

Case Report Article

Hard and soft tissue manipulation to optimize the peri-implant aesthetics – case report

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Abstract

Introduction: The demand for aesthetic results in oral rehabilitation by dental implants in the anterior area constitutes a major challenge for dentists. **Objective:** The purpose of this paper was to report the management of hard and soft tissues to optimize the aesthetics of a single implant at anterior area. **Case report:** The patient underwent autogenous block bone graft surgery, Morse taper implant installation, peri-implant soft tissue manipulation through the “roll on” technique, provisional tooth and prosthetic finishing with metal free implant-supported crown. **Conclusion:** After three years of follow-up, this paper strongly suggests that the combination of bone with gingival techniques proved to be essential for obtaining predictability and adequate esthetic results.

Introduction

The extraction results in bone loss because of the atrophy of the edentulous alveolar ridge [2, 11]. The prosthetic rehabilitation of a single edentulous space at the maxillary anterior area is critical because of the aesthetic demand involved in these cases [10].

During the implant-supported rehabilitations with high aesthetic requirement, many times, the execution of procedures prior to, during, or after the implant installations aims to the reestablishment of the adequate bone contour and healthy and aesthetically natural soft tissue [3].

Many types of grafting have been proposed for bone augmentation, yet the autogenous block grafts have been currently considered the most used for this purpose because its properties of osteoconduction, osteoinduction, and osteogenicity [6, 12].

When the implant treatment has to be executed at a visible area, whose aesthetics should be respected, it is indispensable for the tissue harmony the existence of a peri-implant tissue of quality similar to that of the surrounding periodontal tissues [3].

The aesthetic excellence is also a requisite required by the prostheses, increasing the need and desire for metal-free restorations even in implant-supported ones. The requirement of color, shape and gingival symmetry similar to those of the tooth leads to the development of more aesthetically and stronger copings, as an alternative treatment [17].

The aim of this study was to report the rehabilitation of a single edentulous area at the maxillary anterior region showing a severe aesthetic defect, in which was necessary the use of autogenous bone block graft, manipulation of the peri-implant tissues by roll-on technique, choice for aesthetic coping to reach a satisfactory aesthetic result.

Case report

A 20-year-old, male patient was referred to the clinics of the School of Dentistry of the Federal University of Goias (FO/UFG) to be rehabilitated with implants. He reported the avulsion of tooth #21 at 14 years-old. Thus, the patient worn a provisional partial removable denture (RPD) with labial arch up to the ending of the orthodontic treatment (figure 1a).

At the clinical examination, a large bone defect was observed by a labial depression at the region of the maxillary left central incisor. The gingival biotype was thin and exhibited a small amount of keratinized mucosa. The surrounding teeth displayed a triangular and long shape (figures 1b and 1c).



Figure 1a - Frontal view with provisional RPD



Figure 1b - Close-up of frontal view presenting a satisfactory height of soft tissue



Figure 1c - Occlusal view evidencing the lack of thickness of the tissues

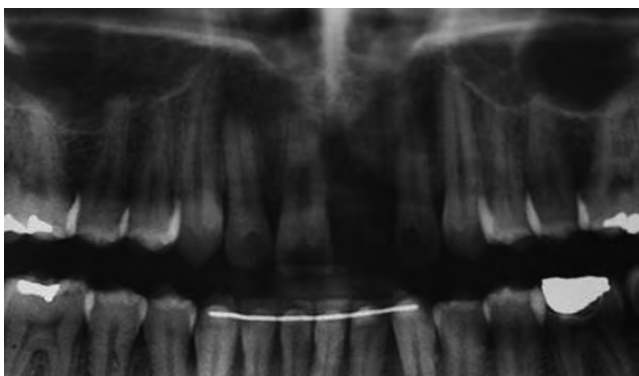


Figure 2 - Initial radiographic aspect

The radiographic examination evidenced the presence of a radiolucent image compatible with bone height deficiency at the area of absent tooth #21 (figure 2).

The treatment planing comprised the execution of a block bone graft on the compromised maxillary area to correct the bone defect. After six months, an implant would be installed and the need for conjunctive tissue graft would be evaluated. The bone graft donor area was the lateral ramus of the left mandible due to its good bone availability.

Pre-operatively, the following drugs were prescribed: 2 tablets of amoxicillin 500 mg, and one tablet of dexamethasone 4 mg one hour prior to the surgical procedure. Post-operatively, the patient was

oriented to take: one tablet of amoxicillin 500 mg every 8 h for seven days; one tablet of nimesulide 100 mg every 12 h for three days and one tablet of sodium dipyron 500 mg every 6 h as long as felling pain.

The first surgical intervention was performed at the pre-maxilla area. After the infiltrative anesthesia with 2% mepivacaine with epinephrine at the vestibule bottom and palatal area of the region involved, the flap was raised from the distal surface of tooth #11 to the distal surface of tooth #22, where a relaxing incision was executed to preserve the dental papilla (figure 3). The receptor site was prepared through perforations of the labial cortical bone with the aid of #700 drill at low speed.

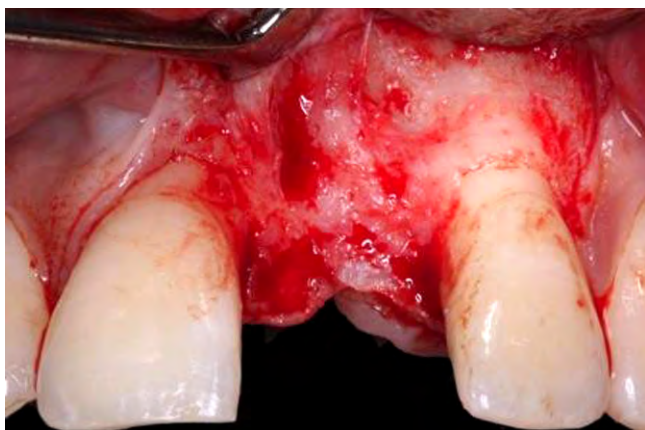


Figure 3 - Aspect of the bone atrophy of the receptor site



Figure 4 - Clinical aspect of the retromolar area - donor site

A linear incision at the mucous-gingival line of about 2 cm was executed at the donor site. After the osteotomy with #700 drill (Komet Brasil, Santo André, SP, Brazil) a bone block was removed (figure 4), comprising predominantly cortical bone with 15 mm of length, 7 mm of width and 4.5 mm of thickness (figures 5a and 5b).

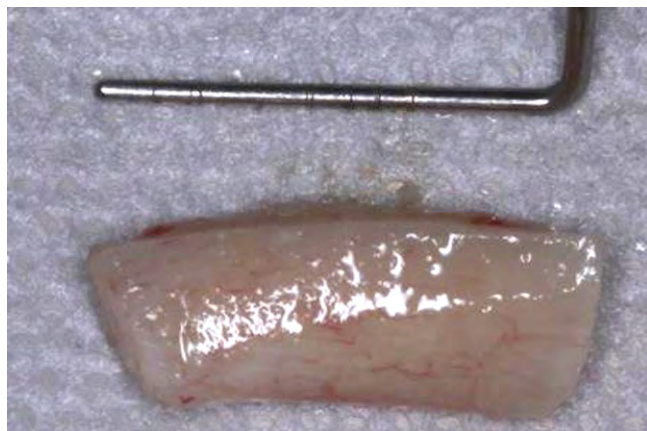


Figure 5a - Length measuring of the bone block removed



Figure 5b - Cortical bone graft of 4.5 mm of thickness

The bone was regularized, adapted and fixed with the aid of a 1.5/10 mm titanium screw (Neodent, Curitiba, PR, Brazil) onto the receptor site at the maxillary anterior area. The flap was repositioned and sutured through simple sutures with Nylon thread 5-0 (Shalon, Goiânia, GO, Brazil) (figures 6 and 7).

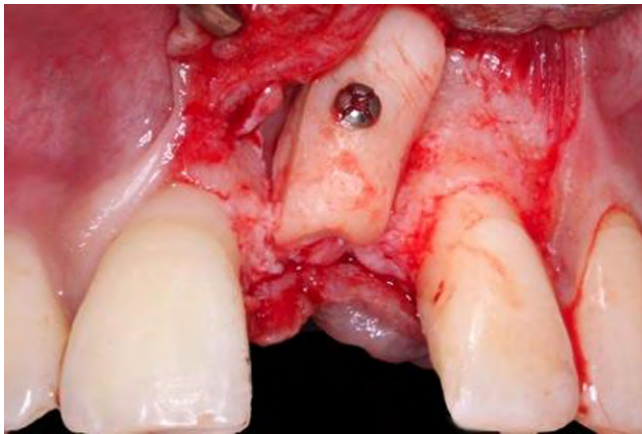


Figure 6 - Aspect of bone graft fixed with 1.5/10 mm screw



Figure 7 - Occlusal view after suture

Eight months after the first surgical intervention, the patient underwent a cone beam computed tomography (CBCT) (ICat, Kavo, Joinville, SC, Brazil) to assess the bone thickness achieved by the bone graft. CBCT showed a bone thickness of 5.7 mm (figure 8). Clinically, the thickness of the grafted area was of 6.5 mm (figure 9). At that time, instead of performing the conjunctive tissue graft proposed in the treatment planing, the soft tissues were manipulated through roll on flap aiming to the patient's less morbidity.



Figure 8 - Tomographic sagittal cut exhibiting the bone gaining obtained



Figure 9 - Occlusal view of the grafted area after eight months. A small depression of the soft tissue is still noted

The initial incision was executed on the most palatal area regarding the alveolar ridge and a total flap was raised (figure 10). The provisional RPD was used as a surgical template to guide the implant installation: the initial perforation was executed at 16 mm height with the aid of a spear drill (Neodent®, Curitiba, Brazil); next, the surgical template aided the observation of the relationship with the surrounding and mandibular teeth; the perforation continued at 15 mm height through drills of the following diameters 2.0 mm; 2.4 mm; 2.8 mm. All drills were guided through using the palatal wall to prepare the bone site, therefore assuring the adequate bone support to the ideal installation of the implant. A cone-morse implant with 3.5 mm of diameter and 13.0 mm of height (Neodent®, Curitiba, Brazil) was installed (figure 11).

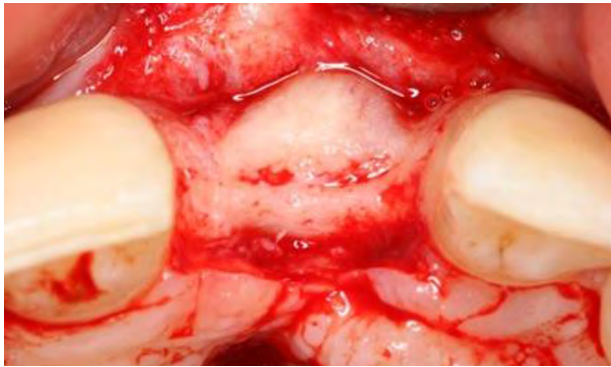


Figure 10 - Clinical area of the grafted bone, proving the bone gaining

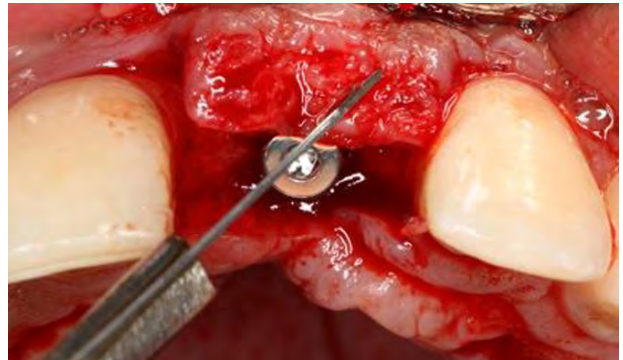


Figure 12b - Removal of the gingival epithelium through scaling with scalpel blade

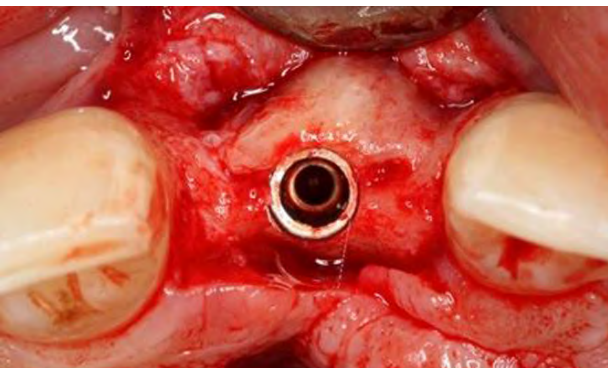


Figure 11 - Aspect of 3.5/13 mm implant installed

The initial torque of the implant was 45 Ncm. With the aid of a cone Morse measuring device (Neodent®, Curitiba, Brazil) and a periodontal probe, it was checked that the implant was 1 mm below the bone. A healing abutment with 3.3 mm of diameter and collar height of 4.5 mm was installed.

Immediately after the installation of both the implant and healing abutment, the epithelium of the palatal soft tissue was removed (figures 12a e 12b) and an incision was executed onto the periosteum to release it.

A gentle incision was performed onto the palatal side of the flap to make its folding easy and decrease the deflection memory of the flap (figures 13a and 13b).

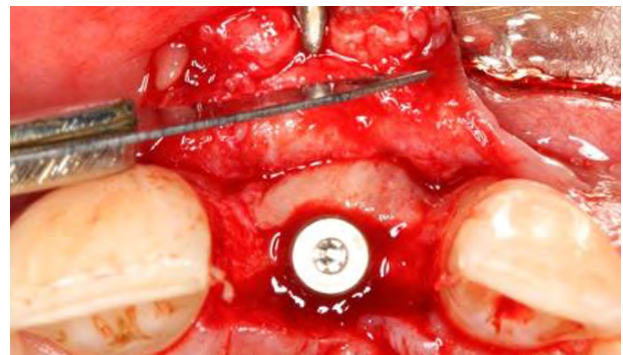


Figure 13a - Palatal incision at the flap folding to make the roll on movement easy

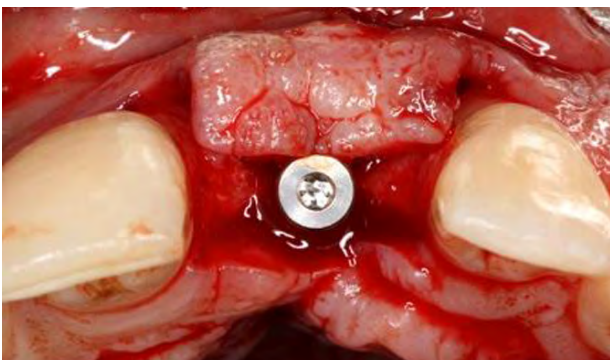


Figure 12a - After the palatal incision the labial flap was moved to the labial side

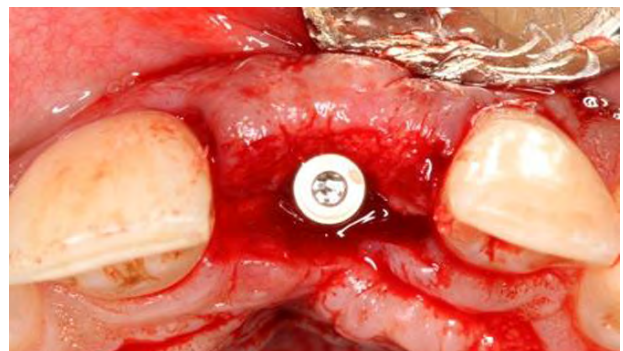


Figure 13b - Folded flap without memory

The flap was rolled towards the periosteum (figure 14a) and sutured thorough Nylon 5-0 thread and simple sutures (figure 14b).

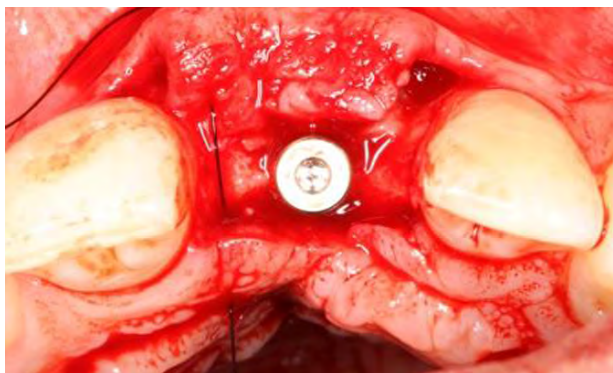


Figure 14a - The suture thread passes through the roll on flap and palatal flap



Figure 15 - Peri-implant tissue conditioning. Note the pink aspect of the tissue showing lack of inflammation

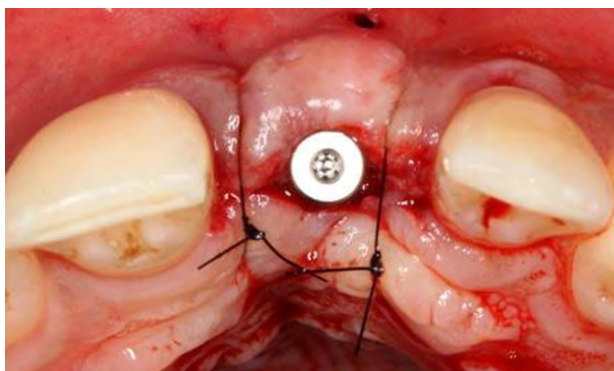


Figure 14b - Sutured area showing the gingival volume obtained with the roll on technique



Figure 16 - Occlusal view of the transfer coping of 3.3/6/2.5 mm cone Morse abutment for closed tray

The provisional RPD was relieved so that it did not interfere in the implant osseointegration. A digital following-up periapical radiograph was taken four months after the implant installation, which demonstrated the preservation of the alveolar ridge surrounding the implant platform. Six months after the implant placement, an intermediary cone-morse abutment with 6 mm height, 3.3 mm width and collar of 3.5 mm height (Neodent®, Curitiba, Brazil) was installed with torque of 32 Ncm. A provisional crown was constructed with stock tooth prepared and adapted to condition the gingiva surrounding the implant. After 15 days, the gingival conditioning was achieved by establishing an ideal emergence profile of the provisional crown. Additionally to the emergence profile, this tissue conditioning aimed to improve the gingival contour and create the interdental papillae (figure 15).

Elapsed one month after the provisional crown installation, the transfer impression of the gingival emergence profile was executed through closed tray with the aid of red acrylic resin (Duralay, Worth, IL, USA) and condensation silicone impression material (Clonage, Dentisply, Petrópolis, RJ, Brasil) onto a Morelli tray previously worn at the tooth area (figures 16, 17 and 18).

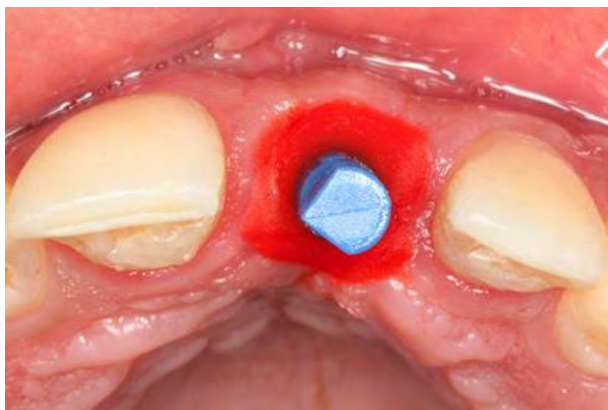


Figure 17 - Customization of the transfer coping of the closed tray technique

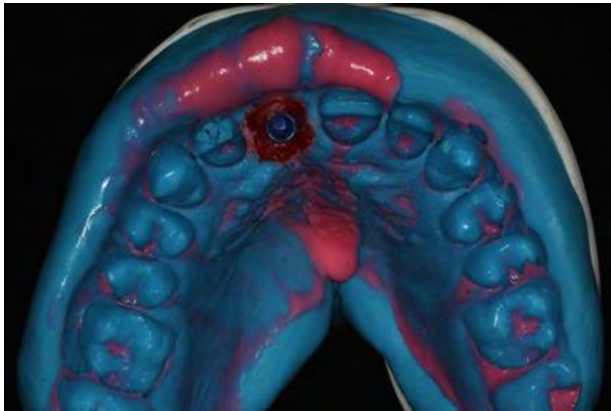


Figure 18 - Condensation silicone impression

The abutment analogue was adapted onto the impression and an artificial gingiva was applied (GingiFast Zhermarck, Germany). The impression was poured with type-IV dental stone (Durone, Dentsply, Petrópolis, RJ, Brazil). The mandibular impression was achieved with alginate (Jeltrate Plus, Dentsply, Petrópolis, RJ, Brazil) and poured with dental stone (Vigodente, Rio de Janeiro, RJ, Brasil). The ceramic E-MAX coping adaptation was verified inside the patient's mouth (figure 19). With the aid of a caliper the coping thickness was measured to guide its occlusal wear. Both the mandibular antagonist and the coping were worn to create space for the porcelain application (figure 20). The inter-occlusal register was carried out with the aid of Duralay resin and color selection through Vita scale and photographs sent to the prosthetic laboratory.



Figure 19 - Frontal view of E-MAX coping



Figure 20 - Occlusal view of the contact point removed from the palatal side of the coping

After the metal-free crown construction (figures 21 and 22), the verification of possible occlusal interference was executed with the aid of carbon paper (Aculfilm, Parkell, IL, USA), assuring a balanced and satisfactory occlusion.



Figure 21 - Frontal view of the metal-free crown



Figure 22 - Cervical view of the metal-free crown

The metal-free crown was cemented under relative isolation with zinc phosphate cement (Cimento de Zinco, SS White, Rio de Janeiro, RJ, Brazil) and final radiographs were taken. The satisfactory aesthetic outcome was determined by establishing the architecture of the supporting tooth tissues and the anatomic morphology of the metal-free crown (figures 23 a and b, 24 and 25). The patient has been followed-up at every six months for three years.



Figure 23a - Metal-free proof appointment prior to cementation



Figure 23b - Satisfactory occlusal clinical aspect of both the crown and peri-implant tissue



Figure 24 - Final smiling



Figure 25 - Final periapical radiograph

Discussion

The choice for the bone reconstruction by autogenous block graft was because of its predictability [16]. Despite of the disadvantages of limited bone availability and post-operative morbidity [14, 16], this technique is the only that provides to the receptor site cells with capacity of bone neoformation, growth factors and a bone structure immunologically similar to the receptor site [6,12].

The bone graft healing is a sequential process involving inflammation, revascularization, osteogenesis, incorporation to the host bone by forming a bone structure mechanically efficient to receive a dental implant. Many studies have shown that the graft type gathered from the mandibular ramus is mainly constituted by cortical bone of high density [14]. Thus, the revascularization, incorporation and remodeling

of the cortical bone are slower so that areas of non-viable bone could last for years [2]. For this reason, because of a thin receptor site with little vascularization, we opted to wait a longer remodeling time (eight months) of the block graft for further implant installation.

At the second surgical stage, the soft tissue was manipulated to reestablish the volume of the marginal soft tissues [8]. The roll on technique was developed by Abrams in 1980 [1] and improved by Scharf and Tarnow in 1992 [15] and Israelson and Plemons in 1993 [8].

The roll on technique has been proposed when the problem is related to a defect of a single implant/tooth, with horizontal deficiency of the bridge and preservation of its vertical height [5, 7, 18]. Among the advantages of this technique, it can be emphasized the single site which decreases the surgical morbidity and makes easy the vascularization through the displacement of a pedicle conjunctive tissue.

Focusing on the gingival aesthetics, several surgical and prosthetic techniques have been proposed to recover the papillae lost between the teeth and implants. Thus, we chose the gingival conditioning from successively relining of the provisional crown prior to the definitive restoration. Although this technique demands successive appointments, caution with the relining, polishing and compression of the provisional crown, it is of easy execution and least morbidity and best clinical outcomes than the surgical techniques [19]. In this case report, the gingival contour was conditioned by the emergence profile of the crown through the compression of the acrylic provisional crown onto the implant [9]. Also, a metal-free crown was chosen because this system has been largely employed due to best optical properties [13].

The search for the natural outcomes in the rehabilitation by dental implants at the anterior area is an increasingly challenge for the dentists over time. A careful treatment including the reverse planing [4], the correct implant positioning, bone and gingival quantity and quality, and correct use of provisional prostheses should be considered during implant-supported rehabilitation, mainly in areas of great aesthetic demand.

Conclusion

It was concluded that the manipulation of hard and soft tissues by obtaining bone and gingival gaining is essential to optimize the peri-implant aesthetics.

References

1. Abrams L. Augmentation of the deformed residual edentulous ridge for fixed prosthesis. *Compend Contin Educ Gen Dent.* 1980;1:205-13.
2. Carvalho PSP, Vasconcelos LW. Influence of bed preparation on the incorporation of autogenous bone grafts: a study in dogs. *Int J Oral Maxillofac Impl.* 2000;15:565-70.
3. Evans BL, Vastardis S. Is keratinized tissue necessary around dental implants? *The Journal of the Western Society of Periodontology and Periodontal Abstracts.* 2003;51:37-40.
4. Francischone CE, Araújo CRP, Arita C, Sendyk CL, Dinato JC. Prótese sobre implantes - um tratamento restaurador que exige planejamento integrado para a obtenção de resultados funcionais e estéticos com qualidade. *Revista da Associação Paulista de Cirurgiões Dentistas.* 2009;63:167-86.
5. Giordano F, Langone G, Di Paola D, Alfieri G, Cioffi A, Sammartino G. Roll technique modification: papilla preservation. *Implant Dent.* 2011;20:48-52.
6. Gordh MAP. Some basic factors essential to autogeneic nonvascularized onlay bone grafting to the craniofacial skeleton. *Scand J Plast Reconstr Surg Hand Surg.* 1999;33:129-46.
7. Hürzeler MB, von Mohrenschildt S, Zuhr O. Stage-two implant surgery in the esthetic zone: a new technique. *Int J Periodontics Restorative Dent.* 2010;30:187-93.
8. Israelson H, Plemons JM. Dental Implants, regenerative techniques, and periodontal plastic surgery to restore maxillary anterior esthetics. *Int J Periodontics Restorative Dent.* 1993;19:279-87.
9. Jenmt T. Restoring the gingival contour by means of provisional resin crowns after single-implant treatment. *Int J Periodontics Restorative Dent.* 1999;19:21-9.
10. Lewis S. Anterior single-tooth implant restorations. *Int J Periodontics Restorative Dent.* 1995 Feb;15:30-41.
11. Mccall RA, Rosenfeld AL. The influence of residual resorption patterns on implant fixture placement and tooth position. Part I. *Int J Periodontics Restorative Dent.* 1991;11:8-23.

12. Pallensen L, Araboe M, Hjorting-Hansen E, Nattestad A, Melsen F. Influence of particle size of autogenous bone grafts on the early stages of bone regeneration: a histologic and stereologic study in rabbit calvarium. *Int J Oral Maxillofac Impl.* 2002;17:498-506.
13. Pellizzer EP, Martins Junior M, Archangelo CM. Considerações estéticas em implantodontia. *Odonto.* 2005;13:5-18.
14. Pikos MA. Mandibular block autografts for alveolar ridge augmentation. *Atlas Oral Maxillofacil Surg Clin N Am.* 2005;13:91-107.
15. Scharf DR, Tarnow DP. Modified roll technique for localized alveolar ridge augmentation. *Int J Periodontics Restorative Dent.* 1992;12:415-25.
16. Schwartz-arad D, Levin L. Intraoral autogenous block onlay bone grafting for extensive reconstruction of atrophic maxillary alveolar ridges. *J Periodontal.* 2005;76:636-41.
17. Kina S. Cerâmicas dentárias. *R Dental Press Estét.* 2005;2:111-28.
18. Studer S, Naef R, Schärer P. Adjustment of localized alveolar ridge defects by soft tissue transplantation to improve mucogingival esthetics: a proposal for clinical classification and an evaluation of procedues. *Quintessence Int.* 1997;28:785-805.
19. Varjão FM, Jorge JH, Silva RHBT, Segalla JCM. Estética em implantodontia: conceitos e técnicas para o sucesso. *Rev Odontol Univ Santo Amaro.* 2004;9:67-72.