6.8 Connective-Tissue Graft to Augment the Buccal Tissue for a Bone-Level Implant at an Upper Incisor Site

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Connective-tissue grafting is primarily known for its long-term proven success in root coverage procedures (Cairo and coworkers 2014; Chambrone and Tatakis 2015). Although recent systematic reviews have found limited scientific evidence for soft-tissue volume augmentation around implants (Thoma and coworkers 2009, 2014; Levine and coworkers 2014), given to the predictability, esthetics, and versatility of the technique, its utility in augmenting areas lacking in soft-tissue quantity and quality around implants and at pontic sites has been successfully documented (Silverstein and Lefkove 1994; Akcalı and coworkers 2015). Deficiencies in soft-tissue position and volume can negatively impact the emergence profile and contour of the final implant-supported restoration (Lorenzana 2008). In turn, such deficiencies can result in a negative esthetic outcome.

The present case demonstrates the application of a connective-tissue graft to augment the buccal soft-tissue profile on an upper left lateral incisor bone level implant.

Presenting complaint

A healthy 47-year-old woman was referred for the evaluation and treatment of a soft-tissue volume deficiency on the facial aspect of her implant-supported provisional crown 22. The patient had recently received the provisional restoration, but the restorative dentist and the patient were both unhappy with the emergence profile of the restoration. Specifically, the patient could see the lack of tissue and abnormal crown shape when smiling (Fig 1). Smile analysis revealed a medium, symmetrical smile line, with only the interdental papillae visible at full smile. The patient presented with good oral hygiene (full-mouth plaque score under 10%), and the full-mouth probing chart did not reveal any pockets deeper than 4 mm.

The anterior retracted view revealed a medium gingival phenotype with previously restored rectangular-shaped tooth crowns 13 to 23 (Fig 2).

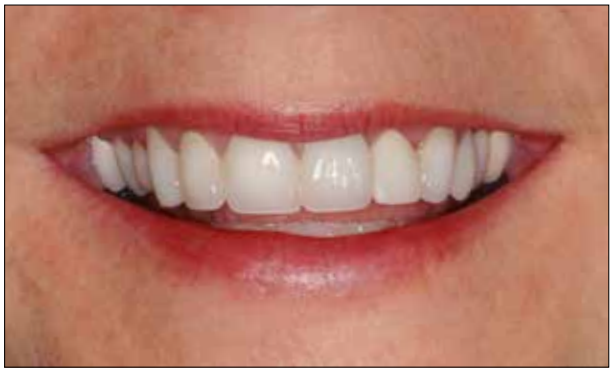

Fig 1 Patient's smile after delivery of the initial implant-supported provisional restoration. Medium smile line. The improper emergence profile of crown 22 is evident.

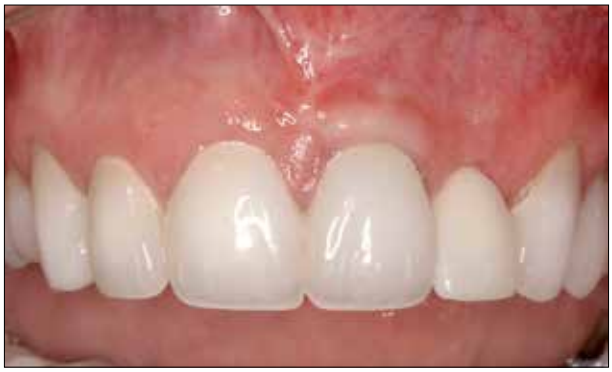

Fig 2 Retracted anterior view. Medium gingival phenotype with a lack of symmetry between tooth 12 and 22 due to a deficient apical third of the restoration at the gingival margin.

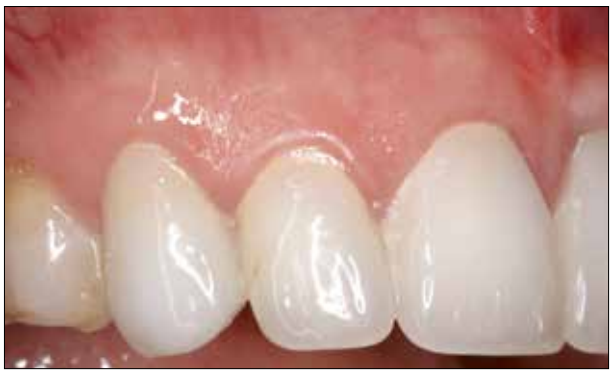

Fig 3 Contour of the restored natural tooth.

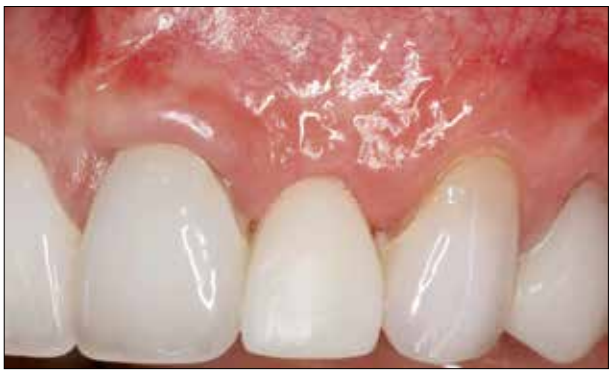

Fig 4 Contour of implant 22 provisional crown. Side-by-side comparison highlighting the lack of symmetry in the emergence profile.

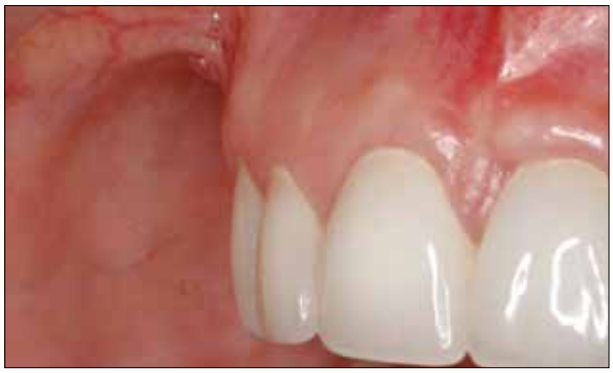

Fig 5 Profile view of tooth 12.

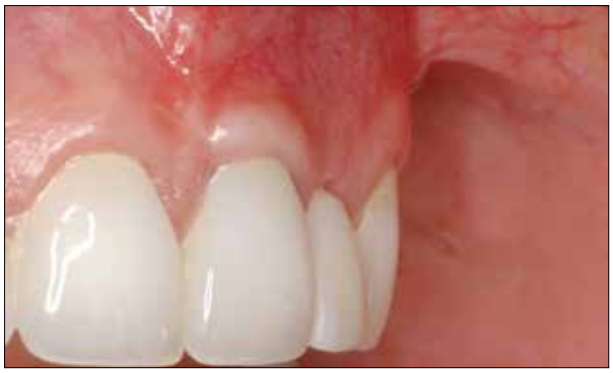

Fig 6 Profile view of implant 22 highlighting the lack of soft-tissue volume.

Although the implant appeared to be in the ideal three-dimensional position, the lack of symmetry between tooth 12 and 22 was evident, with a deficient apical third of the restoration at the gingival margin.

Side-by-side comparison of 12 and 22 more clearly illustrated the lack of symmetry in crown form and contour caused by the lack of buccal tissue volume (Figs 3 and 4). Furthermore, the crown margin at 21 and 23 was exposed and visible (Fig 4).

A look at the long axes of tooth 12 and implant 22 further underscored the atypical emergence profile of implant 22 due to the lack of soft-tissue volume (Figs 5 and 6).

Fig 7 illustrates how the lack of tissue support resulted in an inadequate cervical contour of the restoration. It was recommended to add connective tissue to the buccal aspect of site 22 and to recontour the provisional to the desired shape and emergence profile (Fig 7).

Fig 7 Soft-tissue deficiency on the buccal aspect of implant 22 impacting the angle of emergence of the restoration.

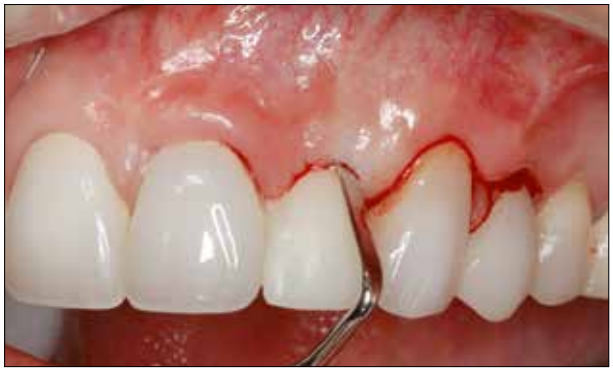

Fig 8 Specially designed end-cutting knife used to initiate the tunnel preparation.

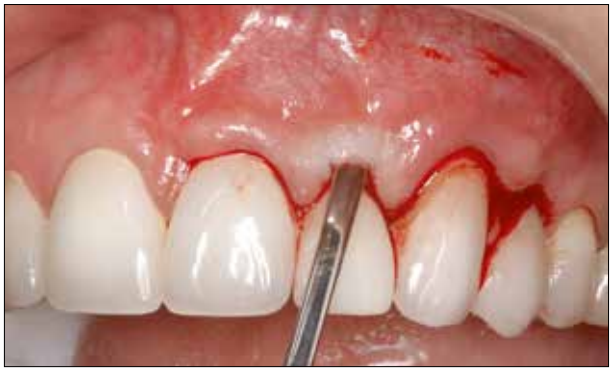

Fig 9 Tissue carefully elevated with a specially designed tunneling elevator.

Fig 10 Elevation of the papillae and release of remaining tissue tags with a curved periodontal universal curette.

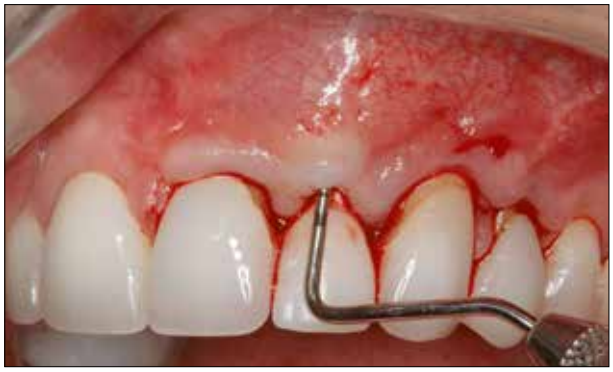

Fig 11 Periodontal probe demonstrating the depth of the pouch preparation.

The initial incision was made using a specially designed end-cutting knife (Allen End-Cutting Intrasulcular Knife; Hu-Friedy, Chicago, IL, USA) along the buccal and distobuccal aspect of tooth 21, the buccal and mesiobuccal aspect of tooth 23, and circumferentially around implant 22. The incision was further extended across the papilla distal to tooth 23. This incision design would allow for maximum elevation and release of the tissue coronally (Fig 8).

The tissue was elevated with a specially designed tunneling elevator that allows for blunt dissection of the tissue pouch, minimizing perforations or tears (Allen Periosteal Elevator Anterior; Hu-Friedy) (Fig 9).

A universal periodontal scaler with a rounded blade edge (Younger-Good 7/8; Hu-Friedy) was used to elevate the interdental papillae and finish releasing tissue tags within the tunnel preparation (Fig 10).

Finally, a periodontal probe was used to verify the continuity of the tunnel preparation and that the pouch was ready to accommodate the connective-tissue graft (Figs 11 and 12).

Fig 12 Continuity of the tunnel preparation verified with the periodontal probe.

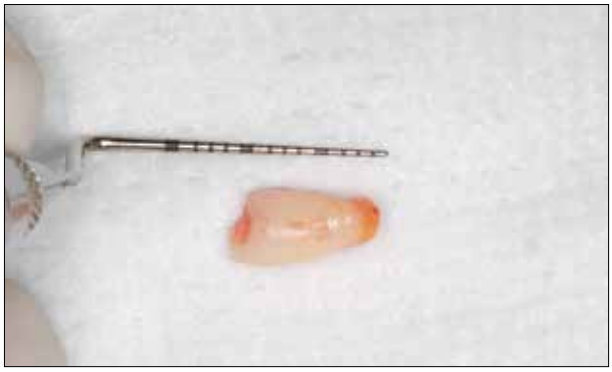

Fig 13 Graft as initially harvested from the tuberosity.

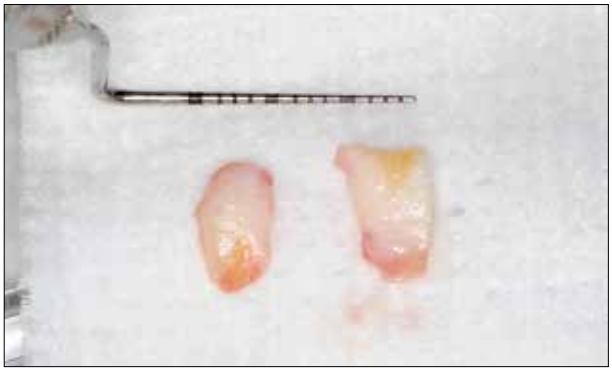

Fig 14 Final grafts shaped prior to delivery.

The traditional donor site for connective tissue tends to be the palatal vault (Langer and Langer 1985; Lorenzana and Allen 2000). However, alternative donor sites exist, with the most common secondary donor site being the tuberosity region distal to the maxillary second molars (Studer and coworkers 1997). Advantages of this donor site include the remote location away from the tongue, the increased density of the tissue, and the reported lower morbidity and pain (Rojo and coworkers 2018; Amin and coworkers 2018; Godat and coworkers 2018). A recent histological study found increased lamina propia vs. submucosa in tuberosity grafts compared to palatal grafts, which the authors concluded could prove beneficial when performing volume augmentation (Sanz-Martín and coworkers 2018).

The patient presented with adequate donor tissue in the tuberosity region distal to tooth 27. Figures 13 and 14 show the tissue harvested from the area, followed by the careful sectioning of the tissue to obtain the desired graft thickness of approximately 2 mm for site 22. The additional soft tissue was to be placed at tooth 23.

With a periodontal probe acting as a retractor, a 5-0 chromic gut suture (Ethicon; Somerville, NJ, USA) was introduced into the apical aspect of the pouch and exited through the coronal aspect of the tunnel preparation (Fig 15).

Next, the intended apical aspect of the connective-tissue graft was made to engage with the suture and the needle reinserted into the pouch and out of the apical aspect of the tunnel. This allowed the suture to guide the graft into the pouch and secure it apically (Fig 16).

Figure 17 demonstrates the graft being guided into the pouch through the sulcus.

Finally, the tissue graft was secured coronally with a circumferential 5-0 chromic gut suture. The extra soft tissue was placed at tooth 23 (Fig 18).

Circumferential 6-0 nylon sutures (Ethicon) were used to coronally advance and secure the tissue flap (Fig 19).

The view along the axis of implant 22 illustrates the amount of volume augmentation achieved (Fig 20).

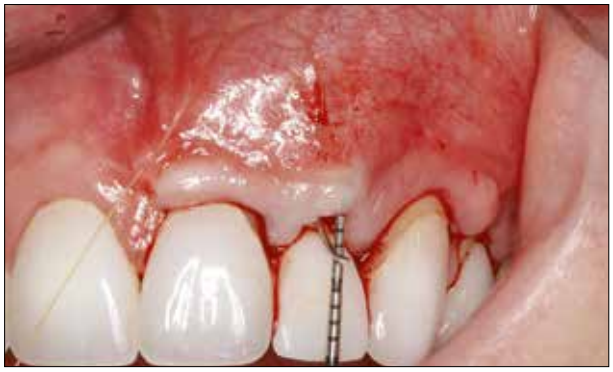

Fig 15 Initial introduction of the chromic gut suture into the pouch.

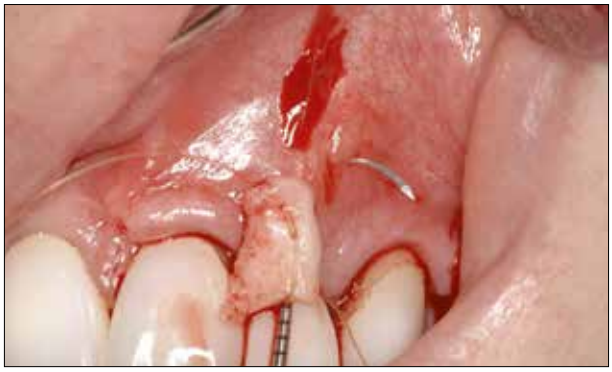

Fig 16 5-0 chromic gut suture engaging the graft and emerging apically.

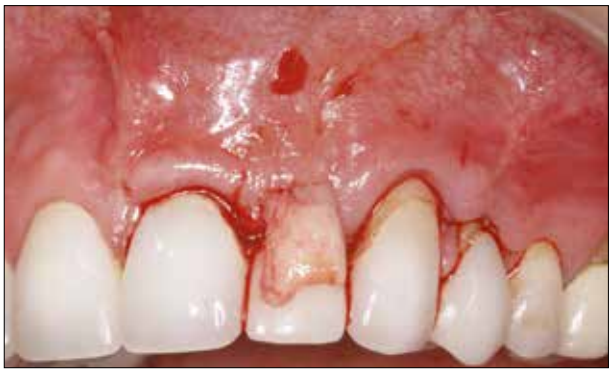

Fig 17 Connective-tissue graft being guided into the pouch with the chromic gut suture.

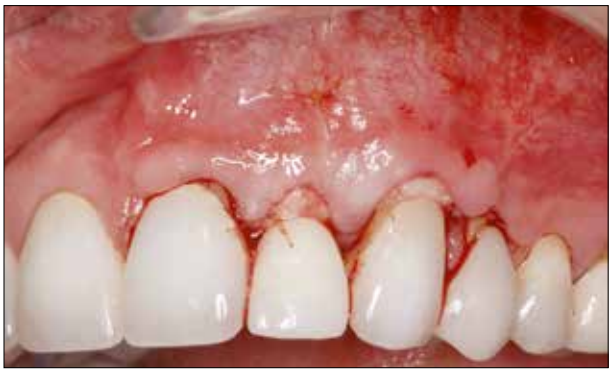

Fig 18 Connective-tissue grafts secured within the tunnel preparation.

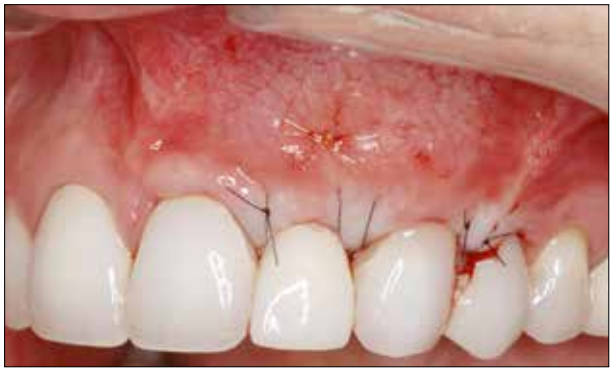

Fig 19 Final suturing of the area accomplished with 6-0 nylon sutures.

Fig 20 View along the axis of implant 22 demonstrating the amount of volume augmentation achieved.

Fig 21 Five-week postoperative profile view of implant 22 showing excellent healing and volume gain.

Fig 23 Provisional on the NC analog showing the discrepancy between the crown contour and the provisional abutment margin.

Fig 24 Provisional margin positioned further apically.

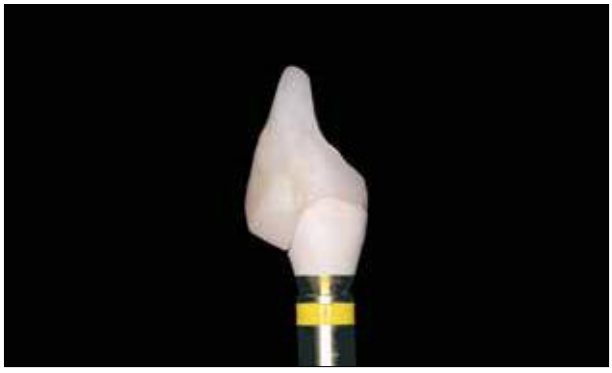

Fig 25 New provisional abutment and complete crown contours.

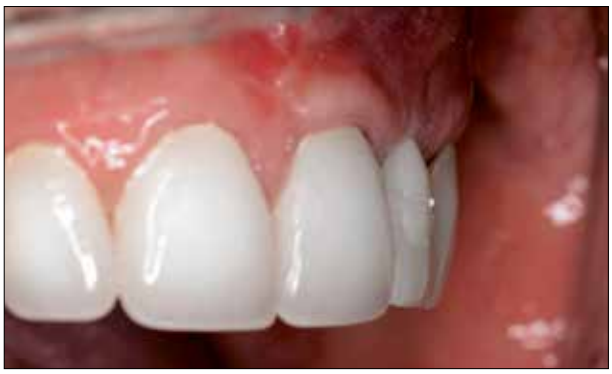

Fig 22 Light-curing composite added to the buccal aspect of the provisional crown to define the desired emergence profile.

Five weeks after the augmentation, the volume attained was evident (Fig 21), so that provisional reshaping could be initiated.

The first step in this process was to create the desired final crown contour with composite resin prior to removing the provisional (Fig 22).

Upon removal of the provisional crown and abutment, the discrepancy between the desired emergence profile and the provisional abutment margin was evident (Narrow CrossFit PEEK; Institut Straumann AG, Basel, Switzerland) (Fig 23).

Next, the abutment was re-prepared to create a more apical finish line (Fig 24). This allowed for a smoother transition from the abutment to the height of contour at the gingival zenith. In this case, a modifiable PEEK plastic provisional abutment was utilized. Another option would have been to use a one-piece screw-retained provisional crown for tissue shaping. This would have eliminated any cement finish line that may cause irritation to the tissues.

The completed provisional abutment and crown were now ready for delivery (Fig 25).

Figure 26 shows the provisional in place following soft-tissue augmentation and recontouring of the provisional abutment and crown.

Viewing the provisional restoration along the long axis of the tooth revealed significant improvement in soft-tissue volume and the improved emergence profile (Fig 27).

The patient was delighted by the improvement in her smile and agreed to now proceed to the final restoration (Fig 28).

Fig 26 Delivery of the updated provisional.

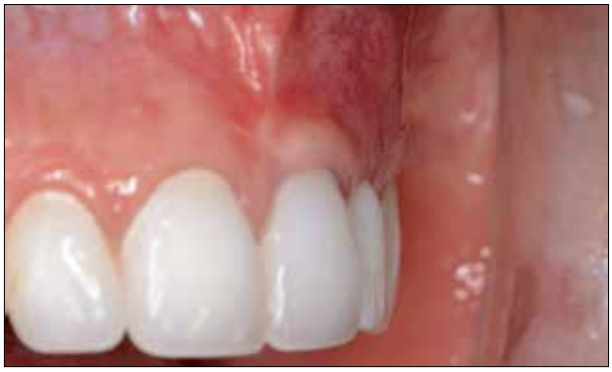

Fig 27 Profile view showing the desired emergence profile and tissue support.

Fig 28 The patient was now pleased with her smile.

Fig 29 Fabricating the custom impression coping. Provisional abutment and crown on an NC analog, immersed in bite-registration material.

To accurately transfer the emergence profile to the master cast for the fabrication of the final restoration, a custom impression coping was made (Figs 29 to 31). First, the provisional abutment and crown were removed and seated on a Narrow CrossFit analog. After applying petroleum jelly to the abutment and crown, bite registration material (Blu-Mousse; Parkell, Edgewood, NY, USA) was applied around the provisional and allowed to set (Fig 29). The buccal aspect was marked with a red permanent marker for reference. The provisional crown and abutment were removed, leaving an outline of the emergence profile (Fig 30). A Bone Level NC impression post was placed into the mold, then composite material was slowly added to fill the voids around the impression post and light-cured until set (Fig 31).

Fig 30 Impression post in place within the mold created by the provisional.

Fig 31 Light-cured composite resin in place within the mold around the impression post.

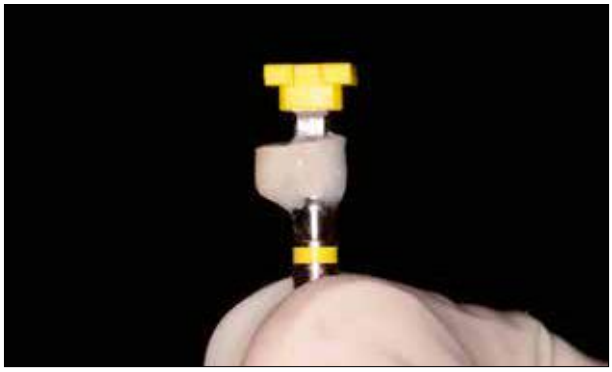

Fig 32 Final custom impression post.

The final custom impression post was now ready for impression-taking (Fig 32).

The custom impression post was marked on the buccal aspect to ensure proper orientation before being seated in the mouth (Figs 33 and 34). Because the shape of the coping was identical to the provisional, it preserved support for the tissues during the impression procedures, thus transferring to the laboratory the desired shape for the final restoration.

Figures 35 and 36 show the final one-piece screw-retained metal-ceramic restoration three years after delivery. The tissues were stable and free of inflammation and complications.

The three-year photograph of the final restoration in profile demonstrate the maintenance of the soft-tissue volume obtained thanks to the connective-tissue graft (Fig 37).

The three-year photograph of the patient's smile clearly illustrated her satisfaction with the esthetic result (Fig 38).

Fig 33 Custom impression post in place, buccal view.

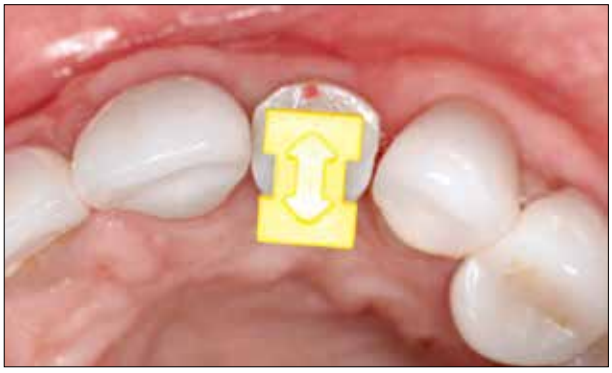

Fig 34 Occlusal view. Custom impression post in place.

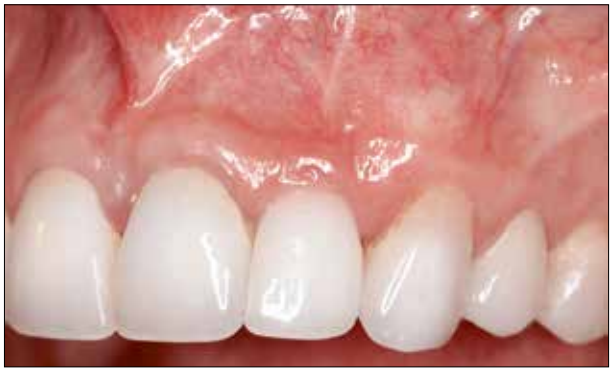

Fig 35 Final restoration at three years.

Fig 36 Occlusal view. Final screw-retained restoration.

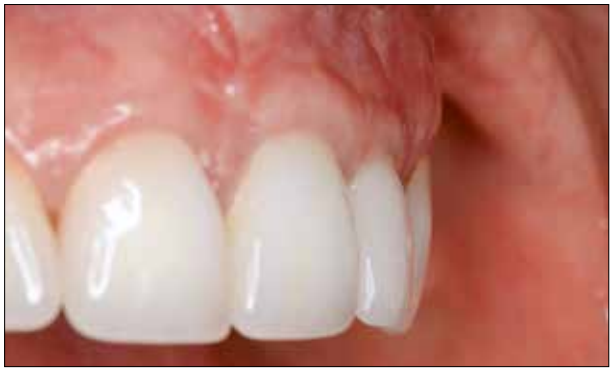

Fig 37 Profile view at three years.

Fig 38 Patient's smile at three years.

Stable bone levels were evident around the implant in the four-year radiograph; the emergence profile of the final restoration was in harmony with the bone profile at the implant site (Fig 39).

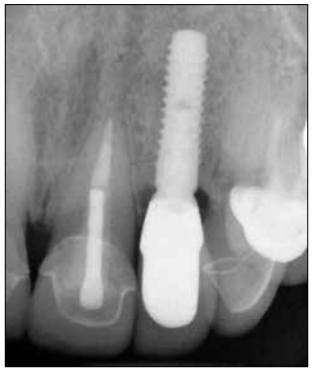

Fig 39 Periapical radiograph at four years.

Biological, technical, or esthetic complications can occur during any stage of the implant-based reconstructive process. In the case presented here, it was fortuitous that the issue was identified prior to delivery of the final prosthesis, because modifications to the restoration and additional surgical reconstructive procedures are simpler to accomplish during the provisional phase than with a final prosthesis in place. Furthermore, there was no recession of the marginal tissue around the implant to complicate the situation.

With the implant in an ideal three-dimensional position, the chief complaint from the patient and referring dentist was the lack of tissue volume on the buccal aspect of the implant, resulting in an inadequate emergence profile of the provisional restoration. There are many case reports in the literature describing connective-tissue grafts to augment the soft-tissue volume around implants (Silverstein and Lefkove 1994; Akcalı and coworkers 2015). Connective-tissue grafting techniques continue to be the preferred method of augmenting the soft-tissue volume around teeth and implants (Thoma and coworkers 2009, 2014; Levine and coworkers 2014).

From a practical standpoint, reducing invasiveness and morbidity during these procedures is important to the patient and clinician. Tunneling and alternative harvesting techniques have been developed to aid in achieving this goal (Allen 1994; Lorenzana and Allen 2000; Godat and coworkers 2018). In this case, a tunneling approach to site preparation was employed together with soft tissue harvested from the tuberosity region of the maxilla.

As mentioned previously, the location of the donor site away from the tongue, the increased density of the tissue, and reported lower morbidity and pain are all advantages of tuberosity donor sites. This yielded the required volume augmentation resulting in the desired esthetic and functional result.

Although recent literature reviews have documented a lack of controlled clinical trials for these types of situations, numerous case series and case reports such as the one presented here cast a positive light on the application of these techniques. Further study with long-term controlled clinical trials is recommended.

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Laboratory procedures
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