Minimally invasive peri-implant procedures to obtain esthetics in the transmucosal profile

Mauricio Clavijo **BELTRÁN***
Veronica Beltrán **CLAVIJO****

Abstract

Introduction: Connective tissue graft techniques are widely used previously and during placement and rehabilitation of dental implants with the purpose of obtaining satisfactory esthetic results. However, surgical techniques are not the only options for correcting tissue volume deficiencies. **Objectives:** The aim of this article is to present through a clinical case, the slow orthodontic extrusion, the semilunar incision during the implant second surgical stage and the use of composite resin flow for soft tissue conditioning in three phases: the ovate pontic, the polymer healing abutment and the provisional crown on the implant. **Results:** Slow orthodontic extrusion promoted better leveling in the gingival collar height. Semilunar incision favored the displacement of the buccal mucosal tissue and the preservation of adjacent papillae. The composite resin flow proved to be easy to handle, in addition to having good polishing, which contributed to obtain an appropriate transmucosal profile. **Conclusion:** After an 1-year follow-up, we concluded that the combined procedures not only aided to yield esthetic peri-implant results, but also contributed to the practice of a minimally invasive Implantology.

Keywords: Dental implant. Tooth movement. Composite resins. Dental polishing. Healing. Friction.

How to cite this article: Beltrán MC, Clavijo VB. Minimally invasive peri-implant procedures used to obtain esthetics in the transmucosal profile. Dental Press Implantol. 2013 Apr-June;7(2):81-90.

Submitted: November 05, 2012
Revised and accepted: January 07, 2013

Contact address

Mauricio Clavijo Beltrán
Rua Marechal Deodoro, 857 sl. 1905
CEP: 80.060-010 - Curitiba/PR — Brazil
E-mail: mauricio@clinicabeltran.com.br

» The patient displayed in this article previously approved the use of her facial and intraoral photographs.

» 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.

* Specialist in Dental Prosthesis, FOB-USP and in Implantodontics, Association of Dental Surgeons/São Paulo.
** Specialist in Implantodontics, Association of Dental Surgeons/Piracicaba and in Periodontology, FOP-UNICAMP.

Introduction

In the recent past, Implantology believed that excellent esthetic results could only be obtained by employing surgical techniques and procedures at the moment of implantantion. In many cases, in which tissue deficiencies had not been previously corrected, there were unsatisfactory esthetic results.[1]

Connective tissue graft techniques have been currently used to correct these deficiencies. Used separately, they promote an increase in thickness of the soft tissue,[2] but lead to greater patient's morbidity due to the removal of graft in the donor sites. When they are performed after implantation, they represent a second surgical stage.

In an attempt to compensate these deficiencies, researchers began to further explore the use of prosthetic tissue conditioning, since the design of the transmucosal portion of the prefabricated abutments can not replicate the emergence profile of a natural tooth. This conditioning promotes support for the papillae and improves the stability of the buccal mucosal tissue.[3] The case report reported herein shows the use of surgical-prosthetic procedures employed to obtain an ideal emergence profile in the implant rehabilitation of the upper central incisor region.

Case report

A female patient sought a private clinic for prosthetic rehabilitation treatment. The treatment planning aimed to rehabilitate the upper teeth with metal-ceramic crowns (Fig 1). After installation of provisional crowns in teeth #13 to #23, mobility and the presence of root fracture were observed in tooth #11 (Fig 2).

In order to avoid proximal bone loss that could affect the esthetic outcome of the case, it was decided to conduct orthodontic treatment, with the purpose of extruding the failed tooth prior to beginning implantation in the area. After orthodontic movement (Fig 3), it was possible to extrude tooth #11 so as its gingival margin was approximately 3 mm below its homologous tooth.[21]

The crown and the post were removed (Fig 4) for minimally traumatic extraction of tooth #11 and for socket inspection. The existing bone defect was small and located in the lingual face of the socket. A locking taper implant (Kopp, Curitiba - Brazil) was installed and the gap between the socket and the implant was filled with Bio-Oss biomaterial. It was closed with a polymer healing plug 2 mm in height, and a Collatape membrane was used to cover the biomaterial.[4] During the same session, the implant and its respective healing plug were installed in the region of tooth #24. A new set of provisional crowns was installed in the upper anterior teeth, so as to unite teeth #21 to #12 in a fixed bridge, ensuring that the pontic maintained its support of the gingival tissue and aided the closing of the alveolus (Fig 5).

Figure 1 - Initial clinical image.

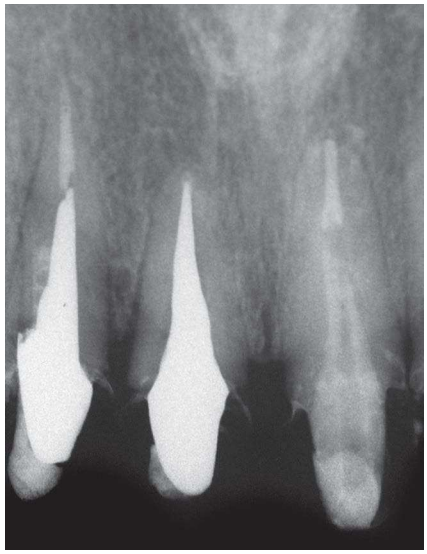


Figure 2 - Initial periapical radiograph.

Figure 3 - Clinical result after slow orthodontic extrusion of tooth #11.

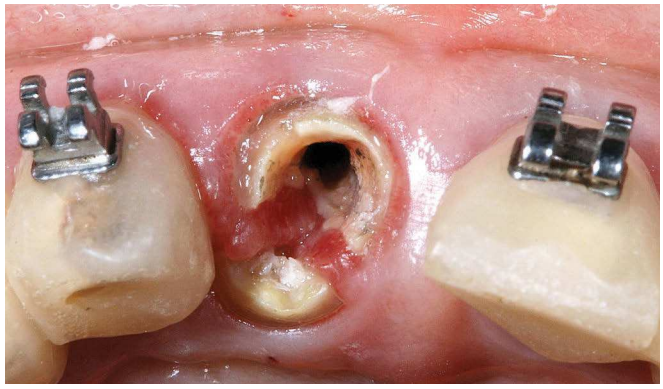


Figure 4 - Dental root after the removing the provisional crown and the metal post.

Figure 5 - Cementation of the provisional bridge between teeth #21 and 12.

Four months after implantation (Figs 6 and 7), the implant of region #11 was reopened with a palatal semilunar supra-crestal incision (Fig 8) and the healing plug was removed so that it could be replaced by another one 6 mm in height (Fig 9). The latter was customized and its surface was previously made coarse by means of burs. Additionally, it was enlarged on the sides with a light-curing composite resin (Fig 10). At the end of customization, a new profile was obtained (Fig 11), which allowed the flap to bucally shift, creating an increase in buccal soft tissue and in the cervical region (Figs 12 to 15).

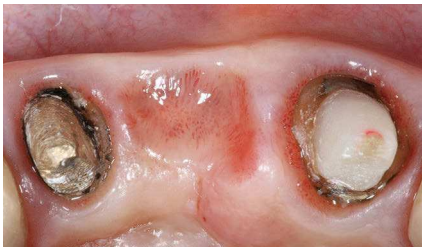


Figure 6, 7 - After epithelial healing of the implant area, we can see the gingival profile outcome obtained with the provisional prosthetic pontic.

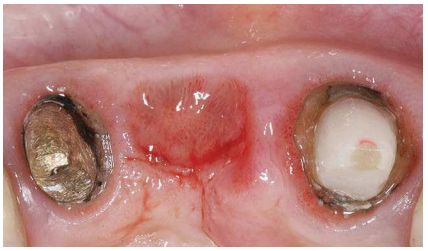


Figure 8 - Occlusal image of the supra-crestal semilunar incision.

Figure 9 - Comparison between the healing plugs before customization.

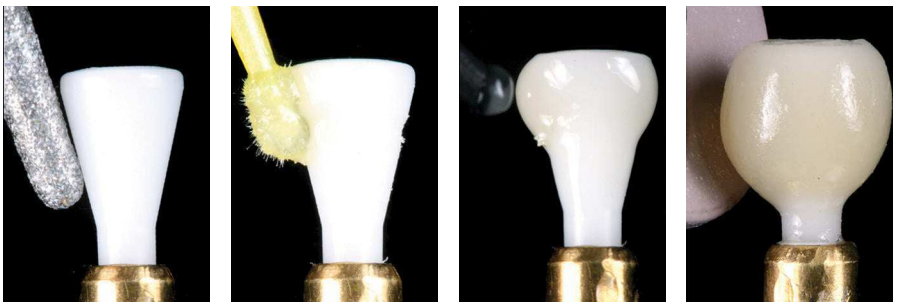
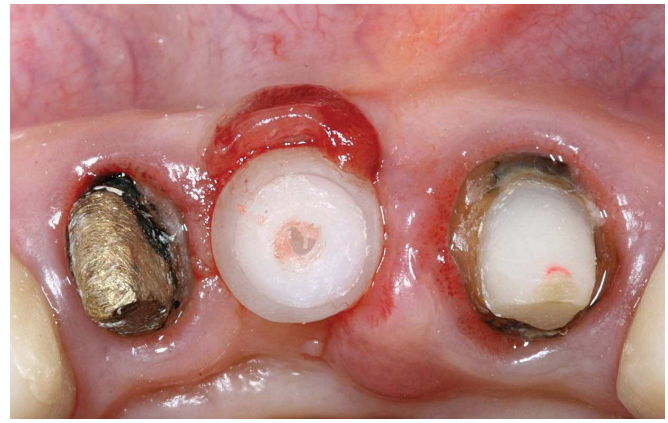
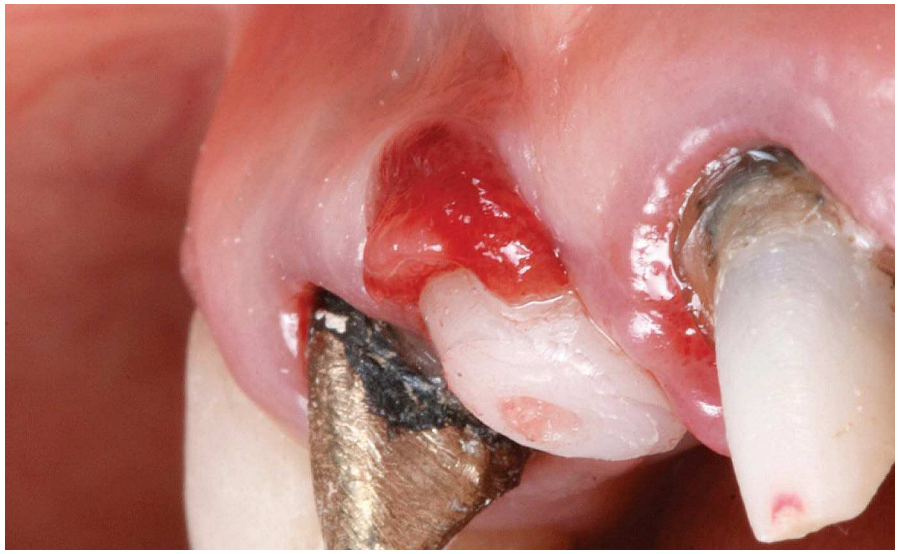
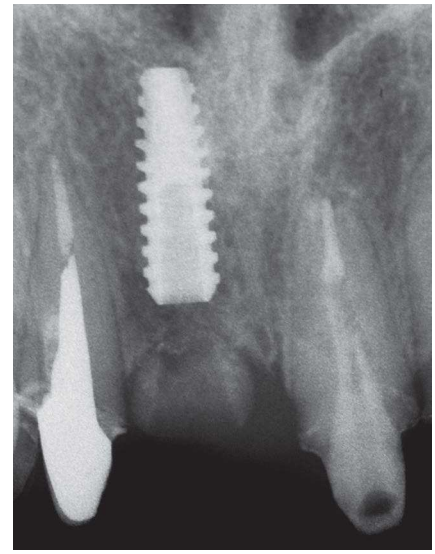


Figure 10 - Customization and polishing of the healing plug.

Figure 11 - Comparison between the healing plugs after customization.

Figures 12, 13, 14, 15 - After the insertion of the new customized healing plug. Periapical radiograph after healing plug customization.

After three months (Fig 16), the implants were loaded with the installation of crowns/provisional abutments that were a little coarse so as to enable addition of light-curing resin on their sides. The same procedure was employed with the polymer healing.

After the conditioning period of one month, the emergence profile obtained with the provisional implant crown was transferred by using a laboratory putty silicone matrix and a titanium transfer/abutment with acrylic resin (Fig 17). Afterwards, it was shaped with Polyvinyl siloxane using the double cord and closed tray techniques (Figs 18, 19 and 20).

The plaster model, the abutment for tooth #11 and the copings were prepared in the laboratory together with the metalceramic crowns for teeth #13 to #23.

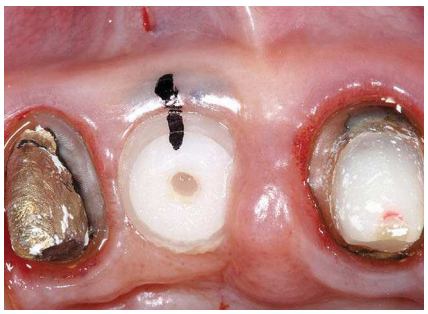


Figure 16 - Gingival conditioning with the customized healing plug after three months.

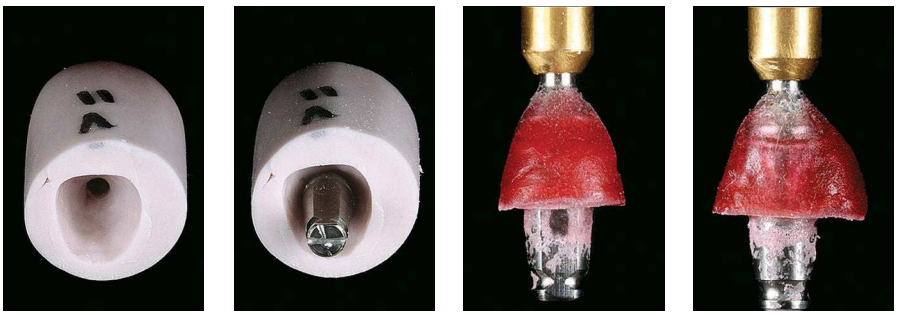
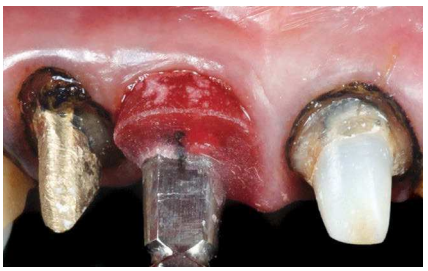


Figure 17 - Transferring of the emergence profile obtained with the provisional implant crown by means of a laboratory putty silicone matrix and a titanium transfer/abutment with acrylic resin.



Figures 18, 19, 20 - Frontal and occlusal images before the implant impression.

The crowns for teeth #13, 12, 21, 22 and 23 were tested and then luted by inserting the retractor cord. The crown for #11 was tested and extra-orally luted with zinc phosphate cement. The excess cement was removed (Fig 21) and the integrated crown/abutment was activated by means of an acrylic resin guide. This guide was used to direct the activation force which must be consistent over the long axis of the implant (Figs 22 to 24). This direction prevents inadequate activation of the integrated crown/abutment, which would make the connection susceptible to failure and looseness.

At the end, a periapical radiograph was taken (Figs 25, 26). The final occlusal adjustments were made and the excess cement was removed from the dental crowns.

After one year, new periapical radiographs and an intraoral photo of the case were taken (Figs 27 and 28). Healthy and stable peri-implant mucosal tissue was observed, and the difference between the incisal edges of the incisors was of approximately 0.5 mm. Occlusal contacts were checked and adjusted.

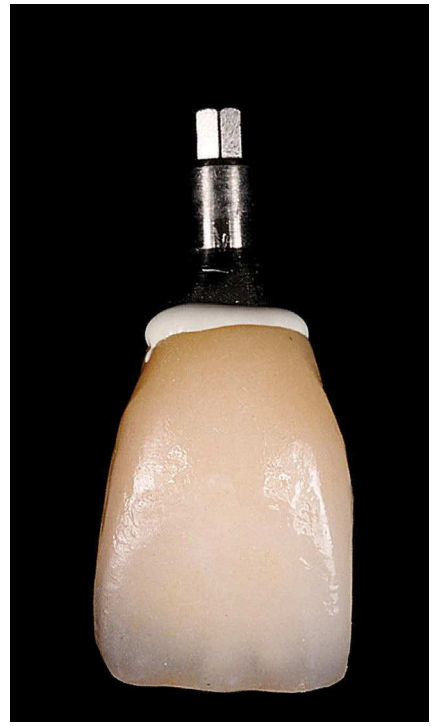


Figure 21 - Extraoral luting of the crown and implant abutment as well as removal of excess zinc phosphate cement.

Figure 22 - Inserting the integrated crown/abutment in tooth #11 implant.

Figure 23 - Placing the acrylic resin guide in the implant crown.

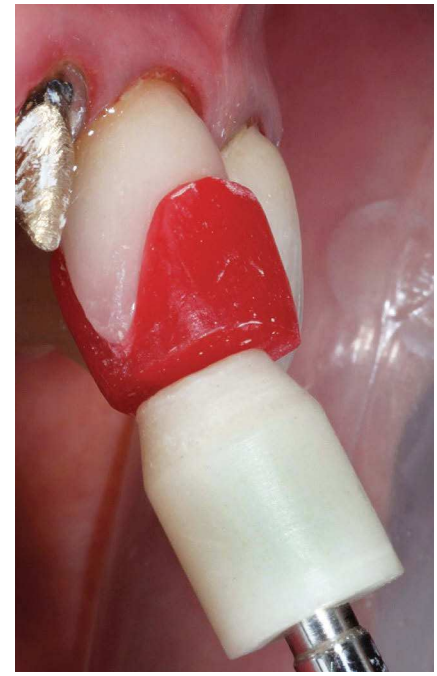


Figure 24 - Proximal view of the acrylic resin guide used to direct the activation force.

Figure 25 - Clinical case outcome soon after all metal-ceramic crowns had been luted.

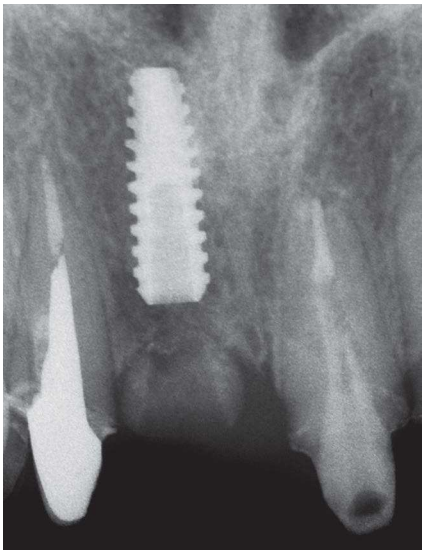


Figure 26 - Periapical radiograph after conclusion of the clinical case.

Figure 27 - Clinical case after one year.

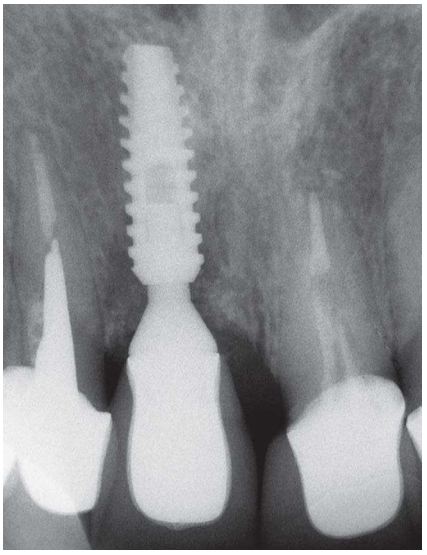


Figure 28 - Periapical radiograph after one year.

Discussion

This case report showed clinical procedures carried out before implantation, which created an ideal site for the extraction of tooth #11 and immediate implantation. Moreover, it showed procedures performed after implantation, which resulted in an ideal prosthetic emergence profile.

The slow orthodontic extrusion is a tooth movement technique that induces the formation of periodontal supporting tissues,[5] leveling the height of the gingival base and promoting the recovery of the gingival papillae.[6,7] This technique was chosen because there were signs of fracture in the root of tooth #11, and consequently, the presence of bone defects.[8]

We emphasize, however, that post-treatment control should be performed since one of the possible causes of the difference between the incisal edges may have been the passive extrusion of tooth #21.

After extraction, the gap was filled with slow reabsorption inorganic xenograft and collagen membrane cover so as to avoid an extreme reabsorption of the buccal wall of the alveolus, which could result in loss of tissue volume.[9] Implant closure was performed with a low-height healing plug instead of an implant cover in order to initiate the formation of an emergence profile. Furthermore, it was used so as, after bone modeling, there was no formation of bone tissue on the implant cover, which is flush with the implant platform.

Tissue conditioning with composite resin added to the rounded prosthetic pontic[10,11,12] was another important step taken at this stage. It ensured support to the papillae of the adjacent teeth and the buccal gingival margin.

Repeatedly used (in the pontic, the healing plug and the provisional implant crown), the light-cured composite resin proved to be a good modeling material (increase and tear) if compared to chemically activated acrylic resin. It presents good working characteristics (time and handling), which allows ideal, immediate and easy polishing,[13] and does not promote irritation of the gingival tissue by the volatilization of solvents. The smoothness obtained after polishing hinders bacterial adhesion,[14] and also the emergence of bad smells, all of which result in perio-implant health at these three steps.

In this case report, the customization of the gingival profile was initiated with the healing plug and not with the temporary crown, as it is usually done. This is because of the material of which the healing plug is made: a polymer susceptible to being worn down, scratched or enlarged with a composite resin. Usually made with titanium alloy, the majority of healing screws currently available on the market do not allow an adequate transmucosal gingival profile, since they have a diameter that is smaller than what is found in the cervical area of natural teeth. A disadvantage of the polymer healing plug is that it cannot be reused, but it is disposable.

The prosthetic implant connection used was the Locking Taper connection, a screwless connection that frictionally links the abutment and the implant in a cold metal welding.[15] This connection has a bacterial seal,[16] it allows extra-oral luting and peri-implant bone stability,[17] provided that the integrated crown-abutment is correctly inserted and activated on the implant.

A second hypothesis that may have contributed to the difference between the incisal edges may have been the micrometer intrusion of the integrated crown-abutment inside the implant.[18] Be as it may, we suggest that long-term studies of both the effects of orthodontic extrusion in implant therapy and of the biomechanical behavior of the locking-taper connection, be carried out.

Another important point that should be highlighted is the change in the incision during the step of reopening the implant. The advantage of a supracrestal incision over a punch instrument incision is that the former maintains the keratinous gingival tissue. The detail is in the semilunar shape that faces the palatine. This provided a greater amount of tissue buccally flaped, increasing the soft tissue in the buccal and cervical portions.[19] There was no rupture of adjacent papillae while trying to prevent them from being damaged and lost.[20]

It is worth highlighting that, in this case, there was no subepithelial connective tissue graft, since the aforementioned clinical procedures favored a suitable esthetic peri-implant profile, which can be seen at the height of the papilla

between teeth #11 and 21, after a year. We believe that these procedures may aid the management of implant rehabilitation cases with high esthetic requirements, with the possibility of a minimally invasive therapy with less surgical steps.

Conclusion

The management of soft tissue is not restrictively dependent on surgical procedures carried out with subepithelial connective tissue grafts. This case report reveals that orthodontic extrusion prior to implantation, protection and support for soft tissue by means of provisional pontic, semilunar incision during reopening, conditioning of tissues performed with light-curing composite resin added to the healing plug and the provisional prosthesis, all contributed to a successful case. We believe that these procedures may aid the management of implant rehabilitation cases with high esthetic requirements, and with fewer surgical steps. The combination of these procedures contribute to a minimally invasive implant practice.

REFERENCES

1. Joly JC, Carvalho PFM, Silva RC. Reconstrução tecidual estética: procedimentos plásticos e regenerativos periodontais e peri-implantares. São Paulo: Artes Médicas; 2010.
2. Kan JYK, Rungcharassaeng K, Morimoto T, Lozada J. Facial gingival tissue stability after connective tissue graft with single immediate tooth replacement in the esthetic zone: consecutive case report. J Oral Maxillofac Surg. 2009;67(11 Suppl):40-8.
3. Kourtis S, Psarri C, Andritsakis P, Doukoudakis A. Provisional restorations for optimizing esthetics in anterior maxillary implants: a case report. J Esthet Restor Dent. 2007;19(1):6-17.
4. Sclar AG. Preserving alveolar ridge anatomy following tooth removal in conjunction with immediate implant placement. The Bio-Col technique. Atlas Oral Maxillofac Surg Clin North Am. 1999;7(2):39-59.
5. Romanelli J. Melhora da estética vermelha para próteses e implantes com "Extrusão Ortodôntica Lenta". Dicas. 2012;1(1):50-4.
6. Kim SH, Tramontina VA, Papalexiou V, Luczyszyn SM. Orthodontic extrusion and implant site development using an interocclusal appliance for a severe mucogingival deformity: a clinical report. J Prosthet Dent. 2011;105(2):72-7.
7. Kan JY, Rungcharassaeng K, Fillman M, Caruso J. Tissue architecture modification for anterior implant esthetics: an interdisciplinary approach. Eur J Esthet Dent. 2009;4(2):104-17.
8. Goenka P, Marwah N, Dutta S. A multidisciplinary approach to the management of a subgingivally fractured tooth: a clinical report. J Prosthodont. 2011;20(3):218-23.
9. Araújo MG, Lindhe J. Rigge preservation with the use of Bio-Oss collagen: a 6-month study in the dog. Clin Oral Implants Res. 2009;20(5):433-40.
10. Gahan MJ, Nixon PJ, Robinson S, Chan MF. The ovate pontic for fixed bridgework. Dent Update. 2012;39(6):407-8, 410-2, 415.
11. Orsini G, Murmura G, Artese L, Piattelli A, Piccirilli M, Caputi S. Tissue healing under provisional restorations with ovate pontics: a pilot human histological study. J Prosthet Dent. 2006;96(4):252-7.
12. Kim TH, Cascione D, Knezevic A. Simulated tissue using a unique pontic design: a clinical report. J Prosthet Dent. 2009;102(4):205-10.
13. Leite FPP, Faria JCB, Santos APM, Oliveira JM, Cruz FG, Carvalho RF. Comparação da rugosidade superficial de resinas compostas após polimento imediato e tardio. HU Rev. 2011;37(4):391-6.
14. Aykent F, Yondem I, Ozyesil AG, Gunal SK, Avunduk MC, Ozkan S. Effect of different finishing techniques for restorative materials on surface roughness and bacterial adhesion. J Prosthet Dent. 2010;103(4):221-7.
15. Beltrán MC, Clavijo VB, Ramos GG. Coroas cimentadas em implantes de conexão sem parafuso. Rev Dental Press Periodontia Implantol. 2010;4(4):40-52.
16. Dibart S, Warbington M, Su MF, Skobe Z. In vitro evaluation of the implant-abutment bacterial seal: the locking taper system. Int J Oral Maxillofac Implants. 2005;20(5):732-7.
17. Venuleo C, Chuang SK, Weed M, Dibart S. Long term bone level stability on short implants: a radiographic follow up study. J Oral Maxillofac Surg. 2008;7(3):340-5.
18. Di Carlo F, Marincola M, Quaranta A, Bedini R, Pecci R. Analisi MicroTac di impianti a connessione conometrica. Dent Cadmos. 2008;76(3):55-60.
19. Bidra AS, Rungruanganunt P. Omega-shaped (Ω) incision design to enhance gingival esthetics for adjacent implant placement in the anterior region. J Oral Maxillofac Surg. 2011;69(8):2144-51.
20. Shahidi P, Jacobson Z, Dibart S, Pourati J, Nunn ME, Barouch K, Van Dyke TE. Efficacy of a new papilla generation technique in implant dentistry: a preliminary study. Int J Oral Maxillofac Implants. 2008;23(5):926-34.