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Peri-implant soft tissue preservation following immediate provisional restoration in the aesthetic zone: a clinical report



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In the past few decades, there has been an increase in public awareness about overall beauty and a pleasant smile. As a consequence, a harmonious gingival profile has gained extreme importance in the overall success of the implant restoration. This article presents a technique and case of an immediate implantation and provisionalisation to maintain pre-implant soft tissue profiles. More importantly, the surgical treatment plan for aesthetic cases, including indications and contraindications, is also outlined.

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■ Introduction

During the initial stages of the Brånemark era, the maintenance of the soft tissue profile was not considered to be an important aspect of the implant case. However, due to the influence of public and professional awareness of beauty and harmonic smile, this has become an essential factor in implant restoration. In fact, anterior maxillary implants (both single and multiple units) are now common practice. These cases appear to be simple at first examination, but they can be associated with several clinical challenges. In fact, maintaining and reconstructing peri-implant soft tissue in the aesthetic zone is considered to be one of the most difficult and unpredictable procedures in implant dentistry¹.

At present the most important aesthetic factor in an implant case is the characteristic of the soft tissue

profile, in particular, the peri-implant papillae¹. According to Pradeep and Karthikeyan¹, the level of peri-implant papilla is determined by the following variables: distance between contact point and alveolar crest; interproximal distance between adjacent implant and tooth and implant; type of periodontium (flat or narrow); position of the tooth; absence or presence of diastema; level of buccal bone; and total volume of embrasure. In addition, it has been demonstrated that the gingival profile is more predictably maintained when implants are placed adjacent to natural teeth^{2,3}. In such cases, the papilla can be supported by supracrestal gingival fibres from the adjacent tooth, which is absent in implants⁴⁻⁶. Tarnow et al demonstrated that when the measurement from the contact point to the crest of bone was 5 mm or less, the papilla was present almost 100% of the time⁷. However, the placement of two adja-



Fig 1 Preoperative labial view.



Fig 2 Preoperative radiographic view of the fractured maxillary right lateral incisor.

cent implants in the aesthetic zone offers a major challenge in maintaining soft tissue profiles. Although single-tooth replacement with implants have been well documented, simultaneous removal of adjacent teeth often leads to peri-implant papilla loss, resulting in unsatisfactory aesthetic results.

Therefore, it is the aim of this case report to present a surgical and restorative technique to maintain peri-implant soft tissue profiles when it is planned that single teeth will be extracted in the anterior aesthetic zone. Indications, contraindications as well as patient selection will also be discussed.

■ Case presentation and results

The technique illustrated in this case report was carried out on a patient treated by the authors in a private practice in Curitiba, Brazil. A 37-year-old Caucasian female presented to the clinic reporting mild discomfort on percussion to tooth 12 (Fig 1). The patient reported to have received endodontic treatment in this tooth a few months prior to the baseline visit (Fig 2). A baseline radiograph revealed endodontic treatment on tooth 12 associated with inadequate post-and-core adaptation. Clinically, the provisional crown of tooth 12 was movable. There were no signs of clinical attachment loss or acute periapical infection. Once the provisional crown was removed, it revealed a vertical distolingual root fracture and the tooth was deemed to be non-restorable. The medical history of the patient was not a contributing factor. The radiograph documented favourable alveolar bone height and treatment planning involved

atraumatic tooth extraction in combination with immediate implant placement and immediate provisionalisation.

The method of extraction was performed as previously described⁸. Initially, severance of the supra- and subcrestal fibrous attachment using scalpels and periostomes was performed. Subsequently, a tapered flat end diamond bur was used at the palatal sulcus (2200, Vortex®, São Paulo, Brazil) to allow atraumatic placement of the elevator. An elevator was then placed at the palatal side until the complete avulsion of the root was achieved (Fig 3). The elevator was not placed at the papilla or buccal sides, so as to avoid inadvertent trauma to the soft tissues. Finally, the avulsed root was gently removed with forceps. The alveolar socket was then completely cleaned so it was free of any soft tissue fragments. No signs of alveolar bone fenestrations or dehiscences were present.

Following alveolar socket inspection, an osteotomy was performed at the palatal line angle of the alveolar socket to guarantee proper primary stability of the implant. A parallel-walled implant, 3 mm longer than the remaining alveolus was selected to ensure primary stability. Hence, a 3.75 mm by 13 mm, external hexagon, dental implant was placed with a final insertion torque of 50Ncm (Classic-CI, Systhex®, Curitiba, Brazil, Fig 4). The implant was placed at the mesial aspect of the alveolus to guarantee proper mesio-distal alignment of the future restoration.

At the same visit, a pure-titanium, UCLA, prosthetic abutment (Systhex®) was placed and properly adapted (Fig 5). A polycarbonate provisional crown was then adjusted to precisely fit the prosthetic abutment without any central or extrusive contacts. Post-



Fig 3 Clinical photograph demonstrating the minimally traumatic tooth extraction. Note the preservation of the peri-implant soft tissues.

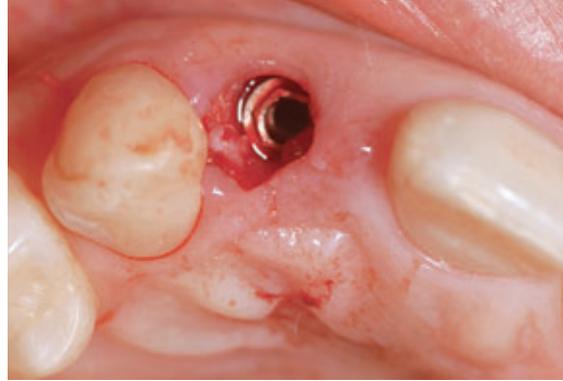


Fig 4 Implant placement demonstrating the correct mesio-distal and labio-lingual orientation.



Fig 5 A prosthetic UCLA abutment was prepared and installed on the implant at a torque of 50 Ncm.



Fig 6 Provisional crown 4 months after the surgery.



Fig 7 Placement of the In-ceram coping (VITA).



Fig 8 Final restoration demonstrating adequate soft tissue maintenance.

operative medication included amoxicillin 500mg every 8 hours for 10 days, chlorhexidine digluconate 0.12% every 12 hours for 7 days and an acetaminophen/hydrocodone-based analgesic taken as needed for pain. The implant was allowed to heal for 4 months (Fig 6). A platform-level impression was then performed and a customised prosthetic In-

ceram coping (VITA Zahnfabrik, Bad Säckingen, Germany) was fabricated (Fig 7). After allowing approximately 4 weeks for healing, the fabrication and cementation of the final restoration was carried out. The 12-month post-operative visit revealed the maintenance of peri-implant soft tissues and an excellent aesthetic outcome (Fig 8).

■ Discussion

The maintenance of peri-implant tissues has received much attention over recent years. Recent investigations have demonstrated that the presence or absence of papilla between an endosseous implant and a natural tooth is similar to that between two natural teeth⁹. Grunder¹⁰ evaluated the soft tissue stability around 10 single-tooth implants. One year after prosthesis insertion, the soft tissue volume in the papilla area increased, and none of the papillae had lost volume. In addition, Grunder's data was comparable to a study previously carried out by Tarnow et al⁷ involving the presence of papilla between natural teeth. In fact, the presence of a natural tooth was so important, that the vertical position of the implant did not influence the papilla formation¹⁰. Choquet et al have shown similar results². However, only two controlled studies demonstrated data on soft tissue changes following immediate implantation and provisionalisation^{11,12}. Kan et al¹¹ reported a mean loss in papilla height between 0.39 mm and 0.53 mm. In the other study, 61% of the papillae demonstrated a loss in height after implant placement¹². Further controlled studies are necessary to confirm these findings.

On the other hand, it has been demonstrated that when two or more implants are placed adjacent to each other, maintaining the papillary and gingival profile is a challenge. This aspect is even more evident in the anterior aesthetic cases, where the periodontium is usually more scalloped. In fact, studies have shown that in these cases, not only the maintenance, but also the reconstruction of the peri-implant papillae between implants is more difficult to achieve³. One reason for this difficulty relates to the differences in location of the biological width around implants compared with natural teeth⁶. It has been demonstrated that the biological width around implants is usually located at subcrestal levels, contrasting with supracrestal levels around teeth⁹. It is widely accepted that the formation of the biological width around the implant leads to alveolar bone loss apically to the implant platform (also called saucerisation). Further, it was demonstrated that there is a lateral bone loss of approximately 1.5 mm around the implant platform¹³. In this study, the crestal bone loss for implants with a greater than 3 mm distance

between them was 0.45 mm, while the implants that had a distance of 3 mm or less between them had a crestal bone loss of 1.04 mm¹³. Consequently, when two implants are placed next to each other, the combined bone loss may influence the soft tissue profile. In other words, the peri-implant papilla in adjacent implants lacks the alveolar bone support usually found around teeth or around teeth-to-implant. For this reason, the results of this case report should not be extrapolated to cases where implants are placed next to each other.

In this clinical report, the main advantage was the presence of supracrestal dento-gingival fibres that maintained the gingival profile. It is important to note that several guidelines should be considered in cases of immediate implantation and provisionalisation. First, the adjacent teeth should be periodontally healthy, stable, and absent of pain and/or infection. Second, the alveolus must be intact without significant dehiscences and/or fenestration. Third, a minimal insertion torque of 25 Ncm should be reached¹⁴ and functional loading, placed on an immobile implant, is an essential ingredient to achieve osseointegration¹⁵ (if an implant is placed in the soft spongy bone with poor initial stability, it often results in the formation of connective tissue encapsulation, similar to the pseudoarthrosis observed in a unstabilised fracture site)¹⁶⁻²³. Fourth, in highly scalloped gingival cases, the implant must be placed at least 3 mm apical to the labial gingival margin. Finally, a well-designed provisional restoration should be installed that poses minimal risk of adversely affecting the initial stages of integration. In cases of cemented restorations, it is recommended that the restorative dentist be especially vigilant to remove excess subgingival cement following cementation and to avoid implant complications²⁴. The excess cement seems to be more difficult to remove or identify when implants are restored with deep subgingival margins. These situations are more commonly seen in anterior restorations, where aesthetic demands are higher. Finally, the provisional crown should also be adjusted without any central or extrusive contacts. The authors further suggest that the temporary prosthesis, once inserted, should not be manipulated or removed during the healing period to avoid any unnecessary movement. If all of these guidelines are followed, previous literature has shown a cumulative success rate of 97.6%²⁵. As a disadvan-



tage of this technique, it must be noted that the provisionalisation stage of the surgical appointment is time consuming, averaging 30 to 40 minutes of chair time following placement of the implant. Although early positive feedback from the patient is rewarding, it is the exceptional tissue health, along with maintenance of soft tissue contours and alveolar bone height that provides the real impetus for pursuing this new approach to maximise the aesthetic potential of implants in the aesthetic zone. Further randomised clinical trials must be carried out to evaluate all of the confounding factors on soft tissue maintenance in aesthetic implant cases.

Conclusion

Several techniques have been proposed for peri-implant papilla preservation and reconstruction. This case report presents a case of immediate implant placement combined with immediate provisionalisation (functional loading) to maintain interproximal soft tissue profiles. Long-term studies should be carried out to fully evaluate the potential benefit of this technique in the preservation of peri-implant soft tissues.

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