Managing complications when the prerequisites for an implant-supported restoration are not ideal: a case report

What to do if ... ?

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Countless contributions to technical journals describe perfect implant solutions. In most cases, the baseline situation is ideal; at most, bone augmentation or a sinus lift is needed. Therapy proceeds without complications, and the patient greets the reader with a beautiful and happy smile in the final picture. "A satisfied patient" or something similar will be the figure legend. But what if smiling is the last thing the patient wants to do after extensive treatment? What if the treatment did not turn out to everyone's satisfaction? The following article reports on an implantologically pre-treated patient who had been disappointed, again and again, by multiple treatment efforts.

Most aesthetic failures in oral implantology have their origins in the planning phase. Proper treatment planning starts with a definition of the prosthetic treatment goal. Depending on the extent of the restoration, this goal should be visualized by a wax-up or a provisional restoration. Implants with an incorrect emergence profile are difficult to correct, and the best one can do in this situation is to resort to compromises in the design of the superstructure. But compromise is never a good thing; in implantology, it implies a potentially dissatisfied patient.

Patient history

The case described here is that of a 35-year-old, prosthodontically pre-treated patient. After several disappointing treatment attempts, she had sought help from a specialized clinic in Hungary. That clinic had done root canals on numerous teeth, and tooth 14 was damaged to the point where the only option was extraction. Also in Hungary, an implant had been inserted at site 14. According to the patient, the treatment provider had not noticed that the emergence site was completely inappropriate until after re-entry, at which point the treatment provider stated that the situation could not be corrected and that the incorrect implant position would be compensated for by the prosthetic superstructure. At this point, the patient decided to abort that treatment. Unhappy with her aesthetic situation, she turned to our practice for assistance.

Fig. 1 Baseline panoramic radiograph: The implant overlaps the root apex of tooth 13.

Findings and diagnosis

The patient's general health was good; she did not smoke. The two maxillary lateral incisors were congenitally, with the canines taking their place in the dental arch. Teeth 16, 15, 25 and 26 had been restored with unsatisfactory long-term provisionals. An implant with a highly unfavourable inclination had been inserted at site 14. On the baseline panoramic radiographs, the implant overlaps the root apex of tooth 13 (Fig. 1). However, a thorough analysis showed that tooth 13 had not been damaged by the implant in any way (see Fig. 21). Serious clinical problem was that the implant emerged too far buccally. The peri-implant soft tissues were severely atrophied on the buccal side. It was thin, delicate and barely stippled, corresponding to morphotype A (Figs. 2 and 3). The clinical examination also showed carious lesions under the temporary crowns as well as several insufficient root fillings. Overall, the maxillary situation was completely unacceptable. The mandible contained, among others, a restoration supported by two implants (see Fig. 1).

Figs. 2 and 3 Situation following removal of provisional crown 14. The soft-tissue defect on the buccal side of implant 14, caused by improper implantological pre-treatment, is clearly discernible.

Figs. 4 and 5 Split-thickness flap without relief incision using the tunnelling technique.

Treatment planning

Following intensive discussions with the patient and the dental technician, the following treatment concept was developed for the maxilla:

- Connective-tissue transplant on the buccal side of implant 14 to transform the peri-implant gingiva from the delicate morphotype A to the more sturdy morphotype B. This latter morphotype exhibits higher tissue stability and is therefore more resistant to recession. A repositioned flap was to cover the implant; a connective-tissue graft was to provide additional bulk in a vertical and sagittal dimension.
- Treatment of the carious lesions; retreatment of the insufficient endodontically treated teeth; exposure and definitive restoration of the implant and the provisionally capped teeth.
- Improvement of anterior aesthetics by providing a ceramic partial crown for tooth 24 and veneers for the central incisors while changing the shapes of the canines to more closely resemble lateral incisors.

Soft-tissue management

The top priority was to resolve the problems caused by the improperly inserted implant. The gingival recession on the buccal side of the implant was a clinical Miller class 3, meaning that complete regeneration of the tissue would appear impossible. However, the radiograph showed that the bony bed was intact, so the situation was rated to be analogous to a Miller class 1, with a considerably more favourable prognosis for recession coverage.

To augment the soft tissue around the implant, we decided to place a subepithelial connective-tissue graft. This – in conjunction with a repositioned flap – is the standard method for covering Miller class 2 or 3 gingival recessions, i.e. in situations where the supply of keratinized gingiva is insufficient. A flap was prepared, the recession was grafted with connective tissue, and the flap was then repositioned coronally over the recession site and the graft.

A split-thickness flap without a relief incision was prepared using the tunnelling technique in local anaesthesia (Figs. 4 and 5). When performing the incision in the marginal gingiva using a micro-scalpel (Swann Morton 15c) while making a minimal incision in the peri-implant gingiva, care had to be taken to ensure that the margins of the surgical wound were free of epithelial tissue at all sites. As no attached gingiva was present, this requirement was easily met. The palatal peri-implant tissue was deepithelialized with a fine-grained diamond cutter.

To ensure adequate mobility of the flap, the incision was extended crestally to tooth 15, followed by preparation of a split flap. This was again done with a micro-scalpel (Swann Morton 15c), then with a slightly modified tissue elevator for the tunnelling technique according to *Allen* (Stoma) and with slightly modified gingivectomy blades according to *Allen/Iglhaut* (Stoma). The split flap had to be prepared as continuously as possible. Short jagged movements do not create an attractive flap surface oriented toward the graft. Empirical observations on the part of the author have shown that smoothed margins heal better. Once the graft bed had been carefully exposed, the flap was examined for mobility. To avoid traumatizing the flap, no instruments that could damage it (such as surgical tweezers with pointed

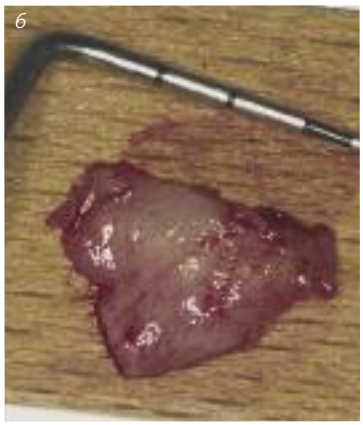

Fig. 6
Graft harvested in the tuber region, rich in connective tissue.

Figs. 7 and 8
Placement and fixation of the adapted connective-tissue graft.

Figs. 9 and 10
Soft-tissue coverage of the implant and tension-free closure with a vertical mattress suture.

Fig. 11
One day postoperatively.

Fig. 12
The sutures were removed two weeks postoperatively.

tips) were used in the procedure. The connective-tissue graft was harvested from the palatal aspect of the tuber region (Fig. 6). Grafts harvested in the premolar region are less suitable for the task due to their increased fat content and exhibit a significantly higher resorption rate (20 to 40 per cent) than grafts harvested in the molar region. Grafts harvested in the palatal region of the second and third molars consist mainly of fibrous tissue, which simplifies their placement and fixation in the target region. Another advantage of tuber grafts is their opaque white colour, which helps mask dark titanium or natural root surfaces. In the case presented here, a supraperiosteal connective-tissue graft was obtained at site 17 by sharp dissection and minimally trimmed to match the target site. It was optimally adapted in the region to be augmented (Figs. 7 and 8). The graft was then pulled to its final position at the target site using a vertical mattress suture. Sutures between 6-0 and 8-0 in thickness are recommended in minimally invasive periodontal surgery. In this case, closure was performed with a mattress suture and interrupted sutures of size 7-0. Care was taken not to place the sutures too closely to the wound margin, as this would have implied a risk of suture material being pulled into the flap, which would have caused unnec-

Figs. 13 to 16 Three months later, implant 14 was uncovered, and a custom healing abutment was introduced. Gingival anaemia persisted for approximately ten minutes, at which time the gingiva had returned to its original colour.

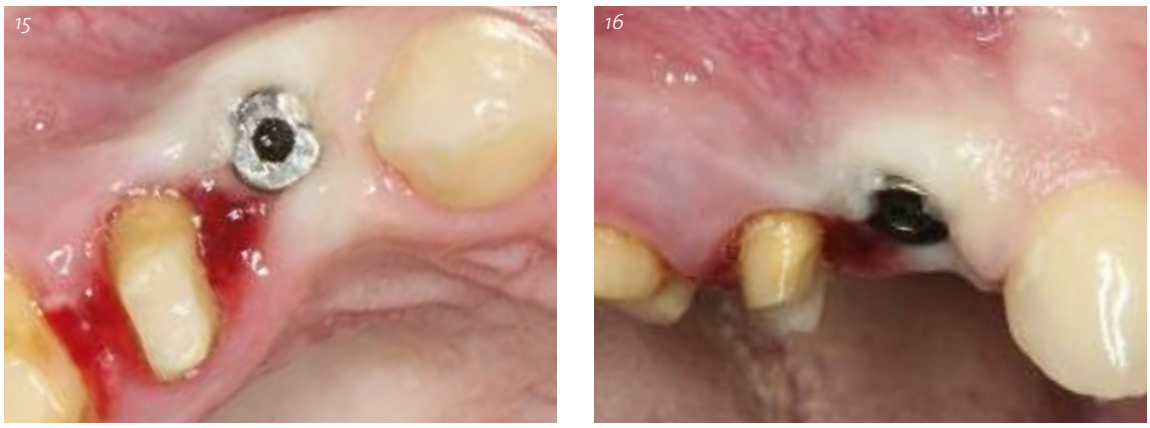

Fig. 17 Provisionalization of implant 14 and teeth 15 and 16.

essary problems during suture removal. Interrupted sutures were placed in the regions of the interdental papillae for additional fixation following apical convergence of the flaps using mattress sutures. It is important to adapt the flap with as few sutures as possible and without creating tension (Figs. 9 and 10). Too many sutures, or sutures that are too strained, may cause tension, which in turn promotes tissue anaemia. Soft-tissue coverage of the implant was performed under magnification in a minimally invasive procedure following microsurgical principles. The tissues healed without tension (Fig. 11); the sutures were removed after two weeks (Fig. 12).

The implant site was re-entered three months later (Figs. 13 and 14). To get the soft tissues the best possible shape, a healing abutment was introduced through a minimum-size access with light pressure. The pressure is documented by the anaemia of the peri-implant gingiva (Figs. 15 and 16). After ten to 15 minutes, the gingiva should recover its original colour. Additional pressure is counterproductive and may result in tissue loss.

In the meantime, the root filling of tooth 15 was revised, and the tooth received a composite core. The patient left the office with new provisional restorations in place (Fig. 17).

Fig. 18
Following complete healing and optimal shaping of the peri-implant gingiva, the provisional crowns were removed.

Figs. 19 and 20
Teeth 15 and 16 were slightly reprepared, and teeth 13 to 23 were prepared for veneers.

Fig. 21
Radiograph with an impression post seated on implant 14. The radiograph shows that tooth 13 was not damaged during insertion of the implant.

Prosthetic restoration

Together with the dental technician, we had decided, before embarking on the treatment, on providing anterior veneers and posterior ceramic crowns. When planning the preparation margins, we were again able to benefit from the dental technician's specialist competence. The preparation margins have been placed very low by the previous treatment provider, but without violating the biologic width. If the biologic width is violated by an excessively low subgingival preparation, this may cause irritation of the marginal periodontal tissues. Following complete healing and optimal shaping of the peri-implant gingiva, the provisional crowns were removed (Fig. 18). Some additional preparation work was required for teeth 15 and 16. Tooth 24 was prepared for a partial ceramic crown, and the anteriors from tooth 13 to tooth 23 were prepared for veneers. Figure 19 shows that tooth 13 is slightly rotated, which had to be accommodated during preparation. The minimal reduction required for this purpose was discussed in detail with the dental technician (Fig. 20). This was followed by taking an open impression of the maxillary situation. The radiograph in Figure 21 shows the gap-free seating of the impression post on the implant and the fact, mentioned above, that tooth 13 had not been damaged by the obliquely inserted implant. A master cast was poured from the impression, and the ceramic crowns and the veneers were fabricated at the laboratory.

Delivery of the completed restorations

The peri-implant soft tissues recovered well from the minimally invasive periodontal surgery. Six months postoperatively, they presented free from irritations; the gingival situation was near-perfect. Thin-flowing Estelite LV Medium Flow composite adhesive was

Fig. 22 Three months postoperatively, the gingival tissue showed no irritation. The soft tissue was optimally prepared for the definitive restoration of implant 14. The successful thickening of the soft tissues can be clearly seen.

Fig. 23 The custom abutment on implant 14.

Fig. 24 During definitive cementing of the ceramic crown on the implant, slight pressure had to be exerted on the tissues. The gingival anaemia subsided after approximately ten minutes.

Figs. 25 to 28 After delivery: Ceramic crowns on implant 14 and teeth 15, 16 and 24. Veneers on teeth 13, 11, 21 and 23.

used to cement the crowns and veneers. This adhesive is universally applicable and has proven valuable for the definitive cementing of different kinds of dental restorations. The procedure for inserting the custom abutment and the crown was similar to that followed when re-entering the implant site. The gingival anaemia that persisted for approximately ten minutes indicated optimal pressure on the peri-implant soft tissues (Figs. 22 to 24). All restorations were precise and aesthetically pleasing. The crowns and veneers fitted without adjusting and were greatly appreciated by the patient (Figs. 25 to 28).

Fig. 29 One day after the restorations were cemented.

Fig. 30 Situation approximately one year postoperatively. The gingiva continues to be healthy and perfectly shaped.

The healthy gingiva was the appropriate frame for the dental technician's perfect work. The patient was now in fact able to leave the office with a smile that she was happy with (Figs. 29 and 30).

Conclusion

Despite the unfavourable baseline situation, we were able to employ minimally invasive methods to resolve the problem of the incorrect implant angle, to bring up the peri-implant gingiva to a "normal level" and to provide restorations that were functionally sufficient and aesthetically pleasing.

In the dentist's everyday clinical work, not every baseline situation is ideal. Difficult or complex cases are much more frequent. And more and more often we are confronted with these complications because many patients prefer dental treatment abroad – hoping to save some money; however, in the case at hand, these hopes were thwarted. However, a satisfactory solution can often be found even in hopeless cases given professional treatment planning. Detailed planning involving all partners of the team is an important factor for success. How important pre-implantological planning can be is demonstrated by the case presented here. The unfavourable actual inclination of the implant could easily have been avoided; the tools we have today for virtual treatment planning would ensure this, but also – more straightforwardly – a joint planning effort of the dentist and dental technician. ■

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