Implant-prosthetic rehabilitation of the severely atrophic maxilla

Prof. George Georg Zafiropoulos & Aiman Abdel Galil
Germany

Modern instrumentation and improvements in regenerative techniques have facilitated both the surgical treatment and the subsequent prosthetic restoration. Nevertheless, dentists and patients frequently are conflicted 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 strap) in the maxilla, supported by four implants using telescopic crowns as attachments (Table 1, Figs. 1 & 2). It was shown that the premolars/isolars of the maxillary denture were not in occlusion with the mandibular teeth (Figs. 3 & 4). Furthermore, the denture was fabricated with a sagittal clinical session, sinuses were augmented using a demineralized bovine xenograft (DBX, CompactBone B, Dentegris, Duisburg, Germany) without additional use of any grafting materials, as previously described (Figs. 2 & 3). Flaps were repositioned with interrupted sutures. Membranes were left partially exposed (Fig. 6). 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. 7).

**Treatment**

Implants #11, 25, and 24 were explanted, the bone defects were cleaned and augmented by using non-resorbable (DPTFE) membranes (Cytoplast, Regentex GBR-200, Ostegraft Biomedical, Lubbock, USA) with additional use of any grafting materials, as previously described (Figs. 3 & 4). 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 demineralized bovine xenograft (DBX, CompactBone B, Dentegris, Duisburg, Germany).

In the mandible, the natural teeth were treated by scaling and root planing and the crown margins were trimmed and finished for allowing a better healing of the soft tissue. Tooth #87 was extracted and the socket was preserved as above described.

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 maxilla (Fig. 7). A duplicate of the new maxillary denture (DentDu) was fabricated using clear methylnethylcytlate (Paludur; Heraeus, Hanau, Germany) and kept for later use (Fig. 8). The customized 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. 10 & 11). Four implants were placed in the mandible (#36, 35, 32, 42; Table 1) and the periodontal pocket #17 was regenerated using DBX and a resorbable collagen membrane (BoneProtect, Dentegris, Duisburg, Germany).

Additionally, FPDs #34, 33, 43, 44 were replaced 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.

---

**Table 1: Implant Characteristics.**

<table>
<thead>
<tr>
<th>Implants area</th>
<th>Restoration (maxilla)</th>
<th>Implant Line Diameter x Length (mm)</th>
<th>Time (Months) until uncovering</th>
<th>Customized Abutments</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 (old)</td>
<td>SB*, 4.5 x 11.5</td>
<td>4</td>
<td>Co</td>
<td></td>
</tr>
<tr>
<td>14 (old + new)</td>
<td>SB*, 3.75 x 10</td>
<td>4</td>
<td>Co</td>
<td></td>
</tr>
<tr>
<td>23 (old)</td>
<td>SB*, 3.75 x 10</td>
<td>4</td>
<td>Co</td>
<td></td>
</tr>
<tr>
<td>24 (old)</td>
<td>SB*, 3.75 x 10</td>
<td>4</td>
<td>Co</td>
<td></td>
</tr>
<tr>
<td>15 (new)</td>
<td>SB*, 3.75 x 10</td>
<td>4</td>
<td>Co</td>
<td></td>
</tr>
<tr>
<td>12 (new)</td>
<td>SB*, 3.75 x 10</td>
<td>4</td>
<td>Co</td>
<td></td>
</tr>
<tr>
<td>23 (new)</td>
<td>SB*, 3.75 x 10</td>
<td>4</td>
<td>Co</td>
<td></td>
</tr>
<tr>
<td>25 (new)</td>
<td>SB*, 3.3 x 10</td>
<td>4</td>
<td>Co</td>
<td></td>
</tr>
<tr>
<td>26 (new)</td>
<td>SB*, 4.5 x 10</td>
<td>4</td>
<td>Co</td>
<td></td>
</tr>
</tbody>
</table>
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, VOCO, Germany) and both maxillary denture and DentDu were fabricated, using a provisional cement (Temp-Bond®, Kerr, USA) for recording the maxillo-mandibular relationship. A bite registration was taken with a resin (pattern resin Penta Soft, 3M ESPE) and the work-up, a micro-ceramic composite during polymerization. The analysis of the articulated casts showed large deviations between the occlusal plane distances. Therefore, a removable appliance was fabricated for recording the occlusal plane 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 dentures to natural teeth for several decades. Recent clinical data have indicated that the use of telescopic crowns with implant-supported overdentures can lead to predictable long-term treatment outcomes. The patient's ability to remove the secondary structure also facilitates abutment hygiene, providing an additional long-term advantage for the telescopic crown system. Furthermore, the high retention achieved through friction force leads to good mastication and phonetics. Further advantages of treatment with telescopic crowns include (a) maximisation of masticatory force transmission that are always axial to the abutments, (b) facilitation of effective oral hygiene, (c) ability to position teeth favourably, (d) avoidance of several soft- and hard-tissue augmentation procedures, (e) achievement 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 a temporary abutment is lost. The main disadvantages of this type of construction are cost and technical requirements, as well as possible psychological burdens experienced by the patient provided with a removable appliance. 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 restoration.

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 minimising 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 veneering eliminates the need for removing the entire structure, 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 construction are cost and technical requirements, as well as possible psychological burdens experienced by the patient provided with a removable appliance. 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 restoration.

In the present case, the patient's hard and soft tissues could have been augmented surgically to provide an aesthetically and functionally acceptable rehabilitation using fixed restorations. Cases such as this raise the question of whether it is preferable to exhaust all surgical possibilities or to pursue the path of least resistance by combining classic prosthetic experience with modern technology. In many circumstances, the latter is a better and safer treatment alternative. For this reason, oral surgeons and periodontists should consider the prosthetic treatment plan extremely carefully before selecting any course of action.

**Contact Info**

Prof. Gregor Georg Zafiropoulos is a periodontal specialist in Düsseldorf, Germany. He can be contacted at zafiropoulos@prof-zafiropoulos.de.

**Fig. 12:** Customised abutments in situ. **Fig. 13:** Articulator cast. **Fig. 14:** Final restoration. **Fig. 15:** Customised abutments in situ. **Fig. 16:** Final restoration. **Fig. 17:** Orthopantomogram.

---

**Discussion**

This case report details the treatment of a patient with insufficient maxillary alveolar ridge height caused by generalised advanced periodontal disease, as well as by subsequent implant treatment, unsuccessful implant prosthodontic 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 dentures to natural teeth for several decades. Recent clinical data have indicated that the use of telescopic crowns with implant-supported overdentures can lead to predictable long-term treatment outcomes. The patient’s ability to remove the secondary structure also facilitates abutment hygiene, providing an additional long-term advantage for the telescopic crown system. Furthermore, the high retention achieved through friction force leads to good mastication and phonetics. Further advantages of treatment with telescopic crowns include (a) maximisation of masticatory force transmission that are always axial to the abutments, (b) facilitation of effective oral hygiene, (c) ability to position teeth favourably, (d) avoidance of several soft- and hard-tissue augmentation procedures, (e) achievement 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 construction are cost and technical requirements, as well as possible psychological burdens experienced by the patient provided with a removable appliance. 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 restoration.

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 minimising 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 veneering eliminates the need for removing the entire structure, 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 construction are cost and technical requirements, as well as possible psychological burdens experienced by the patient provided with a removable appliance. 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 restoration.