Implant-prosthetic rehabilitation of the severely atrophic maxilla

Modern instrumentation and improvements in regenerative techniques have facilitated both the surgical treatment and the subsequent prosthetic restoration. Nevertheless, dentists and patients frequently are confronted when deciding between fixed or removable full-arch restorations.

Many patients, especially those requiring extensive rehabilitation, clearly prefer fixed, implant-retained restorations. Under certain circumstances, the patient's aesthetic demands, however, can be difficult to satisfy with this type of restoration. Aesthetic outcomes are most frequently hindered by bone loss resulting from advanced periodontal disease or by bone resorption following tooth loss. Although several methods can be used to augment hard and soft tissue to meet aesthetic demands, the patient can reject these options or the dentist might not be entirely familiar with the procedure selected.

Both scenarios may produce unsatisfactory results that become apparent only when treatment is complete. Removable restorations that use telescopic crowns as attachments are an alternative to full-arch rehabilitation with fixed bridges. Removable restorations can be used especially in cases with extensive jawbone atrophy (e.g. resorption), resulting in a large vertical dimension. This article presents the treatment of such a case.

Case
The 55-year-old patient (male, nonsmoker, in good general health) presented for consultation and treatment in our clinic in August 2010. The patient had a three-year-old removable denture (with mid-palatal strip) in the maxilla, supported by four implants using telescopic crowns as attachments (Table 1, Figs. 1 & 2). It was shown that the premolars/second molars of the maxillary denture were not in occlusion with the mandibular teeth (Figs. 3 & 4). Furthermore, the denture was fabricated with a sagittal malposition in the anterior area (Figs. 3 & 4). Around the implants, pockets of 4–6 mm with spontaneous bleeding, swelling of the soft periimplant tissue and pain by palpation were recorded (Fig. 2).

A 15-year-old removable partial denture and fixed partial dentures (FPDs) were found in the mandible. The removable partial denture used the following attachments: a) direct retainers (clasps, areas #57 and #95), b) customised gold attachment (area #54–55), c) a gold double crown (area #47, Figs. 3 & 4). The periodontal tissue showed an inflamed gingiva, pockets of a depth of 5 to 6 mm and a deep vertical bone defect at the mesial site of the tooth #47 (Fig. 2).

Treatment
Implants #15, 25, and 24 were explanted, the bone defects were cleaned and augmented using non-resorbable DPTFE membranes (Cytoplast, Regentex GBR-200, Osteogenics Biomedical, Lubbock, USA) without additional use of any grafting materials, as previously described (Figs. 5–6). Flaps were repositioned with interrupted sutures. Membranes were left partially exposed (Fig. 4). The implant #14 (incl. abutment) was saved and used for supporting the maxillary denture. In the same clinical session, sinuses were augmented using a demineralised bovine xenograft (DBX, Compact Bone R, Dentigen, Duisburg, Germany). In the mandible, the natural teeth were treated by scaling and root planning and the crown margins were shortened and finished for allowing a better healing of the soft tissue. Tooth #57 was extracted and the socket was preserved as described above.

Impression was taken in the maxilla for the fabrication of a new denture. An impression was taken from the mandible using an alginate material with the partial removable denture in situ, so that the dental laboratory could put new denture teeth in occlusion with the mandibular denture (Fig. 7). A duplicate of the new mandibular denture (DentDu) was fabricated using clear methacrylate (Palamur; Heraeus, Hanau, Germany) and kept for later use (Fig. 8). The customised gold abutment from implant #14 was replaced through a locator and locator’s matrices were embedded in the basis of both the denture and the DentDu (Fig. 9).

Four weeks after socket augmentation and preservation, membranes were removed (Figs. 10a & b). Four implants were placed in the mandible (#36, 53, 52, 42, Table 1) and the periimplant pocket #47 was regenerated using DBX and a resorbable collagen membrane (BoneProtect, Dentigen, Duisburg, Germany).

Additionally, FPDs #54, 55, 44–47 were removed and the natural teeth abutments were prepared. Impression of the mandibular teeth abutments was taken using a polyether material (Impregum Penta Soft, 3M ESPE) and a master cast.
was made. After that, chairside temporary FPDs for the natural teeth abutments in the mandible were fabricated, using a self-curing composite material (Structur 2; VOLO, Cashaven, Germany). The dental technician fabricated: a) metal-reinforced long-term provisional FPDs and b) final metal-ceramic FPDs (which were kept for later).

On the next day, the metal-reinforced temporary FPDs were fixed using a provisional cement (Temp-Bond, Kerr, Bioggio, Switzerland) and DentDu were placed on the cast and mounted in the articulator (Fig. 15).

Implant abutments were fabricated using system specific customisable abutments (PTB, Dentegris, Duisburg, Germany) and served as primary telescopes. Electroformed gold copings (0.25 mm thick; MG-Galvanogold, Au > 99.9 %, Wieland Dental, Pforzheim, Germany) were also fabricated over the customised implant abutments. The DentDu, the customised abutments and the gold copings were used for scanning, cutting and milling of a Titan framework (Zeramex Ti, Wieland Dental, Pforzheim, Germany). For veneering of the framework, a micro-ceramic composite was used (Ceramagic, SIOPU Dental, Ratingen, Germany).

After veneering, the abutments were mounted with 51 Ncm (Fig. 16). The electroformed copings were placed on the abutments (Fig. 17) and fixed in the superconstruction using a self-curing cement (AGC-Cem, Wieland Dental, Pforzheim, Germany).

At the same session, the final mandibular FPDs were fixed using an acrylic/urethane based temporary cement (Implant Provisional, Adbroach Inc., Snoqualmie, USA; Figs. 16–22).

Discussion

This case report details the treatment of a patient with insuffi- cient maxillary alveolar ridge height caused by generalised advanced periodontal disease, as well as by subsequent implant treatment, insufficient implant-prosthetic restoration, failure of maintenance, and development of periimplantitis. A considerable distance between the occlusal plane of the mandible and alveolar ridge of the maxilla was caused by extensive bone resorption.

Telescopic crowns have been successfully used to connect den- tures to natural teeth for several decades. Recent clinical data have indicated that the use of telescopic crowns with implant-supported overdentures can lead to predict- able long-term treatment outcomes.5–11 The patient’s ability to remove the secondary structure also facilitates abutment hygiene, providing an additional periodontal advantage for the telescopic crown system.5,11 Furthermore, the high retention achieved through friction force leads to good mastication and phonetics. Further advan- tages of treatment with telescopic crowns include: (a) maximisation of masticatory force transmission that are always axial to the abut- ments; (b) facilitation of effective oral hygiene; (c) ability to position teeth favourably; (d) avoidance of severe soft- and hard-tissue aug- mentative surgeries; (e) achieve- ment of favourable aesthetics, even with severe atrophy of the jawbone, which can be covered by the lip shield; (f) the ability to renew veneering at any time; and (g) stability of the restoration, even when an abutment implant is lost. The main disadvantages of this type of con- struction are cost and technical requirements, as well as possible psychological burdens experi- enced by the patient provided with a removable appliance.5,12

The initially delivered denture allowed for the correction of the interocclusal relationship, tooth shape, colour, and angulation throughout the treatment period. In this way, the patient could be- come acclimated to the function and aesthetics of the denture. By using a duplicate of this denture to take the bite records and as a mounting guide, the maxillo-mandibular relationship was re- corded and transferred accurately and the aesthetic outcome previ- ously accepted by the patient was achieved. Thus, it was neces- sary to repeat the usual clinical recordings (e.g., centric relation, occlusal vertical dimension, tooth position and aesthetics, wax try-in) at the time of final restoration fab- rication.11

Additionally, the combined use of the DentDu and the silicon key allowed for the selection of implant abutments of optimal angulation and shape, and also facilitated the fabrication of an aesthetically pleasing implant-supported resto- ration.

In the case presented here, the customised abutments were not removed after mounting and torquing until the final restoration was fitted and placed. Thus, the position of the abutments remained unchanged, eliminating or mini- mising errors that might occur during repeated attachment of the abutments (for various test fittings of the restoration) to the implants and master cast. The fixation of the electroformed gold copings after and not before veneering eliminates additional errors which may occur due to the influence of the veneering composite during polymerization. In the present report, the patient wished for a fixed restoration of the maxilla. Based on the planning model, he accepted a telescopic construction. In the case of a fixed implant-based denture, the crown- to-root ratio would have been un- favourable for natural teeth been used to support the restoration.