

A prosthetic-surgical approach for aesthetic treatment of peri-implant soft tissue defects: A case report

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Abstract

Peri-implant soft tissue defects (PSTD) in the esthetic zone affect approximately 54% cases of post-implant insertion, leading to aesthetic concerns and increasing the risk of peri-implantitis. Various surgical techniques are aimed at addressing these issues, but the outcomes can be unpredictable, especially for severely mispositioned implants. This report details a combined prosthetic and surgical approach to treat a severely angulated single central maxillary implant with mid-labial mucosal recession. A 38-year-old female expressed dissatisfaction with the implant at 21 area, which appeared elongated due to peri-implant mucosal recession of almost 4 mm. Treatment involved two phases: 1) prosthetic phase involves replacing the original crown of implant at 21 area with a temporary crown to promote mucosal growth and 2) surgical phase that involves soft tissue surgery three months later using an envelope flap technique at the recipient site and a connective tissue graft harvested from the palate. Upon three months after the surgery, full coverage with thick mucosal tissue was achieved, and a new zirconia crown was placed. The outcome remained stable throughout the nine-month follow-up. This case demonstrates that PSTD in angulated implants in the esthetic zone can be effectively treated through a combination of prosthetic and surgical modalities.

Keywords: *augmentation, complication, connective tissue, dental implant, recession*

Introduction

Peri-implant soft tissue defects (PSTD) is a common complication following dental implant placement, often leading to aesthetic concerns and functional issues (Bengazi *et al.*, 1996; Small *et al.*, 2001). Various surgical techniques, including gingival grafts and growth factor applications have been employed to address such deformities (Al-Diasty *et al.*, 2022; Sculean *et al.*, 2017). However, the success of these interventions depends on factors such as the implant angulation and underlying bone and mucosal morphology (Stefanini *et al.*, 2023).

The surgical procedure is also unpredictable and frequently necessitates multiple surgeries to achieve aestheticity (Burkhardt *et al.*, 2008). This will increase the cost and length of the procedure and expose the patients to unwanted complications, such as infection or prolonged healing period. There is a suggestion to employ combine both prosthetic and surgical strategies in this scenario, as it has the potential to decrease the frequency of surgical interventions. Zucchelli *et al.*, (2019) deemed PSTD with severe implant malposition suitable for this approach. Here, we present a case of PSTD management in a patient with a severe angulation dental implant utilising the

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combined prosthetic and surgical techniques.

Case Report

A 38-year-old Chinese female expressed dissatisfaction with the appearance of her dental implant, which was placed 10 years ago following tooth loss due to a cracked root after an unsuccessful endodontic treatment. The implant was inserted two months after tooth extraction (Type 2 placement) using a Straumann Bone Level (RC) implant with a diameter of 4.1 mm and a length of 10 mm. It was positioned with a slight apical tilt towards the palatal side to prevent labial bone dehiscence. At the same time, bone augmentation was performed using a xenograft (Bio-Oss Spongious Granules) to correct labial bone deficiency. Due to the labial angulation of the implant, a cement-retained porcelain-fused-to-metal (PFM) crown was chosen to avoid the need for labial screw access.

Almost five months after the implant placement, the patient noticed peri-implant mucosal recession and greyish discoloration. Two surgeries were attempted to correct the defect: the first used a platelet-rich fibrin (PRF) membrane with a coronally advanced flap approach, and the second, performed around a year later, used a Vista approach with an allograft (Mucoderm). Both procedures resulted in temporary coverage, with the mucosa receding and scar forming within a month. PRF injections were then proposed to increase tissue thickness and prevent greyish shadowing. Although this procedure has successfully thickened the mucosa, it is not able to improve the mucosal height. To maintain the thickness, repeated applications are required every 5-6 months. During the assessment in 2023, the patient raised similar concerns about the appearance of the implant area, expressing ongoing dissatisfaction from the aesthetic aspect. She experienced a lack of confidence to smile, which significantly affected her

daily activities. Further examination revealed a 4 mm peri-implant mucosal defect on the mid-labial aspect, with no pockets of ≥ 6 mm or bleeding on probing. The labial aspect exhibited a thin mucosal phenotype and < 2 mm keratinised tissue width (Figure 1a). The labial mucosal depression suggested soft tissue deficiencies and a possible hard tissue deficiency. The implant crown was slightly positioned labially without mucosal shadowing (Figure 1c).

The treatment plan was thoroughly discussed, addressing potential risks and procedural limitations. Concerns were highlighted regarding the crown width, which was slightly wider than that of tooth 11, and the possibility of spacing or black triangles between crowns. The patient's history of fluorosis affecting natural dentition was also considered, as it could potentially impact the aesthetic outcome of the crown blend with adjacent teeth. Initially, the existing crown was removed. An implant transfer piece was placed to evaluate the implant's orientation, revealing a significant angulation of approximately 25° (Figure 1d), indicative of Class IV PSTD as described by Zucchelli *et al.* (2019).

A temporary crown was fabricated using direct composite build-up, modified to reduce labial thickness to facilitate mucosal tissue growth or creeping. In addition, composite build-up on the mesial aspect of tooth 22 aimed at minimising the space between teeth 21 and 22, promoting better papilla formation. The patient underwent monthly reviews to assess the growth of the labial mucosa until stabilisation at 3 months (Figure 2a-c).

Following the prosthetic stage, a surgical procedure that involves harvesting a palatal connective tissue graft (CTG) (Figure 3a) was conducted. An envelope flap was created on the labial aspect using a split-full-split technique, as described by Zucchelli *et al.* (2013).

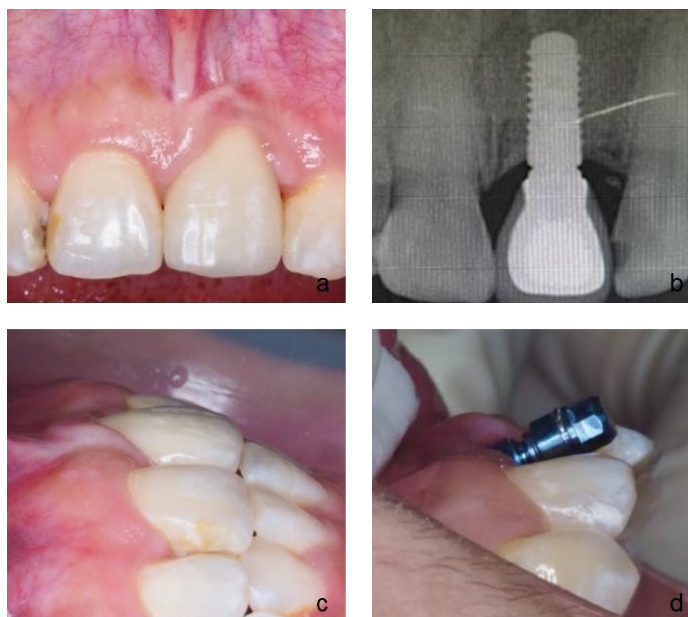


Figure 1. Pre-treatment clinical characteristics: (a) Mid-labial mucosal recession of implant-supported crown 21 with thin mucosal phenotype, and intact interdental papilla. (b) Periapical radiograph of Straumann bone level implant (D:4 mm x L:10 mm). (c) Emerge profile of the crown with labial depression. (d) Lateral view showing implant angulation post- crown removal.



Figure 2. Prosthetic phase: (a) Composite build-up of the temporary crown with elevated mucosal margin. (b) Three months post-modification of the temporary crown with reduced labial-mucosal thickness. (c) Coronal mucosal growth achieved, but incomplete coverage.

This flap extended from the mid-distal point of tooth 11 to the mid-distal point of tooth 22, without raising the distal papilla of either tooth. The apical flap was moderately split to enable passive coronal movement, facilitating complete coverage of the CTG placed on the implant abutment surface at the cemento-enamel junction level of the adjacent teeth (Figure 3b). The CTG was secured with two resorbable simple interrupted sutures on each side, and the flap was stabilised with sling and simple

interrupted sutures using 6/0 non-resorbable monofilament (Figure 3c).

The patient was instructed to refrain from brushing the surgical site for one week, while maintaining regular brushing of the remaining dentition using a gentle technique. Chlorhexidine 0.12% mouthwash was prescribed for daily use, with specific instructions to rinse gently to minimise the potential for flap displacement. In addition, caution was advised against lifting the upper

lip to reduce the risk of inadvertent traction. The patient was also prescribed Ibuprofen 400 mg for three times daily and Amoxicillin 500 mg for three times daily for a week. The palatal sutures were removed after one week. Plaque removal was performed with

gentle saline irrigation at the recipient site, and the remaining sutures were removed two weeks post-surgery. The patient underwent weekly reviews during the first month and the months after for up to three months to monitor healing progress.



Figure 3. Surgical phase: (a) Palatal flap sutured post-harvesting a subcutaneous connective tissue graft (CTG) with optimal closure. (b) Obtained a thick CTG of sufficient size. (c) Flap stabilized by coronal advancement using a sling and interrupted sutures, placing CTG underneath. Distal papillae of teeth 11 and 22 remained undisturbed and intact.

Three months post-surgery, there was a significant increase in mucosal tissue thickness, achieving 100% coverage on the labial surface of the temporary crowns on implant 21 (Figures 4a–c). Subsequently, a new Zirconia implant crown with an angulated screw channel was fabricated to support the screw-retained prosthesis (Figure 4d), which was successfully placed. The patient expressed satisfaction with the outcome (Figure 4e), and a periapical radiograph confirmed the abutment seating, showing satisfactory outcome (Figure 4f)

Upon follow-up within six months after the permanent crown placement (nine months post-surgery), mucosal tissue thickness and complete coverage of the implant crown were maintained without signs of inflammation (Figures 5a–d).

Discussion

Peri-implant soft tissue defects (PSTD) in the esthetic zone is common, with a reported

prevalence of approximately 54% following implant placement (Tavelli *et al.*, 2022). The development of PSTD is multifactorial, often attributed to factors such as thin mucosal phenotype and malposition of the implant, particularly in relation to the labial aspect (Stefanini *et al.*, 2023; Tavelli *et al.*, 2022). Some authors have proposed clinical decision pathways and provided examples to guide treatment protocols for several clinical situations related to PSTD (Alrmali *et al.*, 2023; Zucchelli *et al.*, 2019).

In this case, we addressed a class IV defect using a suggested approach, which involves employing a temporary crown with a thinned labial surface. This approach has resulted in visible improvement of mucosal growth after three months. Although no further changes were observed thereafter, the moderately enhanced appearance prepared the mucosa for subsequent mucosal augmentation surgery utilising CTG, which remains the gold standard in such procedures (Surdiacourt *et al.*, 2024). CTG can be harvested from either the palatal or tuberosity areas.

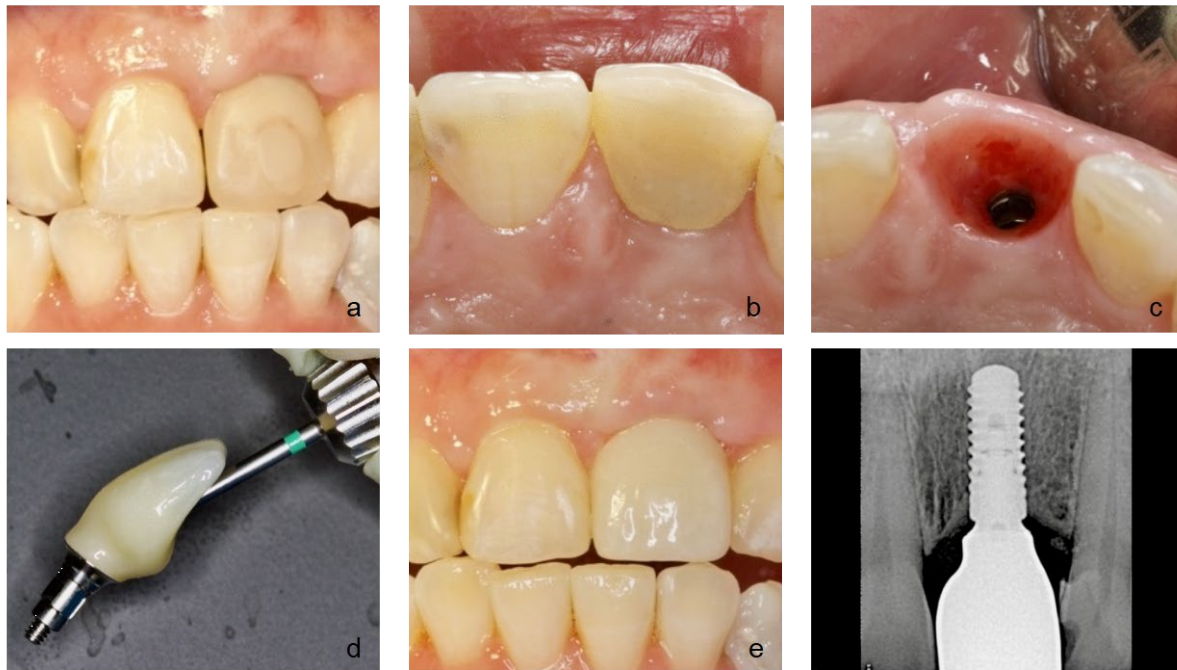


Figure 4. Three months post-surgery and permanent crown placement: (a) Recipient site demonstrates stable healing. (b) Intact palatal tissue observed. (c) Occlusal view reveals increased labial mucosal thickness. (d) Screw-retained zirconia crown with angulated crown with angulated screw channel. (e) Mucosal level over the crown aligns well with adjacent gingiva. (f) Periapical radiograph confirms proper abutment seating and interproximal bone attachment.



Figure 5. Nine months after surgery follow-up: (a-c) Mucosal position and level maintained at the implant site. (d) Absence of inflammation, with healthy mucosal tissue. (e) Patient-completed questionnaire during recent assessment.

Some studies suggest that CTG from tuberosity areas offer advantages due to its denser lamina propria content, thereby reducing the risk of shrinkage (Dellavia *et al.*, 2014; Sanz-Martín *et al.*, 2019). However, conflicting evidence indicates comparable outcomes between subepithelial and tuberosity CTG (Rojo *et al.*, 2018). In terms of aesthetics, tuberosity CTG may prompt a more fibrotic response, potentially affecting the final aesthetic outcome. Nonetheless, patient evaluations indicate similar satisfaction levels for both types of CTG (Kotsailidi *et al.*, 2022; Rojo *et al.*, 2018). In this specific case, palatal CTG is preferred due to its accessibility and the larger quantity available for harvest.

It is essential to evaluate the patient's aesthetic expectations to ensure they are realistic and understand the treatment limitations. Given the patient's high smile line, assessing the quality of peri-implant mucosa is crucial. To create an identical contour for the crown presents challenges, particularly due to the wider space. To address this, a composite build-up is applied on the mesial proximal surface of tooth 22 to slightly reduce crown 21 dimensions and adjust the contact point downward towards the apex for better papilla filling. Recent studies indicate that maintaining a papilla height between 3.4 mm and 4.2 mm effectively fills interproximal spaces between implants (Kourkouta *et al.*, 2009; Tarnow *et al.*, 2003). However, recent research suggests that the periodontal bone attachment status of the adjacent teeth may be more critical than papilla dimensions (Roccuzzo *et al.*, 2018), which was observed in this patient, demonstrating a good level of bone crest between teeth 11 and 22 on radiographs.

In addition, the patient demonstrates excellent compliance with oral hygiene care, with no inflammation observed around the implant mucosal, contributing to the stability of peri-implant tissues and potentially preventing peri-implant disease. Moreover, the patient maintains excellent compliance with the scheduled maintenance appointments, which is crucial for the long-

term oral health and implant stability (Roccuzzo *et al.*, 2012).

An alternative treatment option is a veneer to reshape tooth 11, matching the shape and colour of crown 21. However, this may increase treatment costs and pose a risk of damaging healthy tooth structure. Nevertheless, the patient's primary concern is mucosa recession rather than tooth width. The patient expressed satisfaction with the outcome (Figure 5e), and the mucosa remained stable during the recent nine-month follow-up.

Conclusion

Effective management of labially angulated dental implants with peri-implant soft tissue defects (PSTD) demands a multidisciplinary approach. Precise treatment planning, meticulous surgical techniques, and thoughtful prosthetic interventions play pivotal roles in the success of tissue augmentation and optimal aesthetic outcomes. Regular follow-up evaluations are essential to ensure the long-term health and stability of the implant.

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Disclosure

All authors declare no conflict of interest.

Human right statement

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later versions. Informed consent was obtained from patient for being included in the study.

Ethical approval

The study was exempted from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia review, and this case report is registered with the number NMRR ID-24-01312-GUW.

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