Surgical-prosthetic management of facial soft tissue defects on anterior single implant-supported restorations: a clinical report

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Abstract

The surgical correction of soft tissue defects on the facial aspects of dental implants is documented as an unpredictable procedure. Since the customization of the prosthetic emergence profile contributes significantly to the final esthetic outcome of the soft tissue, a combined surgical-prosthetic approach has been described in the literature. In the case presented in this article, a multidisciplinary approach was used to treat a patient's anterior sextant. It included the treatment of a previously placed implant, perfectly osseointegrated, with a 2 mm recession of the facial soft tissue. Two connective tissue grafting procedures were performed, in conjunction with the modification of the prosthetic profile of the provisional restoration and the definitive abutment. The final esthetic outcome satisfied the patient and resolved the main complaint, and is documented to have been stable for 5 years.
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Introduction

The preservation or reproduction of a natural mucogingival architecture surrounding dental implants placed in the anterior maxilla is esthetically challenging for the restorative dentist, particularly when patients present with a high lip line when smiling. The challenge arises from the loss of soft tissue volume as a result of bone loss after extraction of traumatically injured or periodontally compromised teeth. It can also be due to a traumatic surgical extraction or congenital defects. While surgical reconstructive procedures have been used for the improvement of hard and soft tissue defects prior to implant placement, the preservation of appropriate soft tissue architecture around integrated implants remains challenging, especially when the implants are not inserted in a proper three-dimensional position.[1-3]

In order to establish and maintain an ideal soft tissue architecture, implants should be positioned at the proper distance to the adjacent dentition, at the proper depth, and more palatal than the expected emergence profile.[4-6] When dealing with anterior single implant-supported restorations, the thickness of facial bone as well as the dimensions of the facial peri-implant mucosa has been described as critical for the achievement and the long-term stability of good esthetics, with reduced risk of apical displacement of the free gingival margin.[1,4]

When implants are incorrectly angled or improperly positioned with soft tissue defects, various prosthodontic techniques have been reported in order to correct the soft tissue deficiency, including the use of a gingiva-colored acrylic resin façade, a flexible silicone-based tissue-colored material, or removable prostheses.[7-10] The loss of peri-implant tissue can also be restored by the application of gingiva-colored porcelain on the cervical portion of implant-supported restorations,[11-15] or may be facilitated by the application of gingiva-colored porcelain onto the cervical collars of all-ceramic crowns and implant-customized abutments.[16]

The mucogingival treatment of gingival recession associated with dental implants has also been described in the literature. While the root-coverage procedure has been reported for many years with predictable results on natural teeth,[17-20] the results of this procedure on dental implants have not been encouraging.[21-26] Burkhardt et al reported the use of a connective tissue graft in combination with a coronally advanced flap, with an average reduction of the defect of 66% at 6 months.[21]

The importance of the prosthesis customization of the prosthetic profile in order to improve the esthetic outcome of the peri-implant soft tissue has been stressed in recent literature.[27-30] In particular, Rompen et al recommend the use of concave transmucosal profiles for implant components in the esthetic zone. By reducing the facial pressure on the soft tissue, converging abutments allow for better and more predictable soft tissue stability.[31]

Considering these findings, a combined surgical and prosthetic approach has been recommended, with encouraging results. A gain of soft tissue level and thickness was demonstrated when a reduction of the implant abutment was associated with a coronally advanced

Fig 1 Patient's initial smile, frontal view.

Fig 2 Patient's initial smile, left lateral view.

flap in combination with a connective tissue graft.[32,33]

This clinical report illustrates the combination of surgical and prosthetic management of the soft tissue adjacent to a previously placed lateral incisor dental implant. This approach is used in a more complex perioprosthetic esthetic treatment.

Clinical report

A 31-year-old, healthy Caucasian woman was referred to us. She had esthetic issues with her anterior maxillary teeth. Clinical and radiographic examination revealed the presence of a titanium dental implant placed in the area of the maxillary left lateral incisor. The patient reported that the implant had been placed when she was 21 years old. The implant was perfectly integrated with physiologic probing depth, there was no bleeding on probing, and there was an ISQ of 78. The peri-implant soft tissue level was located 3 mm more apically when compared to the level of the contralateral incisor. To mask this tissue loss, the implant had been restored with a cemented-type implant-supported restoration and 2 mm of pink porcelain in the most apical facial portion. The soft tissue in the area of the implant was thin, with the darkness of the underlying customized abutment showing through.

Additionally, the implant-supported restoration was facially positioned and a significant diastema was present between the lateral incisor and the canine. The maxillary left central incisor was endodontically treated, discolored, and restored with a defective distal composite restoration. The maxillary left canine was also discolored but responded positively to a vitality test. The maxillary dental midline was not coincident with the patient's facial midline and with the mandibular dental midline. The patient was diagnosed, clinically and radiographically, with incomplete passive eruption in the remaining anterior maxillary teeth. The patient was very willing to resolve her esthetic concerns (Figs 1 to 5).

Fig 3 Intraoral initial condition, frontal view.

Fig 4 Intraoral initial condition, occlusal view.

In order to solve the patient's main complaint, the proposed treatment plan intended to solve:

- The esthetic concern present on implant 22, with the elimination of artificial pink porcelain.
- The discoloration of teeth 21 and 23.
- The diastema present between teeth 22 and 23.
- The maxillary dental midline deviation.
- The patient's gingival smile and incomplete passive eruption.

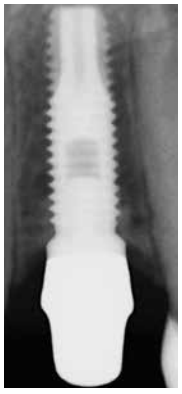

Fig 5 Radiographic initial condition of implant 22.

The implant-supported restoration was removed and an implant level impression was taken (Figs 6 and 7). Prior to this procedure, a metal reinforced acrylic provisional restoration was fabricated for teeth 9 and 10. A cover screw was applied on the implant head and the provisional restoration was relined and cemented on tooth 9 with a cantilever extension on tooth 10 (Fig 8).

The soft tissue grew over the cover screw and toward the ovate pontic of the provisional restoration for 10 days (Fig 9). A full thickness flap was then elevated in the area, using a palatal incision and a vertical releasing incision placed distally to the canine. The implant presented no exposed thread but, as was confirmed by the model fabricated from the implant-level impression, was too facially positioned and inclined (Fig 10). A 1.5 mm-thick connective tissue graft was harvested from the palate and positioned facially and occlusally in the area of the lateral incisor. In the coronal part, where the defect was more severe, the connective tissue graft was folded into two layers to better fill the

Fig 6 Initial tooth preparation of tooth 21 and crown removal on implant 22.

Fig 7 Implant level impression on implant 22.

Fig 8 Implant 22 immediately after the removal of the implant-supported restoration.

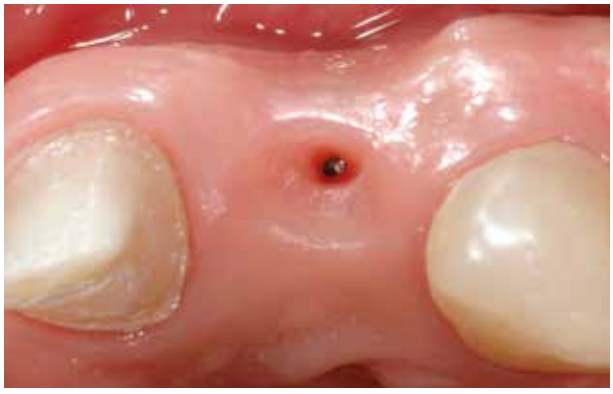

Fig 9 Implant 22, 10 days after the removal of the implant-supported restoration and tissue maturation.

area of the defect (Fig 11). The flap was coronally advanced, and the head of the implant completely submerged (Fig 12). Two months after the first grafting procedure (Fig 13), a small tissue punch was used to expose the implant and a screw-retained provisional restoration was inserted. The facial emergence profile of the provisional restoration had been reduced to the minimum possible thickness to reduce the pressure on the facial soft tissue (Fig 14). In the same appointment, a small pouch facial to the implant was created to position a connective tissue graft harvested from the palate (Fig 15). The interproximal tissue was not elevated in this procedure, maintaining the papillae intact. Due to implant position and angulation, the access hole of the provisional restoration was located in the facial surface of the tooth and was closed with composite resin. A light discoloration of the provisional was caused by the underlying screw because of the

Fig 10 Full thickness flap reflected on implant 22.

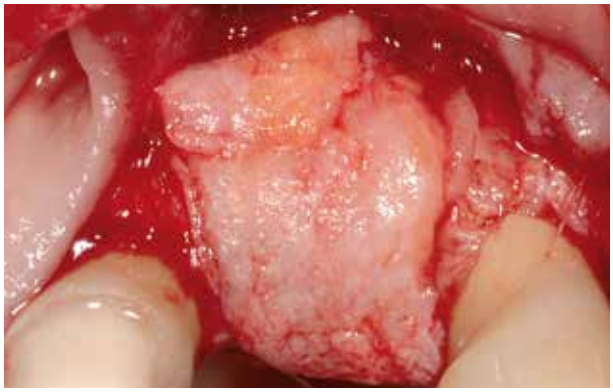

Fig 11 Connective tissue graft was folded on implant 22.

Fig 12 Coronally advanced flap sutured over the head of the completely submerged implant.

Fig 13 Two months' healing after soft tissue grafting procedure.

Fig 14 Screw-retained provisional restoration with undercontoured facial profile.

Fig 15 Connective tissue graft positioned facially to the implant-supported restoration.

Fig 16 Two months after the insertion of the screw-retained provisional restoration.

minimal thickness of the acrylic on the facial aspect of the restoration.

Two months after the insertion of the provisional restoration (Fig 16), a crown-lengthening procedure was performed to recreate a correct symmetry of the gingival margin and also to correct the incomplete passive eruption. A submarginal incision, as well as osteoplasty and ostectomy, were performed on the central incisors and on the left lateral incisor so that the gingival margin on the central incisors would be 1 mm higher than the one on the lateral incisors (Figs 17 and 18). During this procedure, the interproximal papillae were not elevated and the surgery was limited to the facial aspect of the teeth. After the recreation of a symmetric level of the facial bone, the flap was sutured using a 7-0 nonresorbable suture (7-0 Blue Polypropylene, Hu-Friedy) (Fig 19). Considering

Fig 17 Esthetic crown-lengthening procedure, before osteoplasty and ostectomy.

Fig 18 Esthetic crown-lengthening procedure after hard tissue remodeling.

Fig 19 Esthetic crown-lengthening procedure, suturing.

Fig 20 Intraoral condition 6 months after the crown-lengthening procedure.

Fig 21 Prosthetic finalization with a 1 mm-deep chamfer preparation, 0.5 mm subgingivally on the maxillary left central incisor.

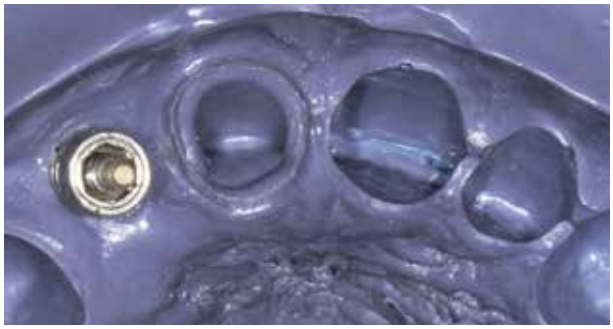

Fig 22 Definitive impression on tooth 21 and implant 22.

the presence of the incomplete passive, it was possible to perform the procedure maintaining the cementoenamel junction subgingivally.

Six months after the lengthening procedure (Fig 20), the prosthetic finalization was carried out. The prosthetic plan included a full-coverage restoration on tooth 9, an implant-supported restoration on tooth 10, a conventional porcelain laminate veneer on tooth 11, and an additional porcelain laminate veneer on tooth 8.

The preparation of the maxillary left central incisor was finalized 0.5 mm subgingivally, with a 1 mm-deep chamfer (Fig 21). The definitive impression for the prepared tooth was made using a polyether impression material (Impregum Penta, 3M ESPE), together with an implant-level impression using a pick-up impression coping (Biomet 3i) (Fig 22).

The definitive implant-supported restoration was a cemented-type. The definitive implant abutment was customized from a gold-machined UCLA

Fig 23 Definitive customized abutment and definitive zirconia-ceramic crown, side view.

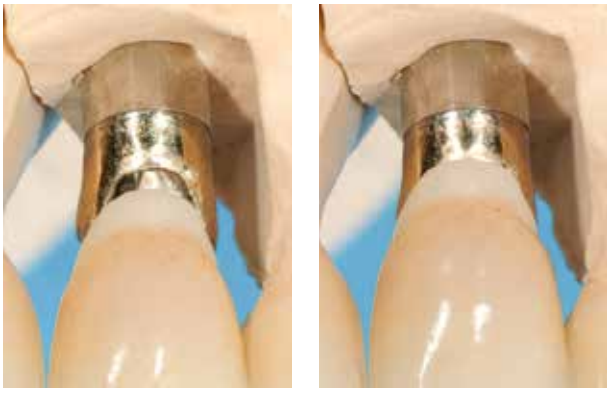

Fig 24 Definitive customized abutment and definitive zirconia-ceramic crown, frontal view, insertion (left) and fully seated (right).

abutment (UCLA Abutment Gold Hexed, Biomet 3i) in an attempt to reduce the facial thickness to as minimum as possible. Considering that the previously placed implant was an external-hex type, some limitations were present as regards the possible inclination of the abutment due to the increased thickness of the implant screw. The final restoration was fabricated with a zirconia coping (Lava, 3M ESPE) and feldspathic porcelain stratification (Ziro X veneering ceramic, Wieland). In order to reduce the pressure on the facial peri-implant soft tissue, the most cervical portion of the implant-supported zirconia crown was designed with 1.5 mm of zirconia exposed (Figs 23 and 24).

At the bisque try-in appointment, the maxillary left canine was prepared for the fabrication of a conventional porcelain laminate veneer of about 0.8-mm thickness, and tooth 11 was only cleaned and roughened (Figs 25a and 25b). A

Fig 25a Cleaning and roughening of tooth 11 prior to definitive impression for additional porcelain laminate veneer.

Fig 25b Maxillary left canine preparation for conventional porcelain laminate veneer.

Fig 26 Definitive tooth preparation and insertion of definitive customized abutment.

Fig 27 Definitive prosthesis prior to cementation. Zirconia-ceramic crown for tooth 21 and abutment 22, conventional porcelain laminate veneers for tooth 23, and additional porcelain laminate veneer for tooth 11.

Fig 28 Definitive restorations 1 week after definitive cementation.

Fig 29 Patient's smile 1 week after completion of the treatment, frontal view.

definitive impression for the laminate veneers, together with a pick-up of the full-coverage restorations, was made using a polyether impression material (Impregum Penta).

After finalizing proper function and satisfactory esthetics, the definitive prosthesis was cemented (Figs 26 and 27). The two porcelain laminate veneers were cemented with a light-curing transparent resin cement (Variolink II, Ivoclar Vivadent). Then, once the abutment screw (Gold-Tite, Biomet 3i) was torqued down to 32 N/cm, the definitive all-ceramic crowns were luted using a resin cement (Relyx Unicem, 3M ESPE) (Figs 28 and 29).

The patient was monitored for 2 months after having been given oral hygiene instructions, and once every 6 months thereafter. The last follow-up of the patient was 5 years following the insertion of the crown (Figs 30 and 31). The patient was functioning well and no signs of complication associated with the new crown and peri-implant soft tissue were noticed (Figs 32 to 34).

Discussion

Malpositioned implants represent a challenge, especially when they are positioned in the anterior sextants. The challenge arises mostly due to the recession of the facial soft tissue, and the literature does not show encouraging results with the limited application of a surgical approach.[21-26] On the other hand, prosthetic management of soft tissue defects with artificial pink tissue does not always satisfy the esthetic goal of the case.[7-16]

In this specific case, a combined approach was used, for which the most recent literature shows encouraging results.[32,33] The importance of thick facial soft tissue is evident for natural dentition and also for implants.[17,18,27] Similarly, undercontoured profiles have been shown to be beneficial in order to gain vertical tissue facially to the implants.[30,31] Taking these factors into consideration, and in order to maintain the existing implant (which was strongly desired by the patient), a simultaneous surgical-prosthetic approach was selected. The achieved esthetic outcome satisfied all the esthetic goals of the case, both in the short term and at the 5-year follow-up.

In any case, the clinician should carefully evaluate the position of the implant because even with a good prognosis a severe defect in the linguofacial position, as well as angulation, would not be able to be solved using the procedure described here. For these specific situations, alternative treatment options should be considered, such as implant submersion and conventional fixed prosthesis, or implant removal and implant replacement in a proper position.

Fig 30 Intraoral initial condition 5 years after the completion of the treatment, frontal view.

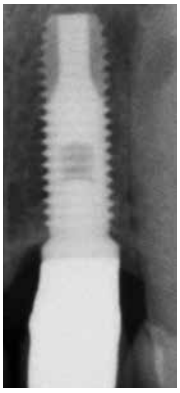

Fig 31 Radiographic condition of implant 22, 5 years after completion of the treatment.

The result of this case is encouraging, as 5-year follow-up of the patient has shown no complications with the implant or with soft tissue stability. Nevertheless, in order to evaluate the predictability of this procedure, the soft tissue stability will be reevaluated in the years to come.

Conclusion

When previously positioned implants present an esthetic problem due to soft tissue recession, a surgical-prosthetic

Fig 32 Initial intraoral condition, anterior sextant, frontal view.

Fig 33 Intraoral condition, anterior sextant, frontal view, 1 week after the delivery of the restorations.

Fig 34 Intraoral condition, anterior sextant, frontal view, 5 years after the delivery of the restorations.

approach represents a valid treatment option in order to recreate a more natural and more coronally positioned gingival scalloping. Careful evaluation of the implant position and the prosthetic emergence profile should be performed prior to selecting this treatment option.

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