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Case Report

Tissue Recession around a Dental Implant in Anterior Maxilla: How to Manage Soft Tissue When Things Go Wrong?

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Abstract: Dental implants represent the gold standard for the treatment of single edentulism, even in anterior areas. Today, the basic criteria for implant success has changed from mobility, pain, radiolucency, and peri-implant bone loss (>1.5 mm) to prosthetic level success, aesthetics, soft tissue parameters, as well as patient satisfaction. This case report documents a combination of surgical and prosthetic procedures for the treatment of gingival recessions in the anterior maxilla, appearing after tooth extraction, socket preservation, and staged guided implant placement. Prosthetic management of the temporary restoration, orthodontic treatment, and a connective tissue graft were performed. The decision-making process and step-by-step execution of the treatments are presented to describe the entire clinical and surgical management of the reported case. Finally, good aesthetic outcomes, patient satisfaction, and recovery of the soft tissue recession were observed with the combination of these techniques.

Keywords: aesthetics; dental implant; mucosa recession; connective tissue graft; root coverage

Citation: Uccioli, U.; Fonzar, A.; Lanzuolo, S.; Meloni, S.M.; Lumbau, A.I.; Cicciù, M.; Tallarico, M. Tissue Recession around a Dental Implant in Anterior Maxilla: How to Manage Soft Tissue When Things Go Wrong? *Prosthesis* **2021**, *3*, 209–220. https://doi.org/10.3390/prosthesis3030021

Academic Editor: In-Sung Yeo

Received: 5 August 2021
Accepted: 20 August 2021
Published: 23 August 2021

1. Introduction

Tooth loss causes inevitable remodeling processes of the alveolar bone in the area of the extraction. These changes usually result in bone volume loss, especially against the buccal side, and this can lead to functional and aesthetic problems. Although the bone resorption is highly variable, alveolar ridge resorption takes place mainly during the first three months after tooth extraction, resulting in the loss of about 50% of the buccal wall [1–3]. Even if bone volume loss is a global problem, it is mostly stressed in the anterior area because of the high aesthetic requirements [4–6]. Immediate implant placement and loading seem to be the gold standard in the anterior area, but mid-facial mucosa recession could compromise the final aesthetic outcomes [7]. Moreover, a higher risk of implant failure can be expected when compared with immediate or early loading performed in healed ridges [8,9]. In order to overcome these drawbacks, several techniques and materials intended to minimize the alveolar bone resorption, including different procedures to cover the grafted material during the healing phase, have been introduced [3–6]. Leaving out the differences between various socket preservation techniques, the common point is that the material introduced into the residual socket should act as space maker, avoiding the complete collapse of the alveolar bone. Socket preservation procedures have been introduced to preserve not only the hard tissue but also the soft tissue contour after a tooth extraction, representing an opportunity to avoid more invasive bone augmentation techniques at a later stage [10]. Despite the progress that has been achieved, post-extractive implants in the anterior area

remain a challenge because of possible unacceptable aesthetics, and consequently poor patient satisfaction, as a result of soft tissue recessions, unfavorable color, and visible crown margins [1–3]. The present case describes the management of an aesthetic complication occurring after the rehabilitation of a central incisor extracted due to a horizontal fracture, with a dental implant.

2. Case Presentation

A 10-year-old boy presented with a composed horizontal fracture (ski trauma) of a previously treated maxillary left incisor, involving full root thickness, and splitting the tooth into two parts. Initial pictures and radiographs were taken for evaluation (Figures 1 and 2). Due to the very young age of the patient, endodontic retreatment was performed and the fracture rhyme was sealed with MTA, after its isolation through an ultrasonic device. After composite reconstruction, two single composite veneer crowns were delivered on teeth 11 and 22. At the follow-up examinations, planned at 4 month intervals, the site of the trauma showed a palatal probing up to 5 mm.

After 12 years, as a result of a second trauma (elbow strike while playing football) the tooth fractured completely. Then, bone sounding with periodontal probing revealed a buccal probing depth of approximately 6 mm (Figure 3) and pathological mobility. Clinical signs of inflammation were visible, particularly at the palatal side (Figures 4 and 5). Overall, the clinical and periodontal conditions of the tooth made the extraction unavoidable. Due to the patient's high aesthetic and functional demands, the proposed treatment plan included initial periodontal therapy, a minimally invasive tooth extraction with socket preservation/seal, and a Maryland bridge for at least 4 months. Then, computer-guided, template-assisted implant placement with conventional loading was implemented. Finally, a cement-retained, implant-supported single crown was installed on the left incisor in addition to a veneer on the right incisor.

Figure 1. Initial situation at the first trauma, frontal view.

Figure 2. Initial situation at the first trauma, periapical radiograph.

Figure 3. Preclinical intraoral picture, after the second trauma, frontal view.

Figure 4. Preclinical intraoral picture after the second trauma, palatal view.

Figure 5. Preclinical radiograph after the second trauma.

After the patient gave written consent for the proposed treatment, and permission to write up the case, all the clinical and surgical procedures began. The patient was prescribed amoxicillin 2 g, 2 times per day, for 2 days before and 5 days after surgery. The extraction was performed flapless, as atraumatically as possible, using a periotome and atraumatic elevators (PT1 and EPTSMS, Hu-Friedy Italy, Milan, Italy). A carefully curettage of the socket was performed with alveolar curettes, and then the area was washed with sterile saline. After that, the socket (Figure 6) was grafted with deproteinized bovine bone (Bio-Oss, Geistlich Pharma AG, Wolhusen, Switzerland), and sealed using a connective tissue graft (CTG) harvested from the palate. Finally, the wound was sutured with non-absorbable surgical suture (Vicryl, Ethicon J&J International, St. Stevens, Woluwe, Belgium). A temporary Maryland bridge was cemented to the neighboring teeth, without compressing the extraction site. The first clinic check, one week later, showed a perfect healing of the wound.

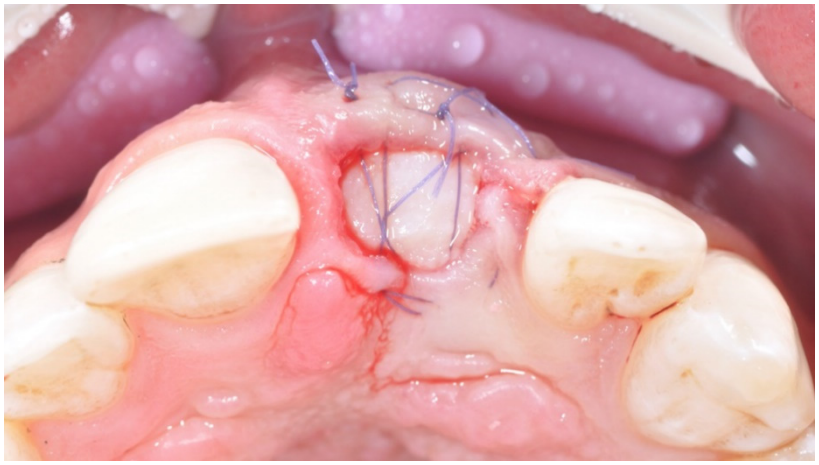

Figure 6. Tooth extraction and socket preservation with deproteinized bovine bone and CTG.

Four months later, the patient underwent a cone beam computed tomography (CBCT) scan (Cranex 3Dx, Soredex, Tuusula, Finland), using a wax bite to separate dental arches. Then, the patient received an intraoral digital impression taken using the 3M True Definition Scanner (3M Italia, Pioltello, Milano). The digital data (STL, Surface Tessellation Language) were imported into 3D design software (Exocad DentalCAD, Exocad GmbH, Darmstadt, Germany) to realize a virtual wax-up according to the functional and aesthetic requirements. Then, the STL and DICOM (Digital Imaging and Communications in Medicine) data were imported in a 3D software planning program (3Diagnosys ver. 4.2, 3DIEMME srl, Cantù, Italy). Afterwards, prosthetic-driven implant position was planned and a surgical template was ordered [3,6,11–24]. Before implant placement, the patient underwent professional oral hygiene, prophylactic antiseptic with 0.2% chlorhexidine (Curasept, Curaden Healthcare, Saronno, Italy) for one minute, and prophylactic antibiotic therapy (2 g of amoxicillin). Local anesthesia (articaine with adrenaline 1:100,000) was administered 20 min before surgery. Immediately before implant placement, the fit of the surgical template was tested in the patient's mouth to achieve a stable fit (Fit Checker, GC—Tokyo, Japan). The surgical templates were stabilized on the residual teeth and fixed with two preplanned anchor pins. The surgical template was temporarily removed to elevate a minimally invasive flap without relation incisors. Then, planned implant (Osstem TSIII, Osstem, Seoul, South Korea) was placed at 35 Ncm using dedicated drills (OsstemGuide Kit (Taper), Osstem Seoul, Korea) in combination with reduction tools, within the surgical templates containing metallic sleeves (Figures 7–9). Finally, the wound was closed with single-stitch sutures using 4.0 resorbable suture material (Vicryl, Ethicon J&J International) and the previous temporary prosthesis was cemented.

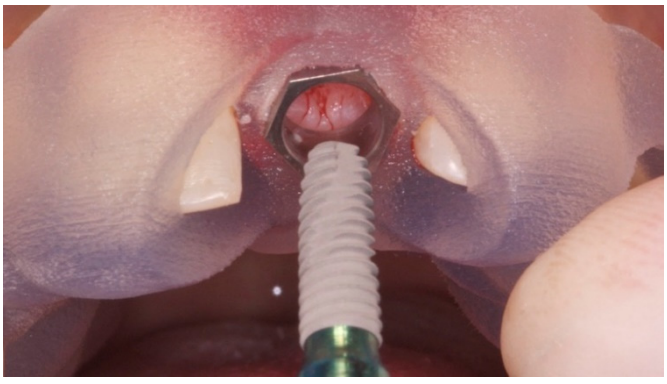

Figure 7. Guided implant placement four months after the socket preservation.

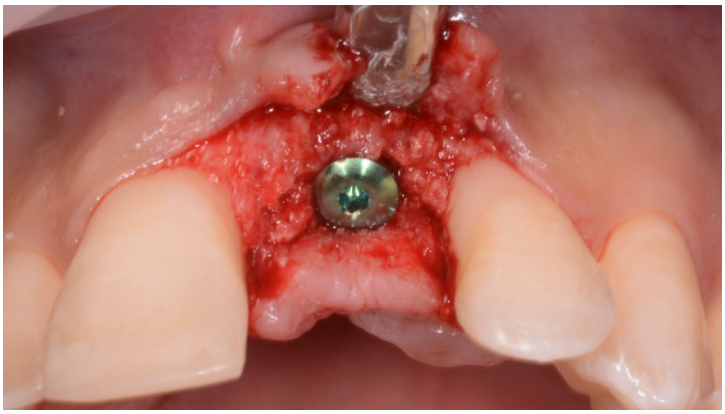

Figure 8. Implant position after guided implant placement, with minimally invasive flap elevation, and submerged healing.

Figure 9. Periapical radiograph after guided implant placement.

Two weeks later, after suture removal, clinical examination revealed papillary recession at the mesial area of the left maxillary lateral incisor (Figure 10). It was classified as Class III based on Nordland and Tarnow's classification [25], which means mesio-distal crestal bone loss. Different non-surgical and surgical techniques, such as guided bone regeneration or connective tissue graft, were widely discussed with the patient to increase the amount of available bone and/or gingival tissue. After all the benefits and limitations of these procedures were evaluated, the patient was scheduled for a fixed orthodontic appliance in order to level the isolated infrabone defect and reposition of the gingival margin, increasing the amount of attached bone and soft tissue. The orthodontic therapy (Figure 11) was carried out for four months after non-surgical periodontal therapy, which included scaling and root planing, and in combination with odontoplasty to allow the extrusion of the tooth in the arch [26].

After debonding (five months after implant placement), an incision using microsurgial blade and avoiding perpendicular incisions was performed, allowing for more tissue adaptation. After that, a screw-retained temporary restoration, designed with an ideal emergence profile, was delivered (Figures 12 and 13). Temporary restoration was shaped with a concavity in the distal part avoiding any compression. This design was chosen in preparation for connective tissue grafting, also allowing for soft tissue creeping.

Figure 10. Papilla recession at the mesial area of the left maxillary lateral incisor two weeks after implant placement.

Figure 11. Orthodontic therapy.

Figure 12. Five months after implant placement, management of soft tissue with screw-retained temporary restoration.

Figure 13. Five months after implant placement, management of soft tissue with screw-retained temporary restoration (without crown).

One month later, local anesthesia was administered in the facial and palatal regions using articaine with adrenaline 1:100,000. Intrasulcular incisions without vertical releasing incisions were made on either side of the papilla to raise a full-thickness flap. After achieving sufficient anesthesia in the maxillary tuberosity region, epithelialized connective tissue was harvested using two parallel split-thickness incisions close to the bone tuberosity on the buccal and palatal aspects. A fibrine sponge was sutured on the site in order to protect the wound during healing (by second intention). The CTG was de-epithelialized, trimmed, and placed over the recipient site (Figure 14), and finally stabilized with resorbable 6.0 suture (Vicryl, Ethicon J&J International). Flaps were coronally advanced and sutured along with single stitches using Supramid non-resorbable, synthetic, multi-filament 5-0 sutures (Braun Milano S.p.A., Milan, Italy) (Figure 15). Nine months after soft tissue maturation (Figures 16–18), the patient received three cemented single crowns, made in lithium disilicate. A zirconia abutment was delivered on the implant (Figure 19). The patient was enrolled in a hygiene maintenance program with visits every 6 months.

Figure 14. Six months after implant placement, CTG placed over the recipient site.

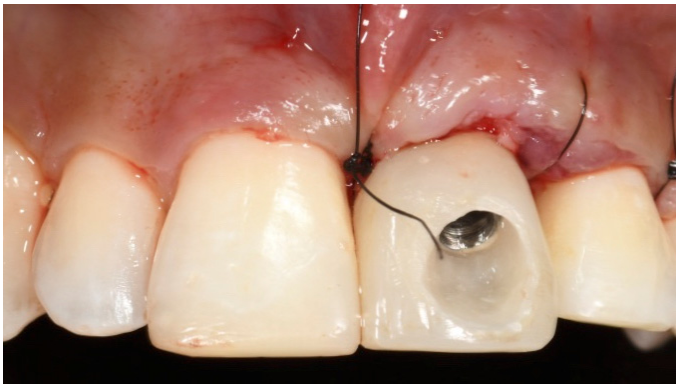

Figure 15. Flaps coronally advanced and sutured along with single stitches using a non-resorbable suture.

Figure 16. Soft tissue maturation 10 days after CTG.

Figure 17. Soft tissue maturation and definitive restorations 9 months after CTG.

Figure 18. Soft tissue maturation and definitive restorations 1 year after CTG.

Figure 19. Radiographic evaluation 1 year after CTG.

3. Discussion

The present case describes the management of an aesthetic complication occurring after the implant rehabilitation of a central incisor extracted due to a fracture, with loss of the interdental papilla. The treatment of aesthetic defects around teeth and implants (e.g., marginal tissue recession, deficient ridges, ridge collapse) presents some of the most challenging and most unpredictable problems, and hence is a real challenge in modern dentistry. The loss of papilla can lead to aesthetic, phonetic (space allows passage for air or saliva), and functional (lateral food impaction) problems. Reconstruction of lost

interdental papilla can be performed by means of surgical and/or non-surgical techniques. Nevertheless, non-surgical approaches such as restorative intervention can only mask the loss of the tissues. In the present case, the loss of interdental papilla could have been caused by flap necrosis and/or a pre-existing periodontal defect. The clinical approach was a combination of non-surgical (repeated curettage of the papilla during maintenance therapy, soft tissue development using a screw-retained restoration, and orthodontic extrusion) and surgical procedures (de-epithelialized CTG harvested from the maxillary tuberosity), in order to restore the interdental papilla after a significant loss of soft tissue between the implant and the lateral incisor [27–29]. Orthodontic extrusion techniques have been described in the literature since the 1940s as tools to restore the interdental bone peak with the idea that attached hard and soft tissues follow tooth movement coronally, increasing the height of the alveolar crest [30]. Orthodontic extrusion can be achieved with slow forces (1 mm/month) to allow periodontal structures to follow the tooth's eruption, or higher forces in cases where elongation of the clinical crown needs to be obtained (fast eruption, 1 mm/week). These last cases are associated with fibrotomy [31]. According to Tarnow et al., the presence of the interproximal dental papilla depends on the distance between the bone crest and the contact point [32]. Following this principle, the left lateral incisor was forced to erupt along its axis, allowing the bone to follow its movement and relocating the crestal bone within 5 mm of the contact point for papilla support. This is particularly useful in cases where there is an implant adjacent to a tooth with crestal bone apical to the cementoenamel junction of the natural tooth [33].

According to a recent randomized controlled trial that compared the use of CTG with guided bone reconstruction using resorbable membrane to re-establish the convexity at the buccal aspect of single implants, both procedures seem to be effective without significant differences [34]. Nevertheless, all the cases presented with a horizontal defect, without loss of vertical bone around the adjacent teeth. In the present case report, in order to reconstruct the interproximal papilla next to the implant, a CTG harvested from the tuberosity was used. Connective tissue graft is considered the gold standard in the treatment of soft tissue defects. There is proof in the literature that connective tissue graft harvested from the maxillary tuberosity presents several advantages compared to traditional palatal graft. Connective tissue graft harvested from the tuberosity is full of connective fibers and poor in glandular components. Moreover, it is represented by its peculiar tendency to a hyperplastic response over time, which makes it a better choice to increase soft tissue thickness compared to the same graft harvested from other donor sites. Finally, CTG from the tuberosity seems to be associated with lower patient morbidity.

The present case report shows a possible strategy to manage the loss of interdental papilla next to a dental implant in aesthetically important areas using a CTG harvesting the graft from maxillary tuberosity followed by a guided orthodontic tooth extrusion to induce the remodeling of the bone architecture in order to restore the periodontal peak.

Although both the authors and the patient agreed upon the most conservative treatment with low morbidity for the patient as well as high patient satisfaction, this approach presented some limitations, including the long treatment time, the need for orthodontics, a surgical procedure, and adjunctive veneer on the lateral incisor that became necessary following the orthodontic treatment.

4. Conclusions

The presented case report describes a successful combination of non-surgical and surgical procedures for the management of an aesthetic complication occurring after implant placement in the anterior maxilla. Slow orthodontic extrusion in combination with a CTG harvested from the maxillary tuberosity, and correct management of the prosthetic profiles, proved effective in the present clinical case. An integrated team approach involving clinicians with different expertise may be considered the gold standard for the management of aesthetic complications.

Author Contributions: Interventions—surgical and prosthetic treatments, U.U., A.F. and M.T.; writing—original draft preparation, S.L. and A.I.L.; review and supervision, S.M.M. and M.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research received not external funding.

Institutional Review Board Statement: Ethical committee of the Aldent University approved the publication of the present clinical case (protocol N° 6/2020).

Informed Consent Statement: Informed consent was obtained from the subject involved in this study.

Data Availability Statement: Original radiographs and adjunctive pictures are available from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

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