Bridge construction in the anterior region of the maxilla

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Initial situation

A 67-year-old patient presented to the dental practice for consultation on implant placement. The anamnesis revealed some specific conditions, particularly an allergy to dental metals.

At this time, prosthetic restoration in the area to be reviewed consisted of an insufficient crown in the anterior region with an attachment monoreducer-combination denture. Significant loosening of the abutment teeth in the anterior region was found. Post and cores that had already loosened several times were found in the insufficiently filled root canals, probably due to monoreducer leverage (Fig. 1).

The prognosis for conservative restoration was thought to be extremely poor.

During the consultation, the patient expressed a preference for an implant solution. The patient also specified a cost limit.

Procedure

Treatment planning

For optimum assessment of the initial situation and subsequent treatment planning, after assessing the clinical situation, a dental panoramic tomogram diagnosis with intra-operative assessment of the implant site was favoured as method of choice (Fig. 2). This would take into account the minimally invasive therapeutic concept of surgical augmentation. Treatment would involve the extraction of non-conservable teeth and the immediate placement of a Straumann Bone Level implant in the region. Two implants were to be inserted in the premolar region. We planned to expand bone with the bone spreading technique and to use two Straumann Standard Plus Narrow Neck CrossFit implants (NNC) made from Roxolid implant material if the transverse bone at the site was compromised. Prosthetic restoration was to fulfil the requirements for an allergy-free dental prosthesis. The prosthetic construction was to be manufactured with the Straumann CARES System in the in-house laboratory.
Surgical procedure

Owing to the impaired vasoconstriction, adrenaline-free local anaesthetic was administered pre-treatment with one subsequent injection during the operation. Extraction of the central and left lateral incisors was without complication. A central crestal incision was made with little crestal bone denudation and no relief incision. The anticipated reduction of the transverse bone then became clearly visible, and bone spreading was performed and two NNC implants were placed (Fig. 3). The insertion sites in the region of both left premolars were prepared by manually shaving the bone until an even bone plateau had been created. The autologous bone chips gained here were later used for bone augmentation in the left central incisor area.

Once the implant sites had been carefully prepared by means of bone spreading (Fig. 4) and the final implant cavities drilled, the prepared bone was meticulously examined with a bulbous probe and gauges from the Straumann surgery set. The two NNC implants were then inserted into the controlled, intact bony structures (Fig. 5). An NNC SLActive implant of 3.3 mm in diameter and 14 mm in height was inserted in the region of the first premolar, and the 3 mm reduced-height NNC healing cap was used for both the implant seal and for primary soft-tissue conditioning. We decided to use an NNC SLActive implant of 3.3 in diameter and 12 mm in height and the matching 3 mm closure screw for the region of the second premolar.

Once this stage of the operation was complete, restoration of the alveolar bone in the central anterior region was performed. The immediate implantation of a Straumann Bone Level implant of 4.1 mm in diameter and 10 mm in height fitted with the 0.5 mm Regular CrossFit Connection closure screw was then performed. The walls of the alveolar bone were undamaged, and there was primary implant stability. As a sufficient amount of autologous bone chips had been gained from maxillary crest levelling in the premolar area, this was used as a volume filler for bone augmentation. The distance between the body of the implant and the wall of the alveolar bone that required augmentation was 1–2 mm. Vertical bone augmentation was performed, and there was a slight overlap owing to a platform switch at the implant shoulder. Restoration of the alveolar bone around the lateral incisor was performed using...
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A collagen matrix. Suture closure in the area of the anterior implant resulted in complete coverage of the augmentation area. The closure screw lay only minimally exposed approximately 3 mm below the mucogingival tissue. Soft-tissue closure at the NNC closure screw supported transgingival healing of the implant (Fig. 6). Intra-operative haptic assessment of the various fixations of the implant insertion aids was easily possible (Fig. 7). In order to assess post-operative treatment success with regard to adequate peri-implant bone coverage in particular, a control CBCT scan was taken to verify the correct implant–bone relation. This meant additional augmentation measures could be safely dispensed with (Fig. 8). Perioperative medication included antibiotic endocarditis prophylaxis. The patient was also given post-operative pain medication for one day.

Prosthetic restoration

Following integration of a provisional denture and a complication-free healing period, individualised gingival architecture was then created in the anterior region. In order to facilitate continued wearing of the provisional denture during the gradual process of soft-tissue conditioning, our dental laboratory prepared and shortened a Regular CrossFit Connection temporary abutment with hard polymer plastic, individualised to the area of the soft-tissue profile (Figs. 9–11). The impression for the incisor abutment was taken with a gingiva former in place on the basis of a Regular CrossFit Connection impression post to match the individual impression post. The NNC implants were incorporated into the impression (Fig. 12) with the ready-made NNC impression posts. On account of the patient’s allergy and in consideration of the aesthetic aspect, in addition to titanium abutments (Fig. 13) it was decided to use a zirconia-based bridge framework with ceramic veneering (Figs. 14 & 15). The titanium abutments and zirconia bridge were designed virtually using the Straumann CARES Scan CS2 scanner in our own dental laboratory and the framework was made at the Straumann Milling Center in Leipzig.

Because of the inter-occlusal distance, an anatomically formed zirconia occlusal surface was used, which was optimally prepared with the Straumann CARES System processing software during the construction phase. In consideration of the aesthetic aspect, the individualised veneering was mostly in the vestibular region (Figs. 16 & 17). A post-operative radiographic control confirmed correct positioning of the prosthetic components (Fig. 18).

Conclusion

The patient was extremely satisfied with both the result and the cost–benefit relationship. Appropriate design of the emergence profile, the titanium abutment and the zirconia bridge entirely fulfilled the aesthetic requirements in the visible areas. In the event of later loss of the second molars, the patient wishes to undertake prosthetic restoration of the ensuing end gap situation. As shown here, in cases of compromised bone and in consideration of the aesthetic zone and CAD/CAM elements of different materials, the use of NNC implants can lead to very positive results.

The prosthetic restoration was made by David Szymanska, MDT (laboratory).

_about the author

Dr Steffen A. Wolf attained his Doctor of Dentistry degree in 2000 from the Department of Oral and Maxillofacial Surgery at the Freie Universität Berlin headed by Prof. B. Hoffmeister. Since 2000, he has worked in his own private practice in Halberstadt in Germany. He received a Master of Science degree in Oral Implantology in 2010 from the DGI.

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CAD/CAM