Application of a Modified Roll Technique to Ridge Augmentation Before Implant Surgery: A Case Report

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Implant-supported prosthetic rehabilitation of anterior edentulous spaces is a challenge to the dentist performing the implant surgery. Proper positioning of the implant and its harmonious relationship with the hard and soft tissues are fundamental, since the area requires a high aesthetic demand. This case report suggests a variation in the roll technique for correction of a defect on the maxillary anterior ridge before placement of dental implant.

Key words: soft tissue, implant, ridge augmentation

INTRODUCTION AND LITERATURE REVIEW

Prosthetic rehabilitation of an isolated edentulous space at the premaxilla is critical, considering the high aesthetic demand (Lewis, 1995). Aspects as the shape and amount of remaining bone, quantity and quality of the mucosa, relationship with the neighboring teeth and opponent arch, smile line, orthodontic aspects, periodontal problems, besides the size of the implant to be employed should be strictly analysed. For achievement of a predictable aaesthetic outcome, detailed previous planning is required (Askary, 2001; Mathews, 2000).
According to Saadoun et al (1994), a desirable aaesthetic outcome may not be achieved if there is impairment in the harmony between prosthesis and soft tissues, even though the appearance and shape of the prosthetic crown are acceptable. Therefore, surgical correction of the bone and/or mucogingival alterations in edentulous areas or peri-implant regions that will be rehabilitated with prostheses is essential (Askary, 2001; Hürzeler and Weng, 1999; Andriaenssens et al, 1999; Potashnick, 1998).

A localised defect on the residual alveolar ridge is characterised by a regional deficit of bone and/or gingival tissue. These types of defect may be caused by local trauma, tooth extraction, periodontal lesions, tumors or congenital developmental disturbances (Gasparini, 2004; Scharf and Tarnow, 1992; Saadoun et al, 1994). According to Scharf and Tarnow (1992) and Gasparini (2004), anterior areas presenting such defects present difficult prosthetic rehabilitation, especially due to the aesthetic involvement, in addition to speech, feeding and oral hygiene disturbances. Seibert (1983) classified the alveolar ridge defects as follows:

a. Class I: loss of tissue volume in buccolingual direction, with normal conditions of height in apical-coronal dimension
b. Class II: tissue loss in apical-coronal direction, with no change in volume in the buccolingual dimension
c. Class III: decreased volume both in buccolingual and apical-coronal dimensions.

In 1985, Allen et al classified the ridges as to the depth of the deformity in relation to the adjacent alveolar level, as:
a. Mild: depth less than 3 mm
b. Moderate: ranging from 3–6 mm
c. Severe: more than 6 mm

These deformities were corrected with prosthetic materials, in an attempt to reestablish the natural arch contour. This led to suspended teeth, as pontics that usually were longer than the adjacent natural teeth, or utilisation of flanks to simulate the gingiva over the pontic. Such types of prostheses were acceptable from a functional standpoint, yet all of them frequently acted as areas for accumulation of debris and were not aesthetic (Seibert, 1991).
Periodontal or peri-implant plastic surgery procedures have been successfully performed in Implantology (Louise and Borghetti, 2002; Adriaessens et al, 1999; Israelson and Plemons, 1993) to restore the shape and dimensions of soft and hard tissues on the alveolar ridge before, during or after placement of implants. These include the approaches for ridge augmentation with soft tissues. The epithelial-connective free grafts (Meltzer, 1979), onlay grafts (Seibert, 1983), subepithelial connective tissue grafts (Langer and Calagna, 1980), and roll pedicled graft techniques (Abrams, 1980; Scharf and Tarnow, 1992; Barone et al, 1999; Gasparini, 2004) are the most employed approaches.
Meltzer (1979) was one of the first authors to indicate the utilization of free epithelial-connective grafts for correction of alveolar ridge defects at the maxillary anterior region. The predictability of free gingival grafts for correction of ridge defects was confirmed later by Seibert (1983). However, this author suggested the accomplishment of thicker grafts, such as onlay grafts, with complete removal of epithelium and connective tissue from the palate, making use of its entire thickness, for correction of Class II and III defects, considered as moderate and severe, respectively. Developed by Langer and Calagna (1980), the subepithelial connective tissue technique is indicated for aesthetic areas, since it allows achievement of a reasonable increase in the volume of the area and does not lead to alterations in color at the grafted area. This comprises preparation of the receptor site, by raising a buccal flap with two vertical releasing incisions, not including the papillae. The free connective tissue graft is placed under the flap, adapted and sutured.

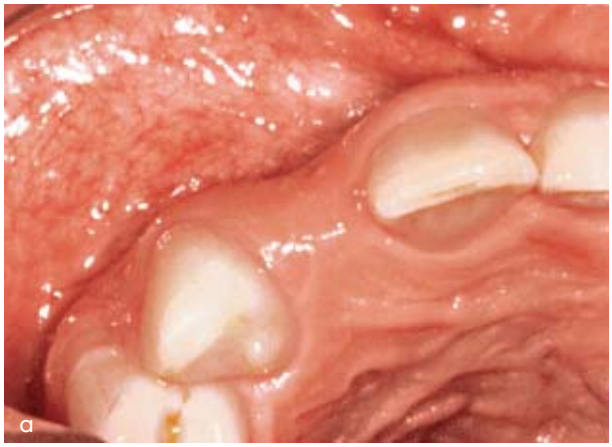
The roll technique, described by Abrams in 1980, comprises de-epithelisation of a palatal flap. The length of the pedicle should be compatible with the height of the defect on the buccal aspect and similar to the crest in mesiodistal direction. This pedicle is rolled under the buccal mucosa to increase the buccolingual dimension of the edentulous ridge for later fabrication of a fixed prosthesis. The flap is released by two vertical incisions extended beyond the mucogingival junction. This technique may be employed for correction of moderate defects, Seibert's Class I.
Later, the first modification to this technique was proposed (Scharf and Tarnow, 1992), in which the epithelium over the palatal connective tissue is raised and preserved, by a 'trap-door' approach. Two full thickness releasing incisions are performed on the top of the alveolar ridge crest towards the palate, extending in buccal direction, preserving the papillae of the adjacent teeth. These incisions are joined by a superficial incision on the alveolar ridge crest, followed by division of the palatal epithelium and its reflection under the buccal flap. This same epithelium will be used to cover the exposed donor site, after release of the underlying connective tissue, which should be rolled under the buccal flap. Healing of the donor site by first intention represents an evolution of the technique, reducing the healing period and discomfort to the patient. Moreover, some authors suggest that the amount of connective tissue that may be rolled under the buccal flap is increased.
Barone (1999) modified the technique suggested by Abrams, adapting it to the second-stage implant surgery, and presented intrasulcular incisions forming a full thickness 'envelope' on the buccal aspect instead of the two buccal releasing incisions, which would serve to accommodate the roll of connective tissue, adopting the technique of de-epithelisation of the donor site that was restricted to the portion of tissue over the cover screw. This paper aims at proposing a modification of the roll technique for correction of Seibert's Class I defects to improve the tissue contour before the implant surgery.

CASE REPORT

The patient E.T.S.A., aged 23 years, white and presenting good general health status, attended the implantology sector at the Hospital for Rehabilitation of

Fig 1 Patient presenting agenesis of the right and left maxillary lateral incisors.

Fig 2 Seibert's class I alveolar ridge defect: normal conditions of height in apical-coronal dimension.



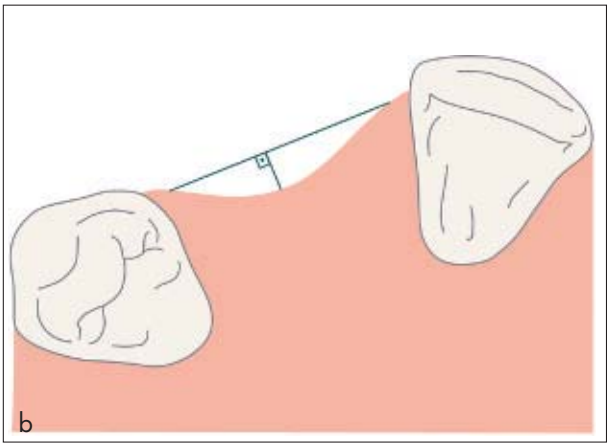


Fig 3a–b Seibert's class I alveolar ridge defect: loss of tissue volume in buccolingual direction.

Craniofacial Anomalies of the University of São Paulo, presenting agenesis of the right and left maxillary lateral incisors (Fig 1), mild Seibert's class I tissue loss (Figs 2, 3) and mild Seibert's Class III loss at the edentulous spaces of the right and left maxillary lateral incisors, respectively. Intervention was initiated on the area of the right maxillary lateral incisor, because this region only required a soft tissue graft for later placement of an osseointegrated implant, different than the left maxillary lateral incisor, planned for future intervention, due to the need for bone grafting.

After local anesthesia with three tubes of 1.8 ml of 0.5% bupivacaine with epinephrine 1:100,000, intrasulcular incisions were initially performed with a blade n. 15C around the right maxillary central incisor and canine. A simple incision, of partial thickness, was realised in mesiodistal direction from the mesial aspect of the right maxillary canine to the distal aspect of the right maxillary central incisor, over the partial edentulous ridge, on the palatal side, joining intrasulcular incisions (Figs 4, 5). The angle of the blade was 90 degrees to the bone. Following this incision, the blade was placed at an angle of approximately 135 degrees and an undermining preparation toward the center started within the incision of the palate. At each new movement of the blade along the incision line, the angle was further flattened until the blade reached a nearly parallel position to the bone surface. The partial-thickness preparation should be observed from the outside without trying to elevate the tissue while cutting with the blade. The position of the blade just below the soft tissue should be carefully controlled to prevent flap perforation. The movement with the blade continued until an adequate size for the graft

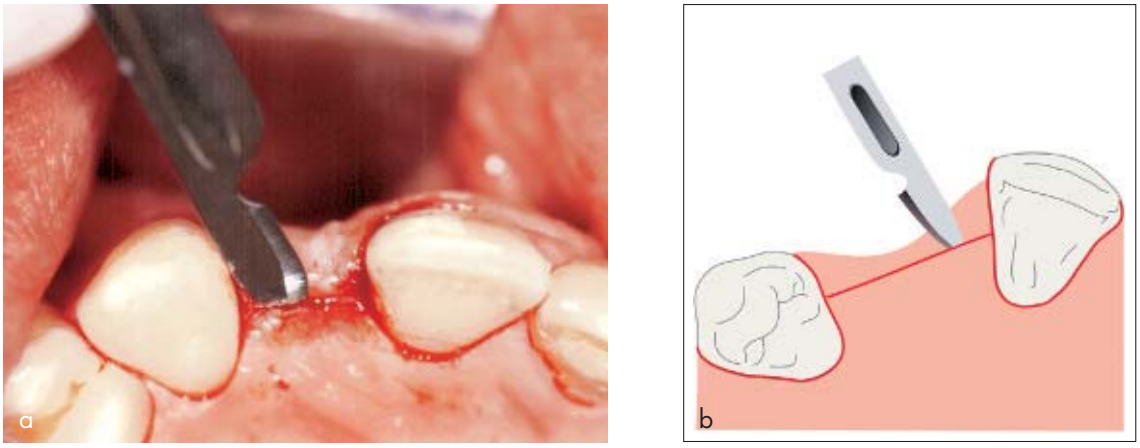


Fig 4a–b Intrasulcular incisions around right maxillary central incisor and canine, joined by a superficial linear incision accomplished palatally to the ridge.

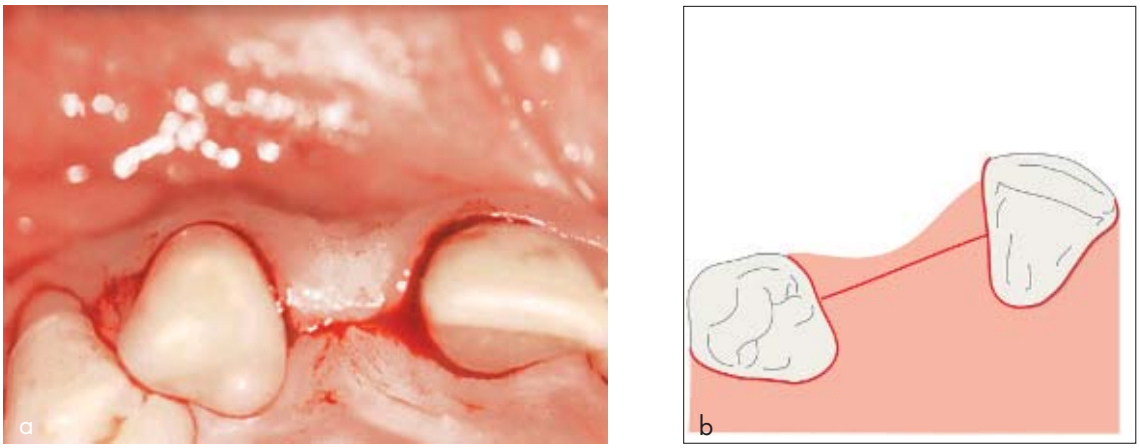


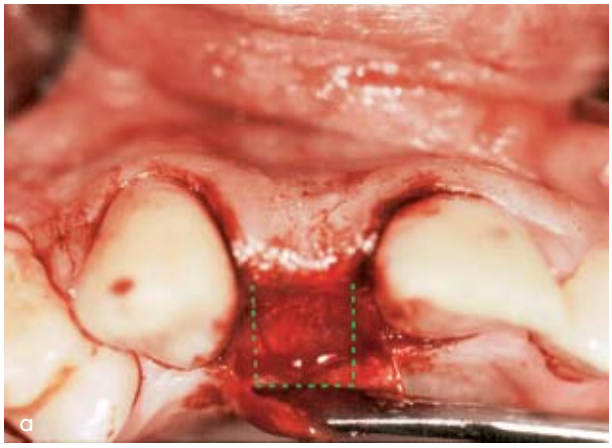
Fig 5a–b Superficial linear incision accomplished palatally to the ridge.

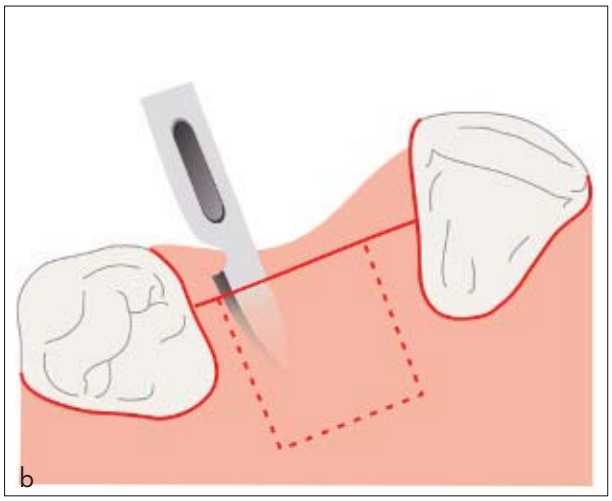
was achieved. The underlying connective tissue graft was separated from the surrounding connective tissue by making incisions in the mesial, distal and apical parts of the graft, directing towards the bone (Fig 6). No extra incision besides the initial incision was realized in the epithelium, preserving maximum blood supply to the donor area, reducing suture size and allowing first-intention healing, thus providing a better post-operative condition for the patient. A periosteal elevator removed, delicately, the insertion of the graft to the bone and thereafter dislocated it in a buccal direction, preserving the remaining pedicle at the top of the alveolar ridge (Fig 7). This flap was 'folded' and the pedicle was embedded inside the 'envelope'-like receptor site created on the buccal aspect. This tissue set was then sutured with simple resorbable suture (Vycril 5.0 Ethicon) (Fig 8).

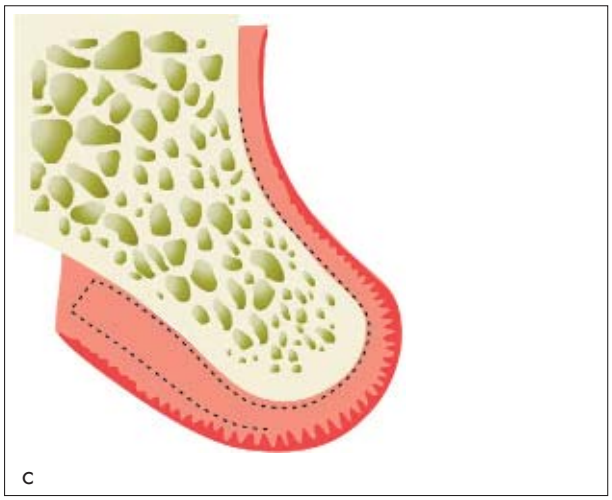
Prescription comprised 35 drops of sodium dipyrone every six hours (500mg/ml) to pain control, mouthrinsing with 0.12% chlorhexidine digluconate for one minute twice a day, beginning at 48 hours after surgery, and local application of ice for 15 minutes, with 30-minute intervals, for 48 hours following the surgery. The patient returned after 60 days for post-operative control (Fig 9).

DISCUSSION

Localised alveolar ridge defects may be corrected by two different approaches: bone grafts or guided bone regeneration (Buser et al, 1996), or soft tissue management (Abrams, 1980) if the amount of remaining bone tissue allows the placement of an implant with favorable conditions; however, the local







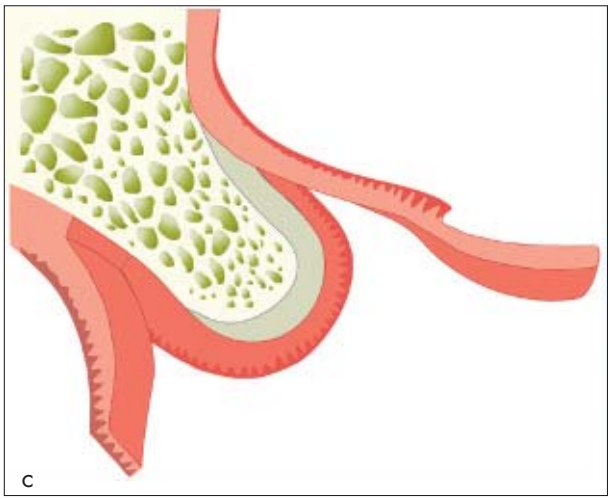
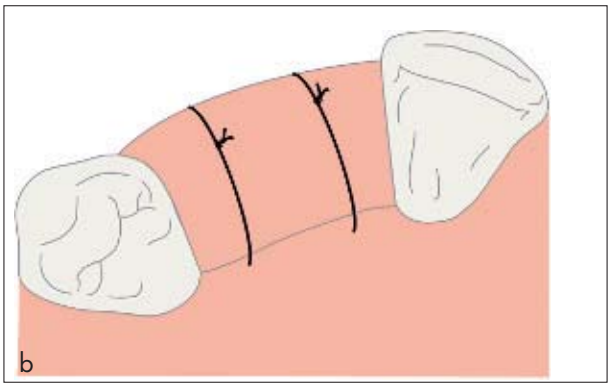


Fig 6a–c The underlying connective tissue graft was separated from the surrounding connective tissue by making incisions in the mesial, distal and apical parts of the graft, directing towards the bone.

Fig 7a–c Connective tissue incised and raised with a Molt elevator up to the top of the alveolar ridge crest.



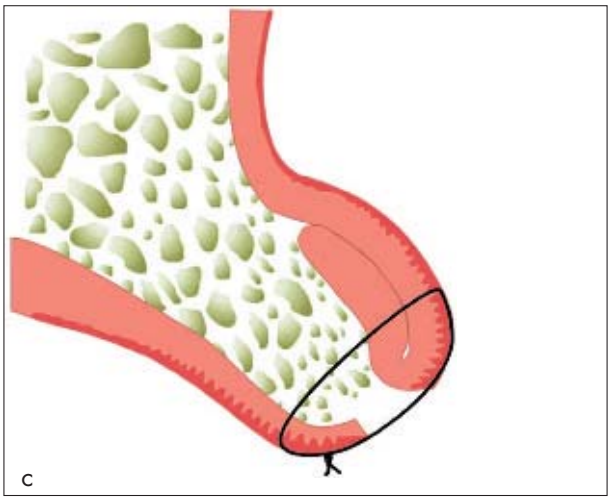


Fig 8a–c Flaps sutured with horizontal mattress and simple sutures.

Fig 9 Sixty days post-operative control.

gingival contour would impair the final aesthetic outcome.

The free gingival graft techniques, both of epithelial and connective tissue (Meltzer, 1979) and subepithelial connective tissue (Langer and Calagna, 1980) are recognised and predictable techniques. However, both techniques present disadvantages.

The free gingival graft technique may not be applied on aesthetic areas, due to the difference in color between the graft and the receptor site, besides the need of two distinct surgical sites. Since it is a free graft, its supply depends on the underlying periosteum, increasing the risk of necrosis if combined to its thickness. Moreover, there is possibility of haemorrhage at the donor site and postoperative discomfort due to healing by second intention.

The subepithelial connective tissue graft requires a second surgical site and does not maintain its original vascularisation, with possibility of necrosis, besides larger shrinkage of the graft.

Concerning the roll technique proposed by Abrams in 1980, the risk of graft necrosis, need for a second surgical site, and pain due to healing by second intention at the donor site, represent some of the disadvantages of this approach.

The modified roll technique, proposed by Scharf and Tarnow (1992), involves a horizontal incision close to the alveolar ridge crest and two parallel vertical incisions on the palate for removal of connective tissue by a trap-door approach. This type of approach, with raising of a partial thickness flap, usually allows good visibility and proper access to the underlying connective tissue. However, in the trap-door approach, with accomplishment of three incisions, there is a possibility of impairment of the blood supply to the flap. The higher the number of incisions performed, the smaller will be the supply

to the palatal flap. Moreover, in cases in which the flap length is bigger than its base, the blood supply to the flap is seriously impaired.

Moreover, a higher number of incisions usually require a higher number of sutures, once the releasing vertical incisions, inherent to the trap-door approach, may be coapted with simple suture (Hürzeler and Weng, 1999).

These aforementioned disadvantages, when considered in combination, represent risk factors that may lead to necrosis of the palatal flap, with consequent healing of the donor site by second intention and unnecessary discomfort to the patient.

Thus, modification of the approach for removal of connective tissue described in the present case report, with accomplishment of only one incision instead of two parallel vertical incisions, represents a concern of the authors for maintenance of integrity of the donor site.

Also, adoption of the principles of single incision presents several advantages: it requires only one horizontal incision for access and release of the underlying connective tissue, there is maintenance of proper blood supply to the palatal graft, reduced number of sutures, no need for stents or hemostatic agents at the palatal region, and healing by first intention at the donor site, which provides more comfort to the patient in the postoperative stage (Hürzeler and Weng, 1999).

In the present study, the modified roll technique was performed before placement of the implants.

Louise and Borghetti (2002) assure that the best time for realisation of peri-implant plastic surgery would be in a second surgical intervention, during the second-stage implant surgery, for reducing the number of interventions. However, we believe that an adequate amount of connective tissue over the alveolar crest is necessary to perform the roll technique. The space occupied by the cover screw in the alveolar crest usually fills the space that could be occupied by connective tissue during the healing period. Hence, in these cases, the connective tissue over the alveolar crest would be thinner, which would difficult or even avoid realisation of the roll technique.

CONCLUSIONS

The procedure described in this case report is indicated for correction of moderate Seibert class I defects. Such a procedure, when realised previously to implant installation, provides better control of tissue healing and greater predictability of the dimensional stability of peri-implant tissues after the maturation period of the soft tissue graft.

REFERENCES

Abrams L. Augmentation of the deformed residual edentulous ridge for fixed prosthesis. Compend Contin Educ Dent 1980;1:3,205–213.

Allen EP, Gainza CS, Farthing GG, Newbold DA. Improved technique for localized ridge augmentation. A report of 21 cases. J Periodontol 1985;56:4,195–199.

Andriaenssens P, Hermans M, Ingber A, Prestipino V, Daelemans P, Malevez C. Palatal sliding strip flap: soft tissue management to restore maxillary anterior aesthetics at stage 2 surgery: a clinical report. Int J Periodontics Rest Dent 1999;14:130–136.

Askary AS. Multifaceted aspects of implants aesthetics: the anterior maxilla. Implant Dent 2001;10:3,182–191.

Barone R, Clauser C, Prato GP. Localized soft tissue ridge augmentation at phase 2 implant surgery: a case report. Int J Periodontics Restorative Dent 1999;19:2,141–145.

Buser D, Dula K, Lang NP, Nyman S. Long-term stability of osseointegrated implants in bone regenerated with the membrane technique. 5-year results of a prospective study with 12 implants. Clin Oral Implants Res 1996;7: 2,175–183.

Gasparini DO. Double-fold connective tissue pedicle graft: a novel approach for ridge augmentation. Int J Periodontics Restorative Dent 2004;24:3,280–287.

Hürzeler M, Weng D. Functional and aesthetic outcome enhacement of periodontal surgery by application of plastic surgery principles. Int J Periodontics Rest Dent 1999;1: 1,37–43.

Israelson H, Plemons JM. Dental implants, regenerative techniques, and periodontal plastic surgery to restore maxillary anterior aesthetics. Int J Oral Maxillofac Implants 1993;8: 5,555–561.

Langer B, Calagna L. The subepithelial connective tissue graft. J Prosthet Dent 1980;44:4,363–367.

Lewis S. Anterior single-tooth implant restorations. Int J Periodontics Restorative Dent 1995;15:1,30–41.

Louise F, Borghetti A. Cirurgia plástica peri-implantar. In: Lima LB (ed). Cirurgia Plástica Periodontal Porto Alegre: Artmed® Editora S.A., 2002;418–435.

Mathews DP. Soft tissue management around implants in the aesthetic zone. Int J Periodontics Restorative Dent 2000; 20:2,141–149.

Meltzer JA. Edentulous area tissue graft correction of an aesthetic defect. A case report. J Periodontol 1979;50:6,320–322.
Potashnick SR. Soft tissue modeling for the aesthetic single-tooth implant restoration. J Esthet Dent 1998;10:3,121–131.
Saadoun AP, Sullivan DY, Krischek M, Le Gall M. Single tooth implant–management for success. Pract Periodontics Aesthet Dent 1994;6:3,73–80.
Scharf DR, Tarnow DP. Modified roll technique for localized alveolar ridge augmentation. Int J Periodontics Restorative Dent 1992;12:5,415–425.
Seibert JS. Reconstruction of deformed, partially edentulous ridges, using full thickness onlay grafts. Part II. Prosthetic/periodontal interrelationships. Compend Contin Educ Dent 1983;4:6,549–562.
Seibert JS. Ridge augmentation to enhance aesthetics in fixed prosthetic treatment. Compendium 1991;12:8,548, 550, 552 passim.

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