Replacement of a single anterior tooth

Surgical procedure and three-year results

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Initial presentation:
Fig. 1. The patient had a high smile line, and tooth #11 was discoloured and had a poor prognosis. The gingiva was thick and the interdental papillae had a high-scalloped appearance.

Fig. 2. Radiograph showing endodontic infection of tooth #11.

Tooth extraction:
Fig. 3. Careful extraction of tooth #11.

Fig. 4. Good preservation of the marginal hard and soft tissue.

Fig. 5. Intact coronal buccal bone plate: Note the thin interdental papillae. The remaining scar tissue of the former apex resection is clearly visible.

Fig. 6. After a vestibular half-circle incision in the apical part of the keratinised gingiva, a flap was reflected downwards.

Fig. 7. The apical bone defect is visible. Granuloma tissue and endodontic material were accurately removed with the help of a magnifying glass.

Implant placement:
Fig. 8. Accurate 3-D placement of a 4.3 mm diameter implant.

Fig. 9. The implant was inserted with a palatinal orientation and a minimum distance of 2 mm to the buccal bone plate in order to prevent its resorption. The implant depth was 2 mm below the gingival sulcus and was dependent on the sulcus of tooth #21. To achieve a primary stability of a minimum of 35 N cm, the final drill was not taken to its maximum depth.

Information on patient and treatment

At the age of 14, the 42-year-old female patient had experienced trauma to tooth #11, leading to luxation and tooth mobility. Endodontic treatment had been carried out in order to correct a discolouration of that tooth aesthetically, which had begun 15 years before the intervention. About ten years after the endodontic treatment, an apex resection had been necessary to treat a periapical infection.
Owing to pulsating pain and the previous endodontic treatment, the tooth was considered hopeless with regard to an optimal long-term outcome and was to be extracted. The X-ray examination confirmed a chronic infection around the apex. The soft tissue was intact with a satisfactory attachment level to the neighbouring teeth. The quality of the rather thick gingiva was good. The incision

Bone augmentation:

Fig. 10. Augmentation of the remaining spaces between the 4 mm bottle-neck healing abutment and the buccal bone plate with Bio-Oss particles (Geistlich).

Fig. 11. Additional augmentation of the apical bone plate with grafting material. Use of a membrane was not necessary because of the anatomical shape of the defect.

Fig. 12. Primary wound closure with 5.0 resorbable vicryl sutures. The apical flap was closed conventionally.

Fig. 13. The bottle-neck design of the transmucosal abutment enabled a tensionless wound closure.

Healing:

Fig. 14. Four weeks post-op: Good soft-tissue healing and gingival adaptation around the bottle-neck abutment.

Fig. 15. Stable papillae, nicely preserved soft-tissue volume. The temporary crown was used to establish a natural sulcus around an implant crown.

Fig. 16. The removable provisional, used by the patient for the four-month healing period, showed adequate gingival height for a functionally and aesthetically acceptable result.

Fig. 17. Nicely healed and healthy soft tissue around a well-integrated implant, replacing tooth #11. The absence of scar tissue thanks to the flap design is obvious.

Soft-tissue management:

Fig. 18. Placement of a temporary crown with soft-tissue management for a natural looking emergence profile. The submerged part of the occlusal screw-retained crown (concave tulip-shaped design) supported the subgingival soft tissue.

Fig. 19. The screw channel (perforating the labial part of the crown) was covered with a composite inlay. Farther apically, the scar tissue from the earlier apex resection was easily removed.

Fig. 20. Natural-looking emergence profile. The mesial part needed to be built up a little more.
Impression taking and prosthetic reconstruction:
Fig. 21. Clinical situation before impression taking.
Fig. 22. The ideal emergence profile of the temporary crown was copied with an individual impression post and reproduced on the master model.
Fig. 23. Individual impression post.
Fig. 24. Individual impression post placed on the implant and the opening of the sulcular structures.
Fig. 25. Lateral view of the implant with impression post.
Fig. 26. Impression tray capturing the crown-gingiva interface.
Fig. 27. Master model with temporary abutment and silicone index showing the preservation of the backward-planning information.
Fig. 28. IPS e-max crown (Ivoclar Vivadent) immediately after definitive placement on the individualised ceramic abutment with PANAVIA cement (Kuraray). The apical scar tissue was shaped with a diamond drill for a smoother gingival outcome.
Fig. 29. Final result one year after implantation. The soft tissue around coronal part remained untouched and the coronal aperture was closed with a trans-mucosal abutment. The flap preparation was performed in the apical region only. This technique was chosen to provide the best possible interface between crown and gingiva.

We were able to achieve an ideal 3-D positioning of the implant and an optimal aesthetic result that was still stable after three years.

Conclusion

Implant-borne reconstruction of missing anterior teeth is challenging, especially in fresh extraction sockets. For a functionally and aesthetically stable outcome, sufficient hard and soft tissue is needed. Care has to be taken to preserve the existing tissue structures. Vertical and horizontal bone loss after insertion of the implant due to remodeling processes has to be taken into account.

In the present case, the patient had high expectations regarding the aesthetic outcome. An alternative treatment of this case would have been a bridge solution combined with augmentation of the pontic area. Such a solution would have held fewer risks and allowed achievement of a more predictable soft-tissue situation. The patient was informed of the risks and alternatives. However, she decided on implant reconstruction.

We aimed to preserve the soft- and hard-tissue structures to achieve an adequate level of marginal gingiva together with an adequate interdental bone peak. Therefore, we decided on immediate implant placement after extraction of tooth #11, creating optimal soft- and hard-tissue structures around the implant at the time of implant placement. The soft tissue around coronal part remained untouched and the coronal aperture was closed with a trans-