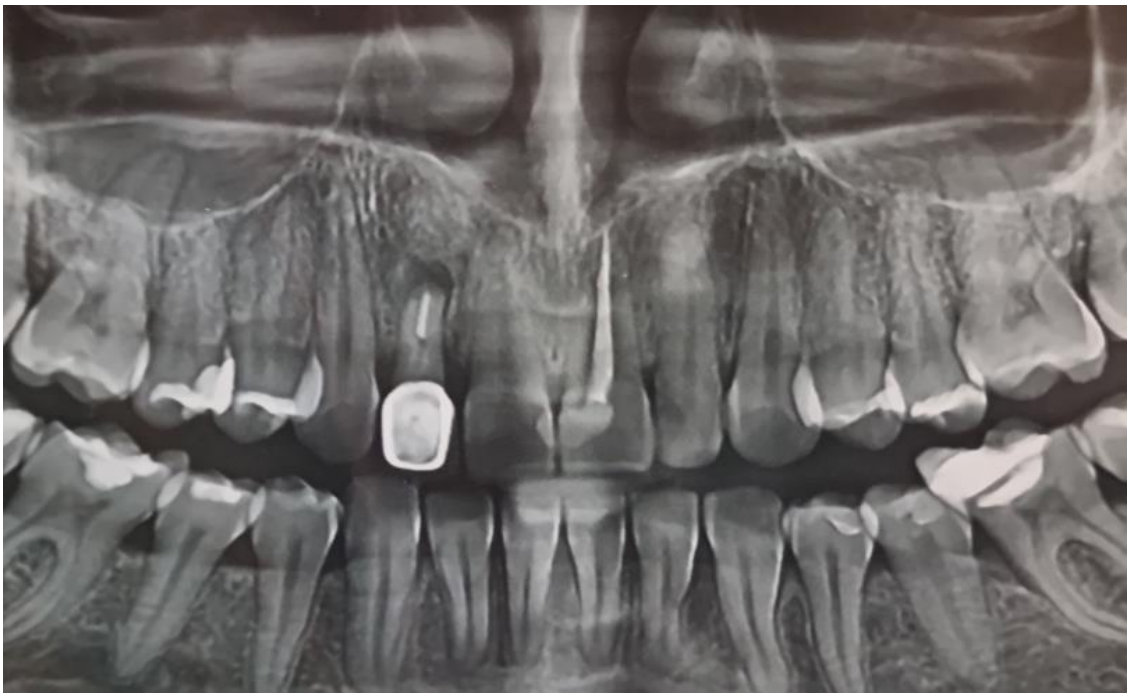

Figure 1. Panoramic radiograph

After obtaining the patient's consent for this treatment plan, the extraction and insertion of an implant was performed in the same session. A Megagen Anyone implant with a diameter of 4 mm and a length of 10 mm was chosen.

In order to support the aesthetic and phonetic function for the pacient, an acrylic Kemeny flipper was made to cover the missing thooth 1.1 during the osseointegration period.

Figure 2 represents the periapical radiograph at the time the healing cap was positioned and the endodontic treatment for 1.1 was done.

At the end of the approximately 6-month of osseointegration period, the patient presented for the continuation of the prosthetic treatment, for the maxillary frontal teeth.

A healing cap was applied for 3 weeks to obtain a healthy gingival biotype and emergence profile for the future implant crown (Figure 3).

Figure 2. Radiograph after implant placement

Figure 3. Healing cap

The established prosthetic treatment consisted of: three single porcelain crowns fused to zirconia, one was a screwed implant supported crown with a hybrid abutment (titanium t-base and customized zirconium abutment) for tooth 1.2, and the other two crowns, on natural teeth, with different shades, respectively maxillary central incisors 1.1 and 2.1, as well as a ceramic veneer on a vital tooth, therefore with a specific shade, on the lateral incisor 2.2.

The major challenge in this case was represented precisely by the difference in color of the prosthetic substrate, and the need to obtain uniform, optimal and satisfactory aesthetic results for the patient.

When the emerging gingival period has ended, before the preparation stage of the teeth for the covering crowns, respectively the veneer, an impression was recorded with a condensation silicone in a standard tray, to obtain temporary crowns by the direct method, as a provisional prosthetic treatment.

The upper central incisors were prepared with a Chamfer finish line, and the 2.2 lateral incisor was made suitable for a veneer (Figure 4).

For the purpose of the impression, a transfer rod was fixed in the implant, and an individual open tray was used, the impression was made using an addition silicone, by the compressive method in one step (Figure 5).

Figure 4. Incisors preparation

Figure 5. Transfer rod in the implant

Given the particular characteristics of this case, together with the dental laboratory, the use a hybrid implant abutment was decided, specifically titanium t-base on which a customized zirconium abutment was cemented. To cover the discoloration of dental abutments, single multilayered ceramic crowns on zirconium caps were made, and the veneer was made of E-max ceramic.

One week later, the patient was called for an intermediate session for the trial of the zirconium caps, which was attended by the ceramist to check and establish a desired final color, with a uniformizing and homogenous effect, which would lead to the desired aesthetic results for this area (Figure 6, 7).

Figure 6. Zirconium caps

Figure 7. Try-in of the zirconium caps

Five days later, another trial session was done, for the zirconium caps with layered ceramics, when all the details related to length, shape, angles, phonation, and occlusion, were established (Figure 8).

Next day, the final glazing stage was carried out (Figure 9).

Figure 8. Layered ceramics

Figure 9. Crowns after glazing

Dental crowns and the veneer, were cemented intraorally in the same session (Figure 10). In this regard, a recommended cement for the covering crowns was used, and a specific cement for veneers.

The screwed implant crown was fixed in the implant and the screw tightened with a force of 25 N cm. Teflon was placed in the head of the screw and the inspection hole was closed with composite. The crowns were then checked in terms of the desired aesthetic results and occlusal adaptation.

Figure 10. Crowns after cementation

Discussions

Starting from the different shades of the prosthetic abutments and the need to cover and standardize them, it was decided to use zirconium caps, which will later be covered with the stratified ceramic by the manual technique.

In the area of maximum visibility, such as the maxillary frontal teeth, achieving prosthetic perfection is most often challenging, an ideal that can be achieved by a perfect fusion between the pink area and the white area. In the case of implant supported crowns, we can therefore say that the pink aesthetics focus on the appearance of the peri-implant soft tissues, and the white aesthetics on the visually pleasing result of the crown itself [13]. The type of abutment chosen can influence the results, both of pink and white aesthetics. In the evolution of dental materials and the prosthetic workflow, the use of zirconium is increasingly common. Compared to metal abutments, this material offers advantages, especially related to an improvement in the appearance of soft tissues, by avoiding the "gray" discoloration of the mucosa, a particularly important aspect especially in situations with thin gingival biotype [10]. Zirconium is characterized by a

dense monocrystalline homogeneity, with a low corrosive potential and good radiopacity [14]. It has been vastly applied in dentistry due to its good mechanical properties, improved aesthetics, and excellent biocompatibility [15]. Aesthetics remain the major advantage of zirconium abutments over titanium, despite concerns about mechanical complications. Data on zirconia abutments with titanium inserts are insufficient, although the outlook for this design is promising [16]. There are numerous clinical studies that have highlighted the excellent clinical performance, including the esthetic results obtained in the case of single implant crowns in the anterior area, when a screw-mounted multilayer ceramic crown was used on a customized zirconia abutment [10]. Chen and Pan (2019) observed a high implant survival rate, a good biological integration and an outstanding aesthetic performance in a retrospective study, that aimed to assess the clinical performance of zirconia implant abutments supporting all-ceramic crowns [17].

Based on all these aspects, we can conclude that zirconium abutments or zirconium ceramic prosthetic crowns represent an advantageous prosthetic option.

Conclusions

Zirconia as a dental biomaterial has firmly established its indications and is a gold standard. No contraindications are reported.

Conflict of interest: None to declare.

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In this case, the solution to use a hybrid abutment (titanium t-base and customized zirconium abutment) for the missing frontal tooth 1.2, proved to be a successful one. Regarding the color difference between soft tissues around teeth and implants, the hybrid zirconia abutments resulted in the least color difference. A porcelain fused to zirconia screw retained single crown proved to be a good prosthetic choice to cover the abutment in this area.

For the frontal teeth 1.1. and 2.1. with different colors of the dentine abutment, using porcelain fused to zirconia crowns proved to be also a good prosthetic option. Zirconium caps with multilayered ceramics, using the manual technique of layering in different ceramic shades, allowed to obtain the desired result. This case report highlights the need for a prosthetic substrate with as homogeneous color as possible, in order to obtain satisfactory final results, otherwise, obtaining them is possible, but the challenge is greater.

The solution of covering prosthetic abutments with different structures and shades, with multilayered ceramic crowns fused to zirconia, proved to be a viable prosthetic treatment.

It is important to emphasize that the prosthodontist must develop a specific treatment for each individual case.

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