MAEDICA – a Journal of Clinical Medicine
2021; 16(1): 145-148
https://doi.org/10.26574/maedica.2021.16.1.145

MÆDICA - a Journal of Clinical Medicine

CASE REPORT

Biologic and Esthetic Outcome of CAD/CAM Custom Ceramic Implant Abutment: A Clinical Report

Ioana Monica VALSAN[a], Mihaela Rodica PAUNA[b], Alexandru Eugen PETRE[c], Luminita OANCEA[c]

[a]Faculty of Dental Medicine, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

[b]Removable Prosthodontics Department, Faculty of Dental Medicine, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

[c]Occlusion and Fixed Prosthodontics Department, Faculty of Dental Medicine, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

ABSTRACT

A prerequisite of a functional and esthetical implant-supported crown is a proper surgical planning and an abutment with a design and color that maintain the initial soft-tissue contour. This clinical report describes the use of a custom ceramic implant abutment designed with computer-aided design and computer-aided manufacturing (CAD/CAM) technology. A zirconia framework was milled and cemented extra orally to a prefabricated titanium base, the new custom abutment being both precise and esthetic.

Keywords: custom implant abutment, esthetic implant abutment.

INTRODUCTION

Esthetic and biologic prerequisites to a successful implant restoration treatment include three-dimensional surgical planning, appropriate site development, soft tissue management, functional and esthetic prosthetic management tested through high quality provisional restorations. Dental implant therapy in the esthetic area is undoubtedly one of the most challenging procedures among current dental rehabilitations (1).

To achieve an optimum esthetic result with implant restorations, the peri-implant soft tissue should be modified to create an optimum emergence profile and a natural contour at the provisional stage (2, 3). Peri-implant soft tissue management is possible if the implant is deep enough and the proper gingival biotype is present (4).

The location of the implant, the relationship of the implant/abutment interface and the crestal bone around the implant determine whether there will be enough support for the gingival tissue surrounding the implant crown (4). A natural emergence profile of the restauration is easy to be created when implants are inserted 3 to 4 mm subgingival in a thick soft tissue biotype (5, 6). The

Address for correspondence:
Dr Luminita Oancea, Lecturer
Occlusion and Fixed Prosthodontic Department
"Carol Davila" University of Medicine and Pharmacy, No. 17-23 Calea Plevnei, sector 5, cod 050051, Bucharest, Romania
Tel.: +0040732477977
Email: luminita.oancea@umfcd.ro

Article received on the 9th of February 2021 and accepted for publication on the 10th of March 2021

situations where implants are shallow inserted and a thin peri-implant soft tissue biotype is present are challenging to obtain a suitable emergence profile (6, 7).

Different dental implant abutments could be used for prosthetic restoration, and disadvantages have been described for every system: titanium abutments can cause grayness on peri implant soft tissue (8), zirconia abutments are recommended for esthetic areas but still require long evaluations for use in the posterior regions (9), and titanium could become visible in zirconia abutments with titanium inserts. The use of CAD/CAM technology facilitates an alternative technique which makes possible the solution of individualized implant abutments, using a zirconia framework cemented to a prefabricated titanium abutment to provide good aesthetics and avoid the presence of zirconia at the abutment hexagon connection (10, 11).

This clinical report describes the successful use of a custom ceramic implant abutment designed with CAD/CAM technology. This custom abutment has the strength and precise fit of a titanium interface and also the esthetic advantages of shaded custom-milled zirconia, with no visible metal. ❑

CASE REPORT

A 28-year-old patient was reffered to our clinic, being dissatisfied with the appearance of the gum in the area of a frontal maxillary implant restauration (Figure 1).

Retroalveolar x-ray revealed an implant (Alpha Bio compatible system – 4.1 x 16 mm) inserted in the 11 position, 1.5-2 mm below the cemento-enamel junction of the adjacent teeth. The prosthetic part was represented by a PMMA cement-retained crown over a titanium standard abutment. At the clinical examination, a grey colour of the periodontium and bleeding at probing are objectified. After removal of the crown and titanium abutment, the internal hex connection implant is discovered in a deep position, showing a thick gingival mucosa, inflammation, bleeding and temporary cement residue.

Based on the clinical signs and para-clinical examination, the diagnosis of peri-implant mucositis was made, due to cement retention. In order to assure healing as well as maintaining of the periodontium volume and color stability, the therapeutical plan had to take into consideration changing the crown retention system or shifting the crown margin coronally, a more accesible area for cleaning the cement excess.

FIGURE 1. Initial clinical situation

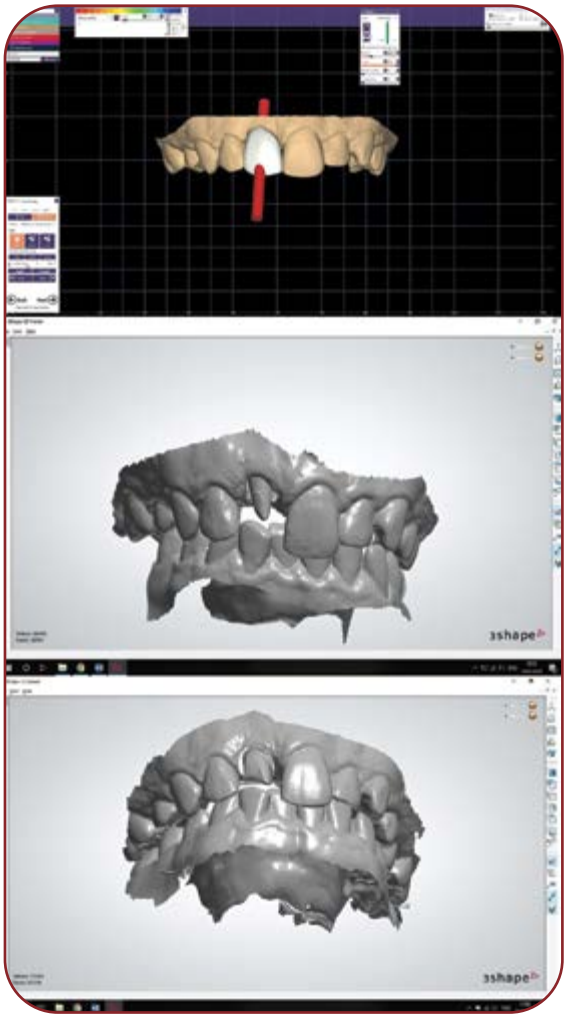

FIGURE 2. Screw-retained crown planning

In the first appointment, after rigourous cleaning and antiinflamatory treatment of the affected

area, a digital impression of upper and lower arches and their occlusal relation were made with an intraoral scanner (3 Shape Trios dental scanner). The resulted 3-dimensional files (standard tessellation language – STL) were imported in exocad design soft (exocad GmbH), where an order has been created.

To improve the peri-implant tissue condition, a screw-retained crown design has been firstly initiated, but considering the position of the implant axis, this solution would have required an inacceptable esthetic compromise: the screw hole would have come out on the buccal surface near the incisal edge (Figure 2).

Thereby, we decided to make a cement-retained Emax crown on a custom milled zirconia framework cemented to a prefabricated titanium base abutment. In the exocad soft, we have designed a zirconia framework with a shoulder margin at the gingival level that has been milled and sintered in the CAD-CAM (computer-assisted design and computer-assisted manufacturing) technology (Figure 3).

This framework was cemented on a compatible titanium base abutment (Ti-Base for CAD-CAM, DSI Dental Implant System, Israel), compatible with the internal hex of the implant. After airborne-particle abrasion with aluminum oxide ≤50 μm and 0.2 MPa (16) was applied on titanium surfaces, composite resin cement (RelyX Unicem; 3M ESPE) was used to cement the surfaces and each side was prepolymerized with a light unit for 20 seconds. Excess cement was removed and the titanium zirconia interface was finished with a diamond impregnated polishing system (Dialite ZR Extra-Oral; Brasseler USA) until a smooth surface was achieved and veriffied under magnification.

FIGURE 3. Virtual customised implant abutment project – digital models with customised implant

FIGURE 4. Overlook on the peri-implant tissue initial status, after one month, three months and eight months – abutment view and provisional crown view

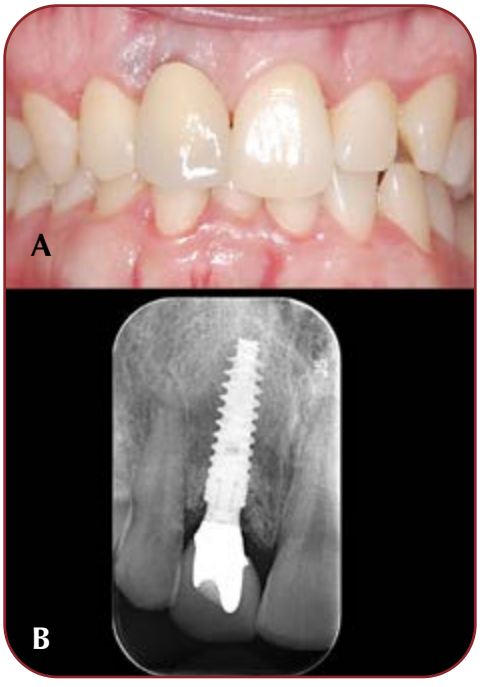

FIGURE 5. Final result: A. Retroalveolar x-ray; B. Intraoral view of the restauration

The hybrid abutment was extraorally scanned using a compatible implant analog and, after it was inserted into the implant body and a torque

of 32 Ncm was applied to the abutment screw to fix it, an intraoral scan has been made too.

A provisional PMMA cement-retained crown has been designed and milled. Several periodical examinations of the peri-implant tisue have been made (Figure 4).

After eight months, we were satisfied with the stable volume, no bleeding, favorable contour and appearance of peri-implant tissue. Therefore, the definitive Emax cement retained crown was fixed (Figure 5). ❑

DISCUSSION

This report describes a technique to create a custom abutment with a corrected emergence profile. The hybrid abutment, with a metal connection and a milled ceramic structure according to the peri-implant emergence profile, is a reliable alternative to maintain a stable and favorable volume of peri-implant tissue (12, 13). Customization of the implant abutment gives the clinician the opportunity to design the cervical margins according to the anatomy of marginal ridge, improving the emergence profile of the restoration (14) and compensating for poor implant angulation (15). This abutment combines the strength and precise fit of a titanium base with the esthetics of shaded custom-milled zirconia. In this way, the need for waxing and burnout procedures is avoided and possibility of errors decreases.

The zirconia meso structure metal link ensures a large amount of polycrystalline material which diminishes the grayish effect on the mucosa (10). Also, the cementation process occurs extra orally and the harmful effects are eliminated. ❑

CONCLUSION

The possibility of individualization of the implant abutments in CAD-CAM technology allows for more refined prosthetic designs that lead to enhanced esthetic, biologically compatible and durable implant-supported restorations. ❑

Conflicts of interest: none declared.
Financial support: none declared.

References

1. **Cooper LF, Pin-Harry OC.** "Rules of Six"--diagnostic and therapeutic guidelines for single tooth implant success. *Compend Contin Educ Dent* 2013;34:94-98,100-101.
2. **Kois JC.** Predictable single-tooth peri-implant esthetics: five diagnostic 351 keys. *Compend Contin Educ Dent* 2004;25:895-897.
3. **Small PN, Tarnow DP.** Gingival recession around implants: a 1-year longitudinal prospective study. *Int J Oral Maxillofac Implants* 2000;15:527-532.
4. **Papazian S, Morgano SM.** A laboratory procedure to facilitate the development of an emergence profile with a custom implant abutment. *J Prosthet Dent* 1998;79:232-234.
5. **Cavallaro J Jr, Greenstein G.** Angled implant abutments: a practical application of available knowledge. *J Am Dent Assoc* 2011;142:150-158
6. **Kutkut A, Abu-Hammad O, Mitchell R.** Esthetic considerations for reconstructing implant emergence profile using titanium and zirconia custom implant abutments: Fifty case series report. *J Oral Implantol* 2015;5:554-561.
7. **Tarnow DP, Cho SC, Wallace SS.** The effect of inter-implant distance on the height of inter implant bone crest. *J Periodontol* 2000;71:546-549.
8. **Alani A, Corson M.** Soft tissue manipulation for single implant restorations. *Br Dent J* 2011;211:411-416.
9. **Qutub OA, Basunbul GI, Binmahfooz AM.** Influence of abutment material on the shade of dental implant restorations in the esthetic zone: a single case report. *Clin Cosmet Investig Dent* 2019;11:73-80.
10. **Tribst JPM, Dal Piva AMO, Borges ALS, Bottino MA.** Different combinations of CAD/CAM materials on the biomechanical behavior of a two-piece prosthetic solution. *Int J Comput Dent* 2019;2:171-176.
11. **Tribst JPM, Piva AMDOD, Borges ALS, Bottino MA.** Influence of crown and hybrid abutment ceramic materials on the stress distribution of implant-supported prosthesis. *Rev Odontol UNESP* 2018;3:149-154. doi:10.1590/1807-2577.04218.
12. **Bressan E, Paniz G, Lops D, Corazza B, et al.** Influence of abutment material on the gingival color of implant-supported all-ceramic restorations: a prospective multicenter study. *Clin Oral Implants Res* 2011;22:631-637.
13. **Lops D, Bressan E, Chiapasco M, Rossi A, Romeo E.** Zirconia and titanium implant abutments for single-tooth implant prostheses after 5 years of function in posterior regions. *Int J Oral Maxillofac Implants* 2013;28:281-287.
14. **Bertolini E, Martinna de Mendonça, et al.** The use of CAD/CAM technology to fabricate a custom ceramic implant abutment: a clinical report. *J Prosthet Dent* 2014;5:362-366.
15. **Adolfi D, et al.** Lithium Disilicate Crown, Zirconia Hybrid Abutment and Platform Switching to Improve the Esthetics in Anterior Region: A Case Report. *Clinical, Cosmetic and Investigational Dentistry* 2020;12:31-40.
16. **Ebert A, Hedderich J, Kern M.** Retention of zirconia ceramic copings bonded to titanium abutments. *Int J Oral Maxillofac Implants* 2007;22:921-927.