Artificial gingiva with papilla restoration in single prostheses over malpositioned implants: an aesthetic and easy to clean alternative

Abstract / This study aimed at describing an alternative approach to the clinical condition of unfavorable implant positioning and unfavorable initial prosthetic planning. This article reports a viable alternative for these situations: the use of single crowns placed over implants with artificial gingiva. This technique reestablishes proper papillae region and proves to be an effective alternative with esthetic benefits and easy cleaning, as well as an important factor that favours the maintenance of peri-implant health.
/ Keywords / Dental implants. Prosthetic complications. Dental esthetics. Artificial gingiva.

Jarbas Eduardo **Martins**
PhD resident in Dentistry, UNICSUL. Professor, EAP-APCD and APCD-UNICSUL.

Eliane Maria Gabriel **Braga**
Specialist in Prosthesis and Implant. Professor, EAP—APCD and APCD—UNICSUL.

Fábio Valverde Rodrigues **Bastos Neto**
PhD in Dentistry and Adjunct Professor, UNICSUL. Professor, EAP—APCD.

Angela Toshie **Araki**
PhD in Dental Sciences, University of São Paulo (USP). Adjunct Professor, UNICSUL.

How to cite this article: Martins JE, Braga EMG, Bastos Neto FVR, Araki AT. Artificial gingiva with papilla restoration in single prostheses over malpositioned implants: an aesthetic and easy to clean alternative. Dental Press Implantol. 2013 Oct-Dec;7(4):52-9.

Submitted: September 15, 2013 - **Revised and accepted:** September 20, 2013

Contact address: Fábio Valverde Rodrigues Bastos Neto
Rua Joaquim Nabuco, 47 – Sala 24 – Brooklin – São Paulo/ SP – Brazil — CEP: 04621-000
bastosneto@terra.com.br

The authors inform they have no associative, commercial, intellectual property or financial interests representing a conflict of interest in products and companies described in this article.

The patients displayed in this article previously approved the use of their facial and intraoral photographs.

INTRODUCTION

Dental implants have become common in the dental clinic not only for being a simple procedure with high success rates and good longevity, but also for providing users of complete and removable dentures with comfort. In addition to that, modern society has had an increasingly quest for beauty, which is often disclosed by the media. As a result, dental esthetics has been frequently required with a view to restoring a natural smile.[11]

The need for esthetic implant-supported restoration requires that implants be correctly positioned with proper diameter, inclination and apico-coronal dimension. These factors seem to be more important than the implant type or brand.[13]

Several factors may influence the positive results of oral rehabilitation yielded by implant-supported prostheses in the anterior maxilla, especially when, before surgery, there are bone and/or gingival limitations that induce unfavorable implant placement and, as a result, interfere in prosthetic esthetics.[12] Additionally, the structures associated with the peri-implant mucosa, the topography of the edentulous space, the smile, adjacent remaining teeth and the type of restoration are key to prosthetic restoration success.[14]

CASE REPORT

A female patient sought treatment at the EAP clinic. She had four internal hexagon implants (Conexão™) as well as temporary prostheses installed in the anterior maxilla and was deeply dissatisfied with esthetics, mastication and speech (Fig 1).

Thorough clinical and radiographic examination as well as dental casts mounted in an articulator revealed implant osseointegration. However, they also revealed that the issues reported by the patient were caused by the absence of papillae between teeth and insufficient bone and gingiva, thus resulting in long teeth and non-esthetic gingiva.

The patient was informed about the advantages and disadvantages of the following treatment options: gingival graft and epithesis, as well as fixed, single prostheses with artificial gingiva. Since the patient had internal hexagon implants, 11.5 mm in length and 4.0 mm / 3.75 mm in diameter, it was decided on the use of single prosthetic crowns with artificial gingiva between teeth, which would allow oral hygiene with dental floss.

A first diagnostic waxing was carried out over the cast so as to obtain the positioning of the prosthetic crowns.

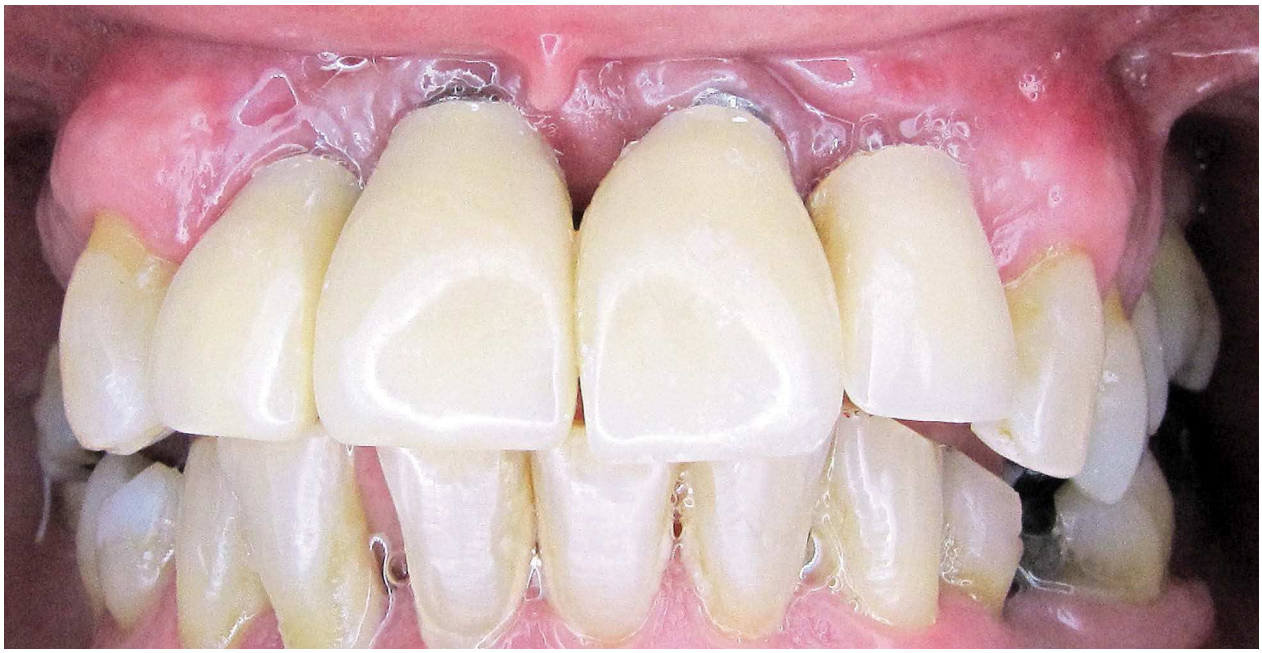


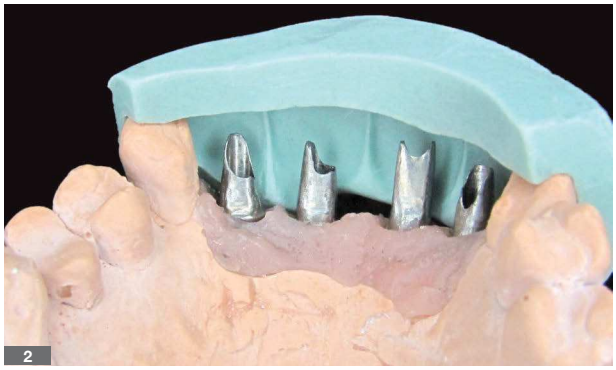
Figure 1: Initial case.

Afterwards, a condensation silicone mold (Zetaplus-Zhermack, Labordental Ltda, São Paulo/Brazil) was produced to guide the positioning of internal hexagon abutments (Conexão Sistema de Prótese, Arujá/SP/Brazil) and subsequent customization (Fig 2).

A guide was made in red acrylic resin using the dental cast as a mold (Duralay, Reliance, USA), so as to allow the customized internal hexagon abutments to be correctly positioned (Figs 3, 4). A periapical radiograph revealed that abutments were precisely fitted to the implants.

In order to precisely shape the artificial gingiva necessary to fill the spaces between teeth, restore esthetics with proper gingival apex, provide proper speech and allow oral hygiene to be easily performed with dental floss, a new diagnostic waxing of the crowns with artificial gingiva contour made in Tomas Gomes resin (STG Wax, Formaden, São José dos Pinhais/PR/Brazil) was requested from the prosthesis laboratory. It allowed prostheses to be tested in the patient's mouth and potential esthetic and/or functional repairs to be carried out (Figs 5-8).

After all necessary corrections were performed, a new silicone mold was created to guide the fabrication of the prosthetic crowns. Subsequently, customized copings were made in Ni/Cr. They were tested and radiographed in the patient's mouth so as to ensure perfect fitting (Fig 9). After the impression was made, color was determined for ceramic application (IPS d'SIGN, Ivoclar Vivadent).



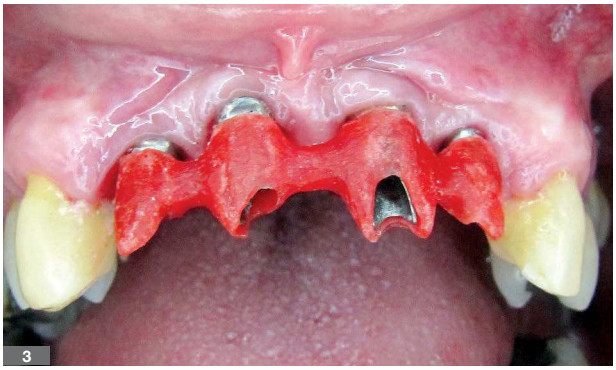


Figure 2: Silicone mold after diagnostic waxing.
Figure 3: Positioning guide for customized posts.
Figure 4: Customized posts positioned over their respective implants.

After ceramic was applied, the prostheses were tested and adapted so as to allow all necessary mandibular occlusal adjustments to be performed. Color and shape were examined and glaze was applied. Teeth were still long-shaped, given that the artificial gingiva had not been applied yet.

The aim was to use single crowns with papillae and artificial gingiva so as to yield satisfactory esthetic results in addition to favoring oral hygiene with dental floss. To this end, artificial gingiva was fixed to the crowns. Ceramage (SHOFU Inc., Japan) (zirconium silicate micro ceramic) was used to determine the shades of the

Figure 5: New diagnostic waxing of crowns and artificial gingiva.
Figure 6: Crown waxing trial with artificial gingiva.
Figure 7: Minor esthetic adjustments carried out to achieve a pleasant smile.
Figure 8: Final analysis of planning and patient's approval.

gingival color scale. This material was chosen due to its excellent ability to bond to ceramic, excellent gingival color reproduction and low curing contraction, all of which favor good fitting of contact points and the use of dental floss between crowns.

With a view to fabricating the artificial gingiva, ceramic was partially removed from the crowns with the artificial gingiva framework precisely determined. Blasting with aluminum oxide was carried out at 0.1 to 0.2 MPa, Solidex Solibond (SHOFU Inc.) bonding agent was applied for 30 seconds, Ceramage Gum (SHOFU Inc.) gingival paste was applied by increments with thickness not greater than 2 mm, thus requiring intermediate curing carried out by 90-second increments. Additionally, Oxy-Barrierb (SHOFU Inc.) was applied, since it prevents air contact before the final curing procedure and avoids an inhibition layer to be established. At last, finishing and polishing procedures were carried out.

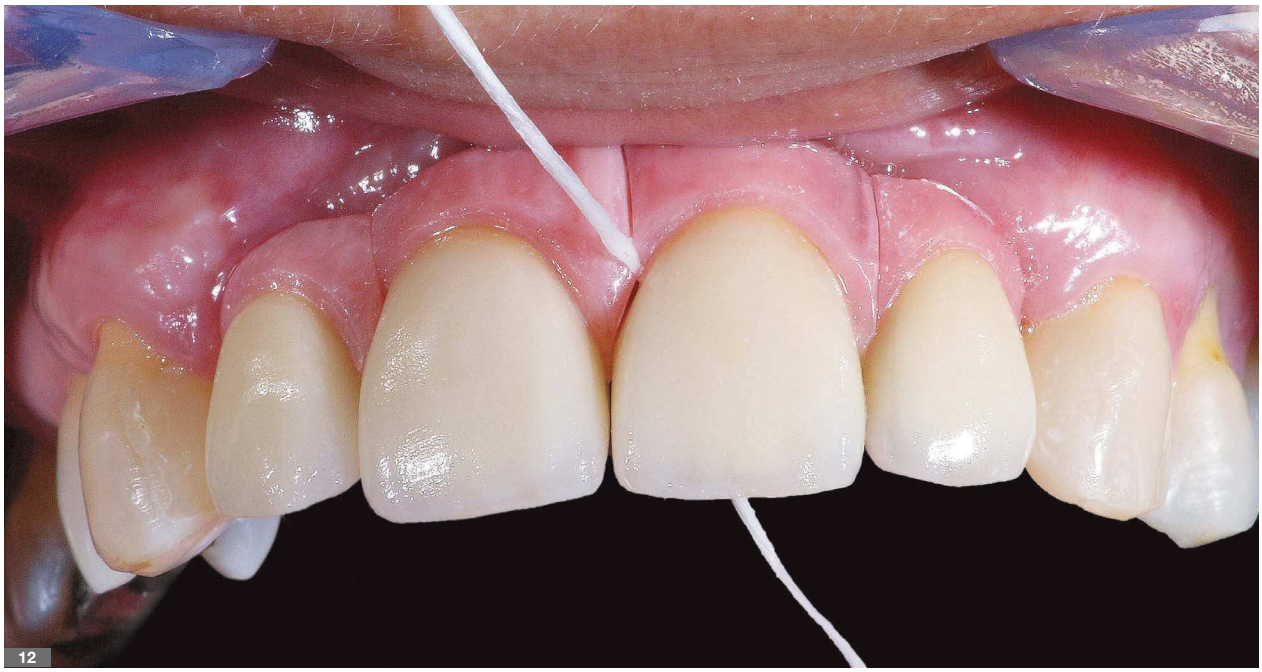
Once again, prostheses were assessed in the patient's mouth. The aforementioned procedures yielded good esthetic gingival results (Figs 10, 11), favored oral hygiene with dental floss (Figs 12, 13) and harmony of prosthetic crowns as a whole (Fig. 14). At last, cementation was carried out.

DISCUSSION

During planning, one must remember that implants function as a prosthesis-supporting structure. Thus, reverse planning of the correct surgical site is of paramount importance[15] to avoid significant differences between surgical and prosthetic procedures,[17] given that after implants have been placed and osseointegrated, they cannot be moved.

This may lead to treatment success or failure and, as a consequence, lack of appropriate prosthesis support, unfavorable biomechanical factors, such as increased tension over supporting structures, and unfavorable esthetic harmony, particularly for treatment performed in the anterior region.[16] Additionally, absence of bone tissue may hinder correct implant positioning previously planned in accordance with reverse planning defined to meet prosthetic needs. Nevertheless, some of these

Figure 9: Metallic copings trial during which marginal fitting and space for ceramic prosthesis was observed.



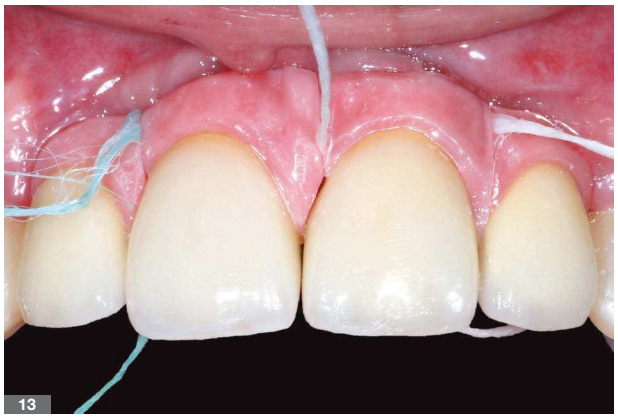


Figure 10: Final metal-ceramic single prostheses with artificial gingival made in Ceramage.
Figure 11: Patient's spontaneous smile with a natural and pleasant appearance similar to natural teeth.
Figure 12 and **13:** Dental floss used to ease oral hygiene.
Figure 14: Detailed profile photograph after case finishing.

situations may be modified by increasing bone and/or gingival tissue before treatment, which provides a proper implant receptor site that meets the esthetic and functional requirements of the planned prosthesis.[18]

In other cases, implants are placed in areas in which the long axis is not compatible with the positioning of the teeth in the arch. In these cases, prosthetic compensation is necessary to correct the problem. To minimize or compensate malpositioned implants, one may opt for a prosthesis that promotes proper oral hygiene and, as a consequence, preserves gingival health, avoids severe damage to the patient and restore, among others, esthetics.[19]

In terms of esthetics, gingival tissue plays an important role, especially in case of patients with a medium or high smile line,[20] given that gingival contour architecture influences the size of tooth crowns. Furthermore, it is worth noting that gingival apex health and contour are of paramount importance for establishing smile esthetics.[21] In this context, patients and dental-surgeons reach a consensus on the fact that a harmonious smile is more pleasant.[22]

In case of malpositioned upper anterior implants, the literature suggests that they be corrected by means of reconstructive gingival surgeries and epithesis, or artificial gingiva. The latter consists of a removable device made of acrylic resin positioned over the cervical surface of teeth with bone loss with the purpose of decreasing interproximal spaces and, as a result, providing a more natural smile.

This treatment approach provides the patient with good hygiene conditions (since epithesis may be removed); speech (since interproximal spaces are completely obliterated) as well as good esthetics (since lip support is completely achieved, as in cases of complete denture).[23,24] Conversely, it is not easily accepted by the patients due to being a removable structure. On the other hand, should a fixed denture with non-removable artificial gingiva[25] be used, it would hinder oral hygiene as additional devices, such as dental floss picks, would be necessary.

Peri-implant bone loss after prosthesis placement over implants is of multifactorial etiology, however, it is directly associated with bacteria accumulation and keratinized mucosa.[1,4,7,8] Additionally, peri-implant disease is time-dependant. According to some authors,[6,9,10] 40% of patients have peri-implant gingival inflammation, while 22% have bone loss as a consequence of poor oral hygiene. Moreover, peri-implant disease is more common among patients with periodontal disease due to poor hygiene.[10]

There is a variety of products available for removal of plaque accumulated around prosthesis placed over implants. However, it is clear that the simpler the hygiene procedure is, the better it will be performed by patients. According to the literature, bone loss around implants of protocol prosthesis or of complete and partial fixed dentures is greater than that found in single prostheses.[2,5,6]

Based on the aforementioned information and from the standpoint of an easy peri-implant maintenance, the use of single crowns provides patients with proper oral hygiene, thus ensuring longevity to bone tissue. To this end, we recommend the use of single crowns with papillae and artificial gingiva so as to yield satisfactory esthetic results in addition to favoring oral hygiene with dental floss.

In the case reported herein, artificial gingiva was fixed to the crowns and Ceramage (SHOFU Inc., Japan) (zirconium silicate micro ceramic) was used to determine the shades of the gingival color scale. This material was chosen due to its excellent ability to bond to ceramic, excellent gingival color reproduction and low curing contraction, all of which favor good fitting of contact points and the use of dental floss between crowns. This technique allowed us not only to provide patients with excellent esthetic results, but also to restore gingival contour, papillae filling and proper speech.

CONCLUSION

Malpositioned upper anterior implants require papillae and gingival esthetics restoration, which can be successfully achieved by means of single fixed prostheses with artificial gingiva. This technique restores papillae framework and has proved efficient in restoring esthetics and masticatory function, as it provides patients with proper oral hygiene — an extremely important factor for maintenance of peri-implant health.

References:

1. Boynueğri D, Nemli SK, Kasko YA. Significance of keratinized mucosa around dental implants: a prospective comparative study. Clin Oral Implants Res. 2013;24(8):928-33.
2. Camargos G V, Prado CJ, Neves FD, Sartori IA. Clinical outcomes of single dental implants with external connections: results after 2 to 13 years. Int J Oral Maxillofac Implants. 2012;27(4):935-44.
3. Costa FO, Takenaka-Martinez S, Cota LO, Ferreira SD, Silva GL, Costa JE. Peri-implant disease in subjects with and without preventive maintenance: a 5-year follow-up. J Clin Periodontol. 2012;39(2):173-81.
4. Covani U, Ricci M, D'Ambrosio N, Quaranta A, Barone A. Changes in soft tissues around immediate full-arch rehabilitations: a prospective study. Clin Oral Implants Res. 2013;24 Suppl A100:122-6.
5. De Bruyn H, Bouvry P, Collaert B, De Clercq C, Persson GR, Cosyn J. Long-term clinical, microbiological, and radiographic outcomes of Brånemark™ implants installed in augmented maxillary bone for fixed full-arch rehabilitation. Clin Implant Dent Relat Res. 2013;15(1):73-82.
6. Dierens M, Vandeweghe S, Kisch J, Persson GR, Cosyn J, De Bruyn H. Long-term follow-up of turned single implants placed in periodontally healthy patients after 16 to 22 years: microbiological outcome. Clin Oral Implants Res. 2012;23(2):197-204.
7. Esper LA, Ferreira Jr SB, Kaizer ROF, Almeida AL. The role of keratinized mucosa in peri-implant health. Cleft Palate Craniofac J. 2012;49(2):167-70.
8. Greenstein G, Cavallaro J. The clinical significance of keratinized gingiva around dental implants. Compend Contin Educ Dent. 2011;32(8):24-31.
9. Mir-Mari J, Mir-Orfila P, Figueiredo R, Valmaseda-Castellón E, Gay-Escoda C. Prevalence of peri-implant diseases. A cross-sectional study based on a private practice environment. J Clin Periodontol. 2012;39(5):490-4.
10. Renvert S, Lindahl C, Rutger Persson G. The incidence of peri-implantitis for two different implant systems over a period of thirteen years. J Clin Periodontol. 2012;39(12):1191-7.
11. Baudou JY, Tinberghien G. Symmetry, averageness, and feature size facial attractiveness of women. Acta Psychol. 2004;117(3):313-32.
12. Zielak JC, Araújo MKDM, Ornaghi RAC, Giovanini AF, Campos EA, Deliberador TM. Posicionamento desfavorável de implantes dentários ântero-superiores: relato de caso. RSBO. 2009;6(2):214-29.
13. Hermann F, Lerner H, Palti A. Factors influencing the preservation of the peri-implant marginal bone. Implant Dent. 2007;16(2):165-75.
14. Bottino MA, Itinoche MK, Buso L, Faria R. Estética com implantes na região anterior. ImplantNews. 2006;3(6):560-8.
15. Misch CE, Misch-Dietsh F. Prótese pré-implante. In: Misch CE. Prótese sobre implantes. São Paulo: Ed Santos; 2007. p. 157-79.
16. Martins JE. Planejamento integrado protético-cirúrgico. In: Fabio Valverde Rodrigues Bastos Neto (Org.). Implantologia ciência e prática. Maringá: Dental Press; 2011. p. 148-79.
17. Curcio R, Perin GL, Chilvarquer I, Borri ML, Ajzen S. Use of models in surgical predictability of oral rehabilitations. Acta Cir Bras. 2007;22(5):387-95.
18. Brugnami F, Caleffi C. Prosthetically driven implant placement. How to achieve the appropriate implant site development. Keio J Med. 2005;54(4):172-8.
19. Barbosa ALT, Silva WP, Martinez Júnior W, Cunha HA, Cruz RM. Falhas mecânicas e biológicas das próteses sobreimplantes. ImplantNews. 2006;3(3):263-9.
20. Claman L, Alfaro MA, Mercado A. An interdisciplinary approach for improved esthetic results in the anterior maxilla. J Prosthet Dent. 2003;89(1):1-5.
21. Obradovic-Djuricic, Kostic L, Martinovic Z. Gingival and dental parameters in evaluation of esthetic characteristics of fixed restorations. Srp Arh Celok Lek. 2005;133(3-4):180-7.
22. Caroli A, Moreto SG, Nagase DY, Nóbrega AA, Oda M, Vieira GF. Avaliação do contorno gengival na estética do sorriso. Rev Inst Ciênc Saúde. 2008;26(2):242-5.
23. Davarpanah M, Martinez H, Kebir M, Tecucianu J-F. Manual de Implantodontia clínica. Porto Alegre: Artmed; 2003.
24. Zielak JC, Araújo MKDM, Ornaghi RAC, Giovanini AF, Campos EA, Deliberador TM. Posicionamento desfavorável de implantes dentários ântero-superiores: relato de caso. RSBO. 2009;6(2):214-29.
25. Coachman C, Salama M, Garber D, Calamita M, Salama H, Cabral G. Prosthetic gingival reconstruction in a fixed partial restoration. Part 1: introduction to artificial gingiva as an alternative therapy. J Periodontics Restorative Dent. 2009;29(5):471-7.

Acknowledgments

We deeply thank the LOF laboratory technician, Daniel Morita da Silva, for fabricating the prosthetic pieces and providing excellent support.