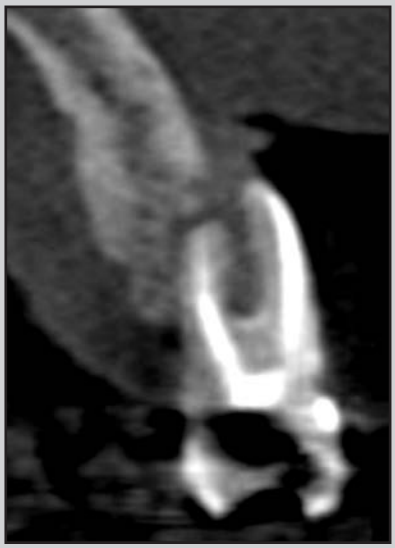

# A Modified Technique for Induced Gingival Growth Around Compromised Teeth Prior to Implant Placement: A Report of Two Cases

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*Regenerative and reconstructive periodontal plastic surgery are important options for treating marginal tissue recession and can be indicated for root coverage or periodontal procedures prior to implant placement. Among the available procedures, periodontal flaps with subepithelial connective tissue graft (CTG) is the most common treatment option to achieve proper tissue manipulation. The present study proposes a modification of a previous technique for inducing spontaneous gingival growth around teeth that will be extracted prior to implant placement, through successive reduction of the buccal root surface. This successive reduction of root surfaces is performed with diamond burs, and such reductions create space for the gingival tissue to grow coronally by reducing root convexity and, consequently, stimulating the healing process with the formation of granulation tissue that will then differentiate into keratinized tissue. The presented technique is suggested to improve the esthetic outcomes for cases involving tooth extraction, implant placement in the extraction socket, and immediate loading with interim restoration and CTG.*
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In the last few decades, the placement of implants in extraction sockets has become a routine clinical approach and a safe alternative to the original surgical protocol, presenting similar clinical results to late implants.[1] The combination of implant placement in the extraction socket along with an immediate interim restoration has the advantage of guiding soft tissue healing, thus providing a more harmonic emergence profile. A successful rehabilitation with implants should not be assessed only by survival rates, as function and esthetics are of utter importance in achieving clinical success and patient satisfaction.[2–4] This is especially true when treating the anterior region of the maxilla, where there is an esthetic challenge to reproduce a natural and symmetrical restoration with the contralateral tooth in order to mirror the periodontal and peri-implant tissue architectures, resulting in esthetic harmony with the adjacent teeth.[2,3]

Previous research has recently focused on the relationship between quantity and quality of soft tissue and on the peri-implant tissue health, as peri-implant health is considered a key factor in implant esthetics.[5,6] From a periodontal point of view, clinicians must focus on the alveolar crest and soft tissue stability, respecting the biologic response

in order to avoid alveolar crest loss and marginal recession.[7]

The most common complications around implant-supported restorations are peri-implant soft tissue recessions in the buccal and proximal areas, with an average buccal recession ranging between 0 and 1.0 mm.[4,8] Another very common esthetic problem occurs when the buccal peri-implant tissue is too thin, which can generate a grayish color in the soft tissue when using metallic abutments due to the tissue transparency, especially in the first 2 mm from the gingival margin.[9]

Reconstructing lost marginal gingival tissue has been the ambition of periodontists, implantodontists, and prosthodontists. Many surgical procedures (such as subepithelial connective tissue grafting, flap slips, and the use of biomaterials) have been suggested for the treatment of teeth with single or multiple recessions. Tissue augmentation with a subepithelial connective tissue graft (CTG) has proven to be successful in the reconstruction and preservation of soft tissue around teeth[10] and implants when performed simultaneously with implant placement or prior to prosthetic abutment placement, mainly for thin biotypes.[9,11]

Many protocols are discussed to limit the esthetic complications caused by buccal bone reabsorption/remodeling of both hard and soft tissues.[12] In order to preserve or minimize the remodeling of the buccal bone plate for immediate implants, many authors have suggested protocols using autogenous bone grafts (removed from the retromolar region or tuberosity), barriers for guided bone regeneration, and the use of different bone substitutes (eg, allogeneic, xenogeneic, or alloplastic) when placing immediate implants.[13]

The consensus of the 4th Conference of the European Academy of Osseointegration[14] suggests that peri-implant tissue augmentation procedures can increase peri-implant soft tissue height and thickness, cover exposed prosthetic abutments, and improve esthetic results, despite little long-term scientific evidence. Additionally, recent clinical studies[1,6,15–17] on the effectiveness of CTG at the time of implant placement have shown that the combination of CTG and postextraction implant placement, regardless of whether it is associated with an immediate provisional prosthesis, can be a reliable and predictable approach to compensate for tissue volume loss, maintain the level and the architecture of the buccal gingival margin, and/or increase soft tissue thickness, which might be sufficient for hiding the underlying restorative material and simulating the natural contour around implants, resulting in good esthetics over time.[1,6,15–18]

The Langer technique[19] was previously suggested for spontaneous gingival augmentation. With this method, a tooth scheduled for extraction is reduced in volume to shift its gingival margin so it is almost at the level of the bone crest. Then, a fixed provisional splint or removable prosthesis is placed. Then, 3 weeks to 1 month later, tooth extraction is performed; usually, most of the root is covered by the gingival tissue. A buccal flap is elevated, the root is extracted, and an immediate implant or ridge preservation procedure can be performed. The aim of the present study is to propose a modification of the Langer technique,[19] for spontaneous coronal gingival growth prior to tooth extraction and immediate implant placement associated with CTG and immediate provisional restoration. The present technique differs from Langer's because the teeth are not submerged, and a sequential reduction of the buccal surface of the root is made until a proper gingival height is achieved, resulting in a more predictable approach with less surgical intervention and a shorter treatment time.

## Surgical Technique

All surgeries in these cases were performed in the first author's (J.S.) private practice, which specializes in implant dentistry and periodontics. The treatment modality was explained in detail to the participants, and written informed consent forms were obtained. This clinical report was written in agreement with the CARE guidelines.[20]

### *Case 1*

The patient presented at the office with an indication for extraction of the maxillary right first premolar due to periodontal problems and a 10-mm buccal recession, resulting in major esthetic problems (Fig 1a).

After clinical and CBCT examinations (Fig 1b), the absence of adequate buccal and palatal bone width was identified. After discussing the case with the patient, it was planned to extract this tooth and place an implant in the extraction socket. Because the tooth did not present pulp vitality, the proposed modification of the Langer technique was indicated.

This modified technique began with a reduction of the exposed root, using a cone-tip diamond burr (Fig 2a), in order to reduce the convexity of the buccal root. It is important to create an ulceration of the periodontal tissue epithelium around the entire buccal root in order to stimulate granulation tissue formation (Fig 2b), consequently stimulating the healing process through a coronal proliferation of the epithelial tissue at the edges of the wound. After 10 days, the gingival tissue already presented a small coronal and laterolateral migration, and another reduction was performed (Fig 2c). On average, four to six reductions are performed at 7- to 10-day intervals until the limit of tissue growth or a favorable position of the marginal tissue is achieved (Figs 2d and 2e).

After that, the tooth was extracted (Fig 3a) and an immediate implant was placed in the extraction socket, followed by a 1.5-mm–thick CTG removed from the palate (Fig 3b). A provisional acrylic crown was made with special care to the emergence profile, leaving it slightly concave (mainly on its buccal surface) for the correct accommodation of the tissues during healing (Fig 3c). Figures 3d and 3e show clinical views of the healing process at 14 and 120 days (~4 months), respectively.

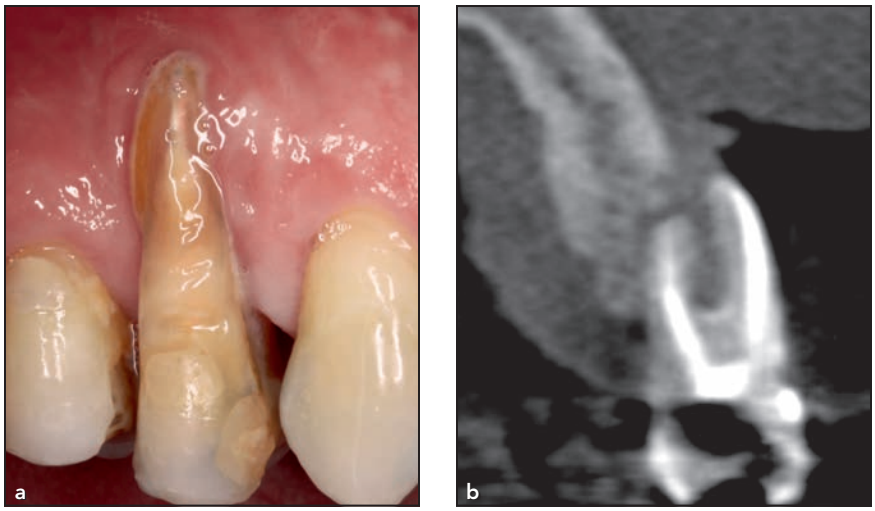



**Fig 1** *Case 1.* (a) *The patient's maxillary right first premolar presented with a major buccal and mesial periodontal defect and was indicated for extraction.* (b) *The initial CBCT scan shows the absence of the buccal and palatal bone walls.*

After osseointegration and gingival margin stabilization (Fig 4a), a metal-ceramic crown was made, maintaining the buccal volume (Fig 4b). Another CBCT scan was performed at the 3.5-year follow-up (Fig 4c), and an adequate width of buccal and palatal bone plates were observed, and a bone dehiscence could also be seen in the mesial portion. However, no esthetic consequences were identified after 6 years of follow-up (Fig 4d).

*Case 2*

The patient presented with an indication for extraction of the maxillary left central incisor due to root resorption and a 3-mm buccal recession (Fig 5a). After consecutive reduction of the root's buccal volume, the gingival margin could be seen at the same height as the adjacent teeth (Fig 5b). After achieving the desired gingival margin position, the tooth was extracted, and an implant was immediately placed in the extraction socket with a 1.5-mm–wide CTG and a provisional acrylic crown.

Figure 5c shows the buccal bone formation assessed by CBCT images before treatment, immediately after implant placement, and at the 1-year follow-up. Figures 5d and 5e show the buccal and occlusal views, respectively, at the 5-year follow-up; marginal soft tissue stability and maintenance of the soft tissue contour could also be seen.

## Discussion

The present Langer technique modification proposes an effective and easy approach that reduces the treatment time, number of surgical interventions, and morbidity, and achieves excellent patient

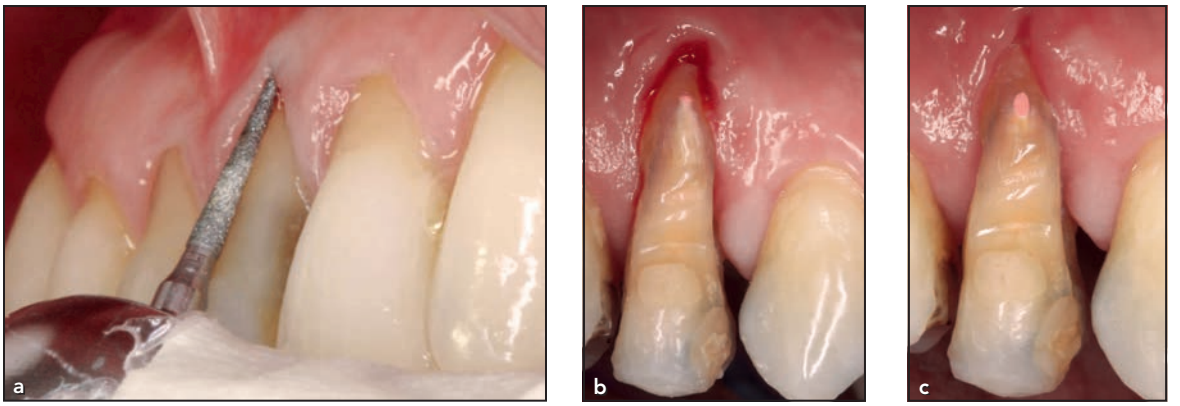



**Fig 2** *Case 1.* (a) *The diamond burr was positioned inside the groove to start root wear.* (b) *Clinical view after the first root wear, which was performed in order to reduce root convexity. The mandatory ulceration of the gingival sulcus epithelium can be seen.* (c) *Clinical appearance 15 days after the first root wear. The gingival tissue already shows a small coronal and laterolateral migration. At this time, the second root wear was performed.* (d) *Clinical appearance 30 days after the first root wear. At this time, the third root wear was performed.* (e) *Clinical appearance 60 days after the first root wear and gingival peeling on the buccal tissue. Note the large coronary migration of the gingival tissue.*

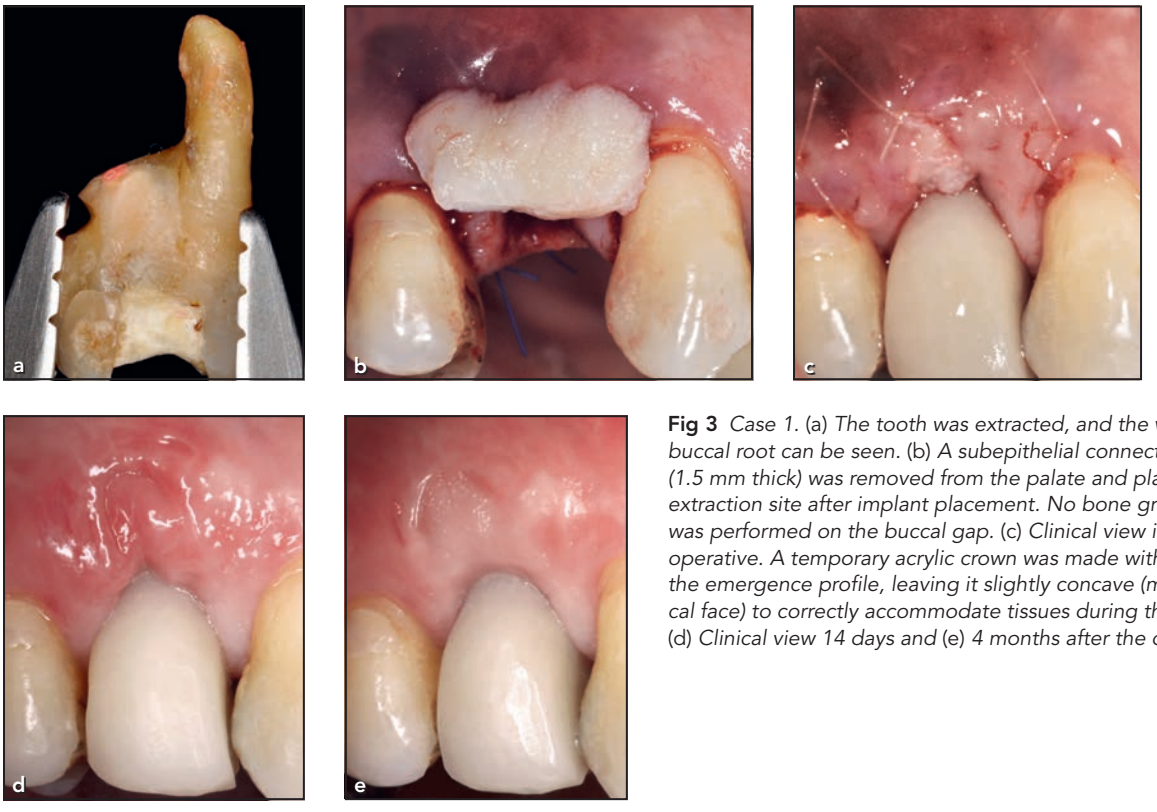



**Fig 3** *Case 1.* (a) *The tooth was extracted, and the wear of the buccal root can be seen.* (b) *A subepithelial connective tissue graft (1.5 mm thick) was removed from the palate and placed at the extraction site after implant placement. No bone grafting procedure was performed on the buccal gap.* (c) *Clinical view immediately postoperative. A temporary acrylic crown was made with special care to the emergence profile, leaving it slightly concave (mainly on its buccal face) to correctly accommodate tissues during the repair phase.* (d) *Clinical view 14 days and* (e) *4 months after the operation.*

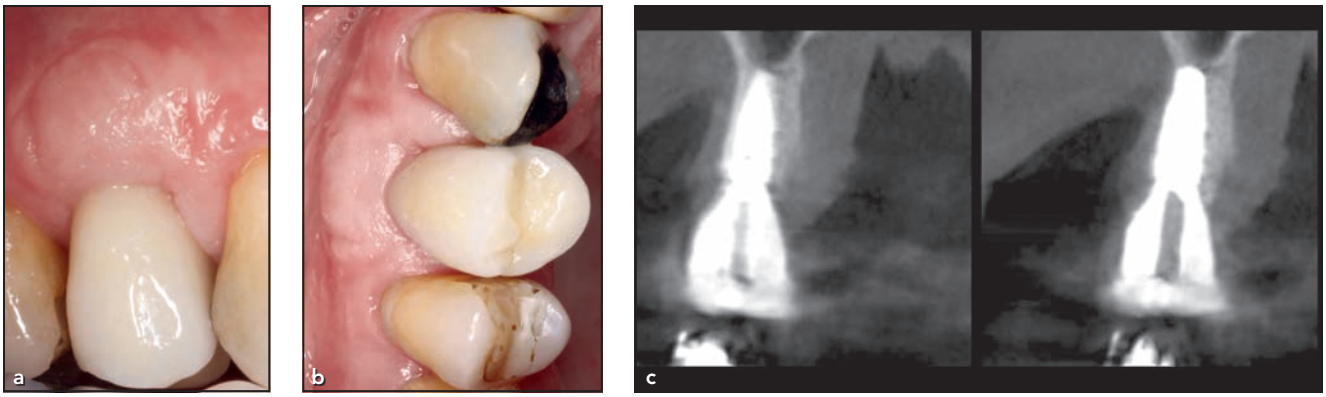
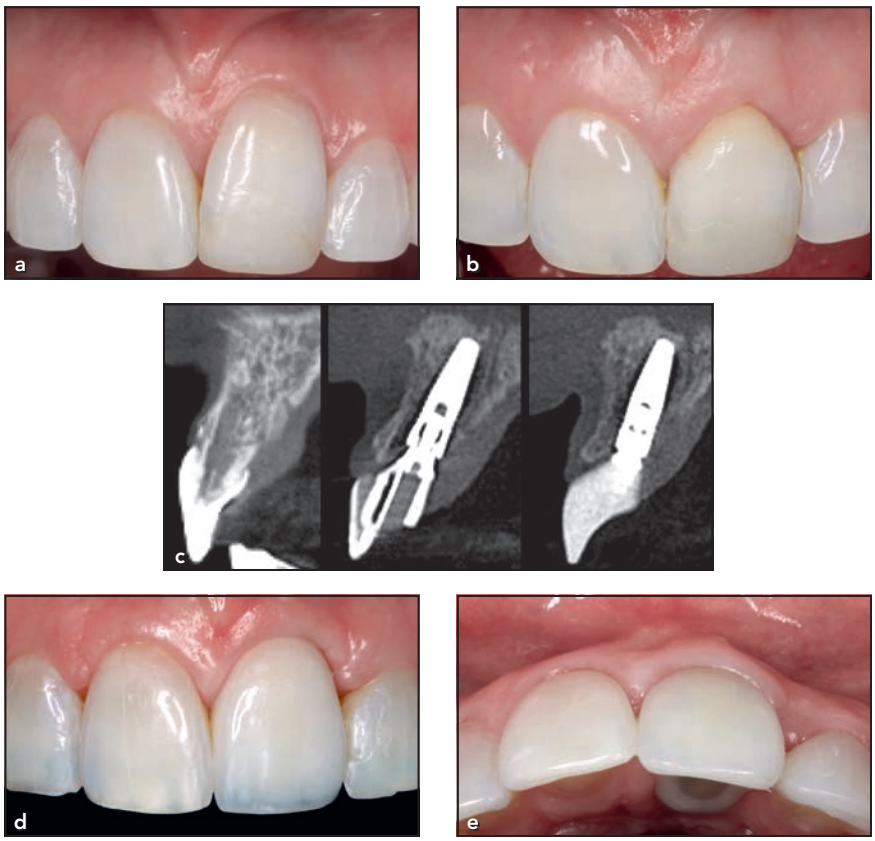



**Fig 4** *Case 1.* (a) *The prosthetic metalloceramic crown was placed, restoring the esthetic-functional balance. The buccal aspect of the prosthetic crown, the volume maintenance, and the color and texture of the gingival tissue are notable.* (b) *Occlusal view of the restoration, showing a stable gingival margin and a maintained buccal volume.* (c) *Tomographic view at the 3.5-year follow-up. Note the buccal and palatal bone plates. In the most mesial portion, there is bone dehiscence without esthetic consequences.* (d) *Clinical view 6 years after implant placement, and the esthetic-functional balance has remained stable.*


**Fig 5** *Case 2.* (a) *The patient's maxillary left central incisor presented with root resorption and a 3-mm–long buccal recession, and the tooth was indicated for extraction.* (b) *After root wear, the gingival margin at 4 months was positioned at the same height as the adjacent tooth.* (c) *Tomographic images were taken before surgery (left), immediately after surgery (middle), and at the 1-year follow-up. Note the buccal bone formation.* (d) *Facial view at the 5-year follow-up. Marginal soft tissue stability can be noted.* (e) *Occlusal view at the 5-year follow-up. The volume maintenance and alveolar contour can be seen.*



acceptance in cases where a tooth with marginal buccal tissue recession is scheduled for extraction. The technique first reported by Langer[19] suggested that the root must be submerged, allowing the body's regenerative capacity to produce extra tissue around the root of the tooth scheduled for extraction. The modification proposed by the present study focuses on maintaining this tissue-growth response but without root submersion, instead performing sequential reductions on the root's buccal surface in order to create space for coronal gingival tissue growth. This approach has some advantages compared to the original technique, as it requires fewer surgical interventions and a reduced treatment time.

The exact principle by which the soft tissue growth occurs may not yet be fully elucidated. Different hypotheses can be suggested for this phenomenon. The first hypothesis is creeping attachment: spontaneous growth or migration of marginal tissue in a coronary direction over a previously exposed root after periodontal procedures.[21] Other authors hypothesize that this phenomenon occurs after procedures such as a free gingival graft and subepithelial CTG, periodontal surgery, root scaling and planing (RSP), and root reduction aimed to reduce the buccal convexity.[21,22] Procedures such as RSP, periodontal surgery, and root reduction decrease the mesial and distal distances from the edges of the wound and cause granulation tissue formation, on which the epithelial cells could migrate from the wound margins until they meet the epithelium of the opposite surface, resulting in the formation of a fibrin clot coverage on the wound space.[23]

Regarding the increase in gingival tissue volume, it has been suggested that the granulation tissue is a key factor in the development of keratinized tissue during the healing period. Granulation tissue from supra-alveolar connective tissue or from periodontal ligament cells will form a keratinized epithelium, as the periodontal connective tissue has the capacity to differentiate epithelial cells into keratinized epithelium, similar to that of the gingiva.[23,24]

Another hypothesis for coronal gingival growth comes from orthodontic procedures. When a prominent tooth is moved to a more appropriate position within the alveolar process, the bone dimensions on the buccal surface may thicken, which can result in an increased gingival height and subequent decreased clinical crown.[25] After lingualizing a tooth, the compression on the gingival tissue is reduced, which improves its vascularization and results in soft tissue root coverage.[26]

The modified technique proposed in the present study seems to encompass some pieces of the aforementioned hypotheses, as the reduction of root surface would position the root more lingually into the alveolar process of the adjacent tooth (thus supporting results seen in other works[26]) and would also bring the wound edges closer together, favoring epithelial migration due to proximity.[24] The ulceration of the sulcular epithelium all the way to the supra-alveolar soft tissue induces the formation of a granulation tissue that can originate from the supra-alveolar connective tissue, which can cause a creeping attachment and keratinized tissue.[21,22,24]

Currently, focus has been on the relationship between the quantity and quality of soft tissue and the peri-implant tissue health, as healthy tissues and good stability over time are considered key factors in implant esthetics.[5,6,27] Therefore, the moment of implant placement and the manufactured immediate restoration are very important to guide the soft tissue healing process. Even in extraction sockets with intact buccal bone walls, it is known that after tooth extraction, a biologic cascade begins the process of healing and can considerably affect the external architecture of the gingival tissue and increase esthetic limitations, especially in the anterior maxilla.

Buccal mucosa thickness is indicative of long-term vertical movement of the margin. In thin periodontal tissues, after remodeling and apical resorption of the bone ridge, a tissue recession may occur; thicker tissues may present less apical movement. Thus, the combination of CTG with implant placement is important in order to convert thin biotypes into thicker ones, reducing future risks of mucosal recession and improving the esthetic result (mainly by improving the contour of the alveolar process[3,5,18,27,28]), improving the clinical parameters (such as bleeding on probing), and increasing patient satisfaction with the final result.[14,29] To assess the changes on the peri-implant margin, a previous study was conducted[30] with immediate anterior

implants associated with a biomaterial in the gap, with and without the use of CTG. The study concluded that the CTG sites had less marginal changes (0.25 mm) than the control group (0.7 mm). Those results are corroborated by another study,[13] which reports that a CTG (tunnel) masked the horizontal resorption and coronally moved the marginal tissue, which remained stable and with a good esthetic result for 2 to 8 years. However, others question this approach, as there is no evidence of long-term stability of soft tissue growth and its influence on peri-implant bone levels.[13]

The restoration or preservation of a normal alveolar contour is a critical step, or even a prerequisite, for esthetic success. Periodontal plastic surgery and soft tissue augmentation procedures have been developed to prevent and/or compensate for the predictable loss of volume that occurs after surgical and prosthetic procedures. In addition to correcting localized defects, it has been proposed to maintain adequate soft tissue dimensions around implants, achieving favorable short- and long-term biologic, functional, and esthetic results.[3,13,29]

The presented modified technique requires careful planning from root reduction to the definitive prosthesis, through placement of the implant, CTG, and provisional prosthesis. In the present study, this modified technique is presented as a safe and predictable technique, reducing the number of surgeries and maintaining the esthetic results for up to 6 years. However, the possible limitations and the limited level of evidence related to case reports must be considered. Thus, prospective studies with greater scientific rigor should be carried out to assess the possible benefits of this modified technique compared to different therapeutic possibilities.

## Conclusions

Within the limitations of the present study, it can be concluded that the presented modified technique is simple and could optimize soft tissue reconstruction prior to implant placement in extraction sockets, without the need for extra surgical interventions.

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The authors report that there are no conflicts of interest related to this study or its royalties, and they also confirm that they do not work as specialized witnesses or perform activities for an entity with a financial interest in this area.

## References

1. Malchiodi L, Corrocher G, Cucchi A, Ghensi P, Bissolotti G, Nocini PF. Long-term results of immediately loaded fast bone regeneration-coated implants placed in fresh extraction sites in the upper jaw. Oral Implantol 2010;36: 251–261.
2. Tsuda H, Rungcharassaeng K, Kan JY, Roe P, Lozada JL, Zimmerman G. Peri-implant tissue response following connective tissue and bone grafting in conjunction with immediate single-tooth replacement in the esthetic zone: A case series. Int J Oral Maxillofac Implants 2011;26:427–436.
3. Grunder U. Crestal ridge width changes when placing implants at the time of tooth extraction with and without soft tissue augmentation after a healing period of 6 months: Report of 24 consecutive cases. Int J Periodontics Restorative Dent 2011;31:9–17.
4. Zucchelli G, Sharma P, Mounssif I. Esthetics in periodontics and implantology. Periodontol 2000 2018;77:7–18.
5. Masaki C, Nakamoto T, Mukaibo T, Kondo Y, Hosokawa R. Strategies for alveolar ridge reconstruction and preservation for implant therapy. J Prosthodont Res 2015;59:220–228.
6. Noelken R, Moergel M, Pausch T, Kunkel M, Wagner W. Clinical and esthetic outcome with immediate insertion and provisionalization with or without connective tissue grafting in presence of mucogingival recessions: A retrospective analysis with follow-up between 1 and 8 years. Clin Implant Dent Relat Res 2018;20:285–293.
7. Romanos GE. Tissue preservation strategies for fostering long-term soft and hard tissue stability. Int J Periodontics Restorative Dent 2015;35:363–371.
8. Kan JY, Rungcharassaeng K, Lozada JL, Zimmerman G. Facial gingival tissue stability following immediate placement and provisionalization of maxillary anterior single implants: A 2- to 8-year follow-up. Int J Oral Maxillofac Implants 2011;26:179–187.
9. Happe A, Stimmelmayr M, Schlee M, Rothamel D. Surgical management of peri-implant soft tissue color mismatch caused by shine-through effects of restorative materials: One-year follow-up. Int J Periodontics Restorative Dent 2013;33:81–88.
10. Tatakis DN, Chambrone L, Allen EP, et al. Periodontal soft tissue root coverage procedures: A consensus report from the AAP Regeneration Workshop. J Periodontol 2015;86(suppl 2):s52–s55.
11. Bianchi AE, Sanfilippo F. Single-tooth replacement by immediate implant and connective tissue graft: A 1-9-year clinical evaluation. Clin Oral Implants Res 2004;15:269–277.

12. Butler B. Masking buccal plate remodeling in the esthetic zone with connective tissue grafts: Immediate implant concepts, techniques. Compend Contin Educ Dent 2014;35:486–493.
13. Lee CT, Tao CY, Stoupel J. The effect of subepithelial connective tissue graft placement on esthetic outcomes after immediate implant placement: Systematic review. J Periodontol 2016;87: 156–167.
14. Sicilia A, Quirynen M, Fontolliet A, et al. Long-term stability of peri-implant tissues after bone or soft tissue augmentation. Effect of zirconia or titanium abutments on peri-implant soft tissues. Summary and consensus statements. The 4th EAO Consensus Conference 2015. Clin Oral Implants Res 2015;26(suppl 11):148–152.
15. Lee YM, Kim DY, Kim JY, et al. Peri-implant soft tissue level secondary to a connective tissue graft in conjunction with immediate implant placement: A 2-year follow-up report of 11 consecutive cases. Int J Periodontics Restorative Dent 2012;32:213–222.
16. Migliorati M, Amorfini L, Signori A, Biavati AS, Benedicenti S. Clinical and aesthetic outcome with post-extractive implants with or without soft tissue augmentation: A 2-year randomized clinical trial. Clin Implant Dent Relat Res 2015;17:983–995.
17. Rungcharassaeng K, Kan JY, Yoshino S, Morimoto T, Zimmerman G. Immediate implant placement and provisionalization with and without a connective tissue graft: An analysis of facial gingival tissue thickness. Int J Periodontics Restorative Dent 2012;32:657–663.
18. Tirone F, Salzano S. Esthetic treatment of alveolar ridge atrophy in the anterior maxilla via connective tissue graft performed simultaneously with implant placement: A three-case series. Quintessence Int 2018;49:801–807.
19. Langer B. Spontaneous in situ gingival augmentation. Int J Periodontics Restorative Dent 1994;14:524–535.
20. Riley DS, Barber MS, Kienle GS, et al. CARE guidelines for case reports: Explanation and elaboration document. J Clin Epidemiol 2017;89:218–235.
21. Harris RJ. Creeping attachment associated with the connective tissue with partial-thickness double pedicle graft. J Periodontol 1997;68:890–899.
22. Aimetti M, Romano F, Peccolo DC, Debernardi C. Non-surgical periodontal therapy of shallow gingival recession defects: Evaluation of the restorative capacity of marginal gingiva after 12 months. J Periodontol 2005;76:256–261.
23. Karring T, Lang NP, Löe H. The role of gingival connective tissue in determining epithelial differentiation. J Periodontal Res 1975;10:1–11.
24. Caffesse RG, Karring T, Nasjleti CE. Keratinizing potential of sulcular epithelium. J Periodontol 1977;48:140–146.
25. Karring T, Nyman S, Thilander B, Magnusson I. Bone regeneration in orthodontically produced alveolar bone dehiscences. J Periodontal Res 1982;17:309–315.
26. Machado AW, MacGinnis M, Damis L, Moon W. Spontaneous improvement of gingival recession after correction of tooth positioning. Am J Orthod Dentofacial Orthop 2014;145:828–835.
27. Levine RA, Ganeles J, Gonzaga L, et al. 10 keys for successful esthetic-zone single immediate implants. Compend Contin Educ Dent 2017;38:248–260.
28. Zuiderveld EG, Meijer HJA, den Hartog L, Vissink A, Raghoebar GM. Effect of connective tissue grafting on peri-implant tissue in single immediate implant sites: A RCT. J Clin Periodontol 2018;45:253–264.
29. Thoma DS, Naenni N, Figuero E, et al. Effects of soft tissue augmentation procedures on peri-implant health or disease: A systematic review and meta-analysis. Clin Oral Implants Res 2018;29(suppl 15):32–49.
30. Yoshino S, Kan JY, Rungcharassaeng K, Roe P, Lozada JL. Effects of connective tissue grafting on the facial gingival level following single immediate implant placement and provisionalization in the esthetic zone: A 1-year randomized controlled prospective study. Int J Oral Maxillofac Implants 2014;29:432–440.