Periodontal and peri-implant tissue management in the aesthetic zone

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_Initial situation_

A 38-year-old male patient with a non-contributory medical history presented owing to a vertical fracture of the maxillary left central incisor (tooth #21). The patient showed a combination of risk factors that together had led to the fracture: the absence of the ferrule effect, short posts, bruxism, and occlusal overload due to premature contacts during protrusive movements (Figs. 1–3).

_Treatment plan_

Based on the clinical and radiographic examination, the aesthetic risk profile was determined to range from moderate to high on the International Team for Implantology's aesthetic risk assessment guidelines. Horizontal and vertical bone defects were detected, with a distance of 6 mm from bone level to the contact points (Fig. 4). A delayed implant placement (Type 2) was planned in order to...
achieve complete healing of the soft tissue before the guided bone regeneration procedures and implant placement. In order to minimize the number of surgical appointments and reduce the overall morbidity, a simultaneous approach of periodontal and implant surgery was preferred. The periodontal tissue of tooth #11 was modified along with implant surgery on region #21 with two different objectives: (a) to increase the ferrule effect and move the mid-facial soft-tissue margin slightly upwards to improve the harmony of the scalloped mucosal line (Fig. 5); and (b) to hide the dark underlying appearance of the root with a connective tissue graft (Fig. 2).

The initial phase involved the removal of the fractured tooth #21 utilizing a periotome. The extraction socket was filled with a collagen plug to achieve stabilization of the blood clot during the initial healing of the soft tissue. A Maryland bridge was cemented on the same day and modified to avoid interferences during protrusive movements (Fig. 6).
Procedure

First surgical procedure

Six weeks later, periodontal and implant surgery were performed. A mid-crestal incision was executed on the implant site. At this stage, scalloped incisions were applied on the palatal and buccal sides of tooth #11. Afterwards, bucco-oral ostectomies on the root were performed for the previously described goals. The tiny interproximal bone peak was treated with due respect and left untouched (Fig. 7). Subsequently, a Straumann Bone Level implant (ø 4.1 mm, SLActive 12 mm) was inserted in the correct 3-D position to replace tooth #21 (Fig. 8). Shortly afterwards, autogenous bone chips were harvested locally and applied to cover the dehiscence-type defect. A layer of Straumann BoneCeramic (400–700 μm) was placed to overcontour the external surface of the facial bone. The grafting material was covered with a non-cross-linked collagen membrane in accordance with guided bone regeneration principles (Fig. 9). A double-layer technique was used to improve the stability of the membrane. Once perfused with blood, the membrane could be easily adapted to the alveolar bone crest and did not require any additional fixation. Tension-free primary wound closure was achieved with horizontal mattress sutures after splitting the periosteum at the base of the flap (Fig. 10). The ovate pontic was ground to avoid pressure on the tissue below. The provisional bridge was then recemented (Fig. 11).

Second surgical procedure

The stability of the provisional bridge allowed an extended interval (four months) for the final flattening of the ridge contour due to remodelling of the alveolar bone. A roll flap technique was then regarded as adequate to compensate for a mild horizontal discrepancy at region #21 (Figs. 12 & 13). Meanwhile, a very thin (≤ 1 mm) connective tissue graft was harvested from the premolar area of the palate and inserted with a tunnel technique in a supra-periosteal pouch, with the purpose of hiding
the dark aspect of the nearby root of tooth #11 (Figs. 14 & 15). In both surgical appointments, vertical papillary incisions, which had been deemed not necessary, could be avoided.

**Prosthetic procedures**

A screw-retained provisional crown remained in situ for six months on the implant while maturation and stabilization of the peri-implant soft-tissue contours were established. During this period, modifications in form, contour and outline were effected to improve the aesthetic outcome using a light-curing composite material (Fig. 16). Proper implant placement allowed the establishment of an optimal final subgingival contour (Fig. 17). A customized impression coping was then fabricated to capture the transition zone contour created by the provisional restoration. For the final restoration, a CAD/CAM zirconia abutment was selected and Straumann CARES CAD/CAM was used to fabricate the frameworks (Figs. 18 & 19). The screw access position allowed the use of a one-piece restoration. The abutment was veneered using a pressable ceramic system. After the try-in and colour correction by the laboratory, the final crown was delivered to the patient and tightened at 35 N cm. The access hole was sealed with gutta-percha and a light-curing composite resin.

The prosthetic procedures on the root of tooth #11 involved the delivery of a longer golden post in order to reduce the risk of root fracture. For the same purpose, it was essential to perform prosthetic preparation of the palatal aspect of the gold abutment to create 1.5–2.0 mm of space for the zirconia framework and pressable ceramic. The final goal was to avoid interference during protrusive movements.

**Conclusion**

The surgical and prosthetic challenge in this clinical case was to develop a natural scalloped mucosal line on the maxillary central incisors and to obtain a good aesthetic outcome with the prosthetic crowns, despite the various existing dental and skeletal asymmetries and the bone defects at the implant site.

Of utmost importance was knowledge of the hard- and soft-tissue remodelling around the implant in region #21 and around the root of tooth #11 after the surgical steps.

A benefit resulting from the conservation of the root of tooth #11 was the maintenance of the interproximal height of the tiny bone peak, which provided support to the papilla mesial to the implant. Furthermore, this approach was highly beneficial to the natural appearance of the prosthetic crowns (Figs. 20 & 21). The periapical radiograph (two-year follow-up) shows the stable crestal bone levels around the implant (Fig. 22).