Immediate restoration in the edentulous mandible

According to the Maló procedure using the CAMLOG Guide System and Vario SR abutments

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The Vario SR prosthetic components for fixation of implant-supported occlusally screw-retained restorations were used in this case to treat neuropathic pressure-indicated facial pain. The 66-year-old patient came to our practice for the first time in May 2010 complaining of persistent pain in the right mandible. The pain intensified when the complete mandibular denture was inserted. However, pronounced pain continued even after several days of not wearing the prosthesis. The intensity of the pain varied between 6 and 10 on the visual analogue scale.

The following diagnosis was made:
- severe mandibular atrophy;
- crestal position of the bilateral mental foramina;
- chronic neuralgiform facial pain in regions 43 to 45—the trigger point indicated the mental foramen region.

Treatment planning

The patient had been treated with two one-piece diameter-reduced implants in regions 31
and 43, as well as a complete mandibular denture anchored by ball abutments (Figs. 1 and 2).

After extensive counselling and discussion, we opted for a temporary fixed mandibular restoration on four implants with simultaneous explantation of the existing implants.

Benefits of the selected restoration concept:
- explantation, implantation and immediate restoration in one sitting;
- a high level of safety owing to 3-D implant planning;
- durable temporary restoration with CAD/CAM high-performance plastic;
- precision template-guided implantation with the CAMLOG Guide System;
- high patient satisfaction with fixed screw-retained immediate restoration.

_Pre-implantation planning_

Because the existing denture satisfied the basic aesthetic and functional requirements, the given situation was reproduced in plastic containing barium sulphate according to backward planning. The desired prosthetic was fabricated from clear plastic with a titanium reference pin for the scanning template (Fig. 3). In order to make the prosthetic tooth axis visible in the CBCT scan, holes were drilled through the radiopaque teeth in the axis (Fig. 4).

The DICOM data was then read into the coDiagnostiX implant planning system (Straumann). Computer-supported analysis offers the possibility of accurate diagnosis and planning the implants in agreement with anatomical and prosthetic requirements (Figs. 5a and b). Positioning of the terminal implants at an exact 30-degree angle is a crucial requirement for the success of this treatment (Figs. 6 and 7).
Fabrication of the drilling template and immediate restoration

The position of the implant determined during 3-D implant planning was transferred to the drilling template in the dental laboratory using the gonyX coordinate table. The guiding sleeves with depth stops from the CAMLOG Guide System were precisely bonded on to the scanning template, thereby converting the scanning template into a drilling template (Fig. 8).

In order to fabricate the immediate restoration, a model was required. Corresponding cavities were incorporated into the cast (Fig. 9). The CAMLOG Guide insertion posts were then used to insert the laboratory analogues into the cast (Fig. 10). It was important here to position the insertion posts with the screw-retained laboratory analogues according to the required cam alignment Fig. 11). Figures 12 and 13 show the Vario SR abutments and Vario SR titanium caps on the cast.

A laser scanner was then used to digitise the cast (Fig. 14). In order to simplify the CAD of the immediate restoration, it made sense to superimpose the desired prosthetic situation defined by backward planning over the existing situation (Fig. 15). The design was created with DentalDesigner (3Shape; Figs. 16 & 17). After a suitable milling strategy had been determined, the data was transferred to a five-axis milling machine. A tooth-coloured PMMA blank was used as the material of choice (Figs. 18–20).

In contrast to traditionally fabricated temporary solutions, CAM-fabricated immediate restorations distinguish themselves by their high resistance to fracture. This property is an important technical requirement for complication-free function of the restoration. In order to achieve pleasing aesthetics, gingiva-coloured
plastic was used (Figs. 21 & 22). Careful polishing is required to keep plaque deposits as low as possible. The bonding gap around Vario SR titanium caps should be sized for tension-free intra-oral bonding (Fig. 23).

**Surgical procedure**

The one-piece diameter-reduced implants were explanted (Figs. 24 & 25). The drilling template was secured using four osteosynthesis screws (Fig. 26). These provided adequate stability and safety for guided implantation. In order to correctly align the insertion posts, corresponding markings were milled into the CAMLOG Guide guiding sleeves in the laboratory (Fig. 27).

Implantation was flapless using the CAMLOG Guide System gingival punch (Fig. 28). The implant bed was prepared accurately with the CAMLOG Guide System and depth referenced with drills of ascending lengths in an intermittent drilling technique (Fig. 29). After a central implant had been inserted, a terminal implant was inserted (Fig. 30). The second centrally positioned implant was then placed and the second terminal implant thereafter (Figs. 31–34).

**Seating the immediate restoration**

After removing the CAMLOG Guide insertion posts, the Vario SR abutments were inserted at 20 N cm (Figs. 35 & 36). The Vario SR titanium caps were shortened to the required length, placed on the Vario SR abutments and mounted with the Vario SR prosthetic screw (Fig. 37). The immediate restoration fabricated pre-implantation could then be bonded in the mouth tension-free (Figs. 38–41).

**Discussion**

The procedure demonstrated here, which follows the All-on-4 technique taught by Paulo Maló from Lisbon, led to the complete disappearance of the severe facial pain about two months post-operatively. The immediate prosthetic restoration was highlighted in particular in the patient's evaluation. This resulted in an immediate improvement in mastication, speech function, food intake and quality of life. Remission of neuralgiform symptoms protracted over two months after seating of the fixed prosthesis and corresponding load relief of the mental foramen.

This case illustrates the failure of a number-reduced implant treatment concept in the advanced atrophied mandible and the potential of purely implant-supported prostheses to avoid pressure-induced neuropathies. The mandibular restoration was converted into a removable bar-retained superstructure (Figs. 42 & 43).