Straightforward advanced complex in dental implantology

Authors: Dr Rolf Vollmer, Dr Patricia Wieschollek and the laboratory team of Michael Anger, Germany

Introduction

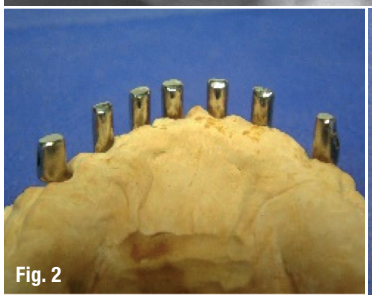
SAC (Straightforward Advanced Complex) defines the level of difficulty in dental implantology. Originally created by the ITI team in order to describe difficulties in dental implant surgery, this term has also been applied and adapted to dental prosthetics. This article presents a surgically moderately difficult but prosthetically highly demanding case. The special difficulty arose when the implant position was planned in a perfect alignment but impeding the prosthetic restoration. In close cooperation with the dental laboratory and due to backward planning, the patient could be provided with an individual, if not even unconventional solution.

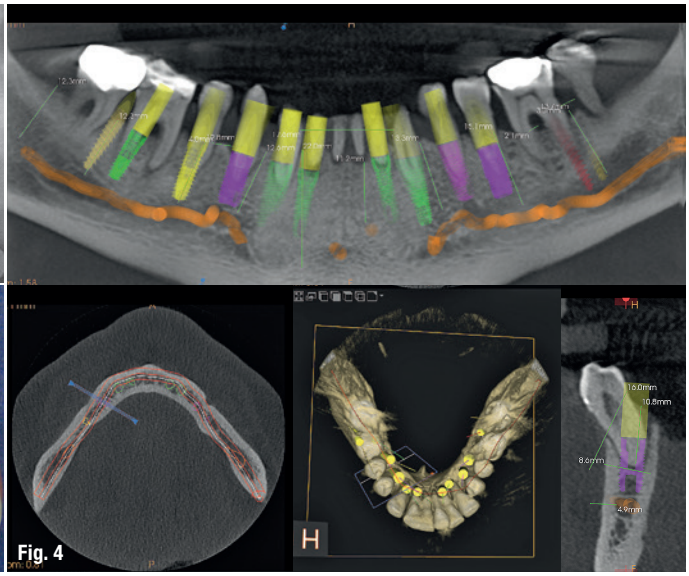
Case presentation

Years of progressive refractory horizontal bone loss with alternating acute periodontitis were observed in the patient (Fig. 1). In 2011, when the patient was 43 years old, the removal of all teeth in the maxilla and the insertion of a full denture took place. Since his sensations of taste were strongly affected by the palate cover, the decision was made for implantation of seven implants in the maxilla, supplied with a removable cover denture telescope prosthesis with bonded secondary parts in Galvano or electroforming technique (Figs. 2 & 3).

In 2015, there was a recurrent severe periodontitis in the mandible and extremely strong loosening of all the lower teeth in the now 47-year-old patient (Fig. 4). So, definitive treatment planning for the mandible was necessary. The mandibular incisors had to be removed in advance because of their missing stability. Due to the patient's severe gag reflex, implantation under general anaesthesia was provided. The removal of all remaining teeth with simultaneous implantation and insertion of two

Fig. 1: Initial situation in maxilla and mandible.
Figs. 2 & 3: Insertion of a full denture in 2011.
Fig. 4: The CBCT planning shows the scheduled implant positions in the mandible and the exit points of the abutments in relation to the teeth before extraction.





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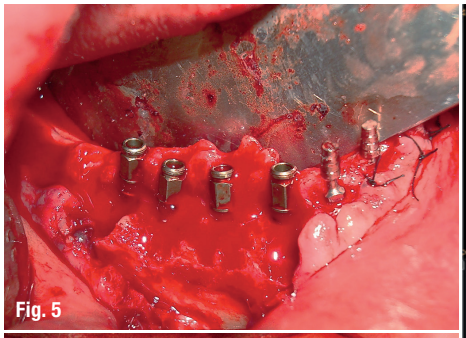
Fig. 5

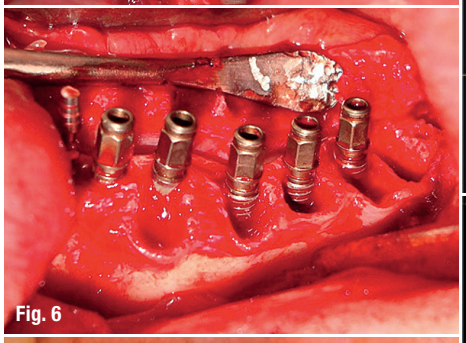
Fig. 6


Fig. 7

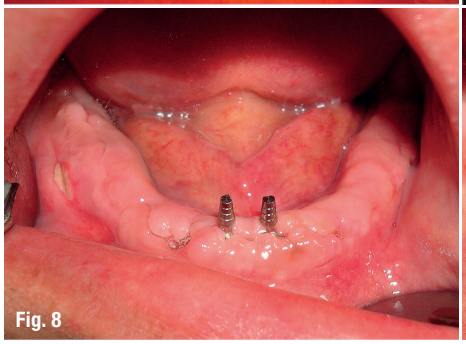
Fig. 8

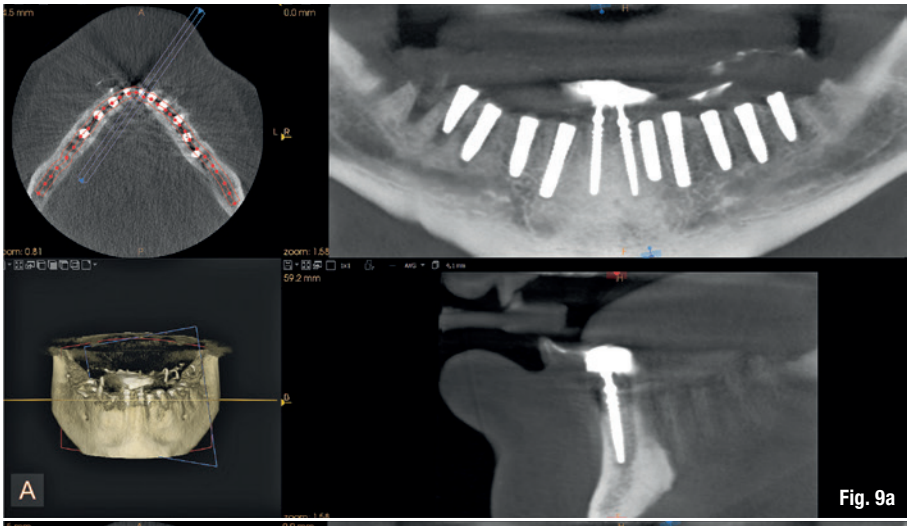
Fig. 9a

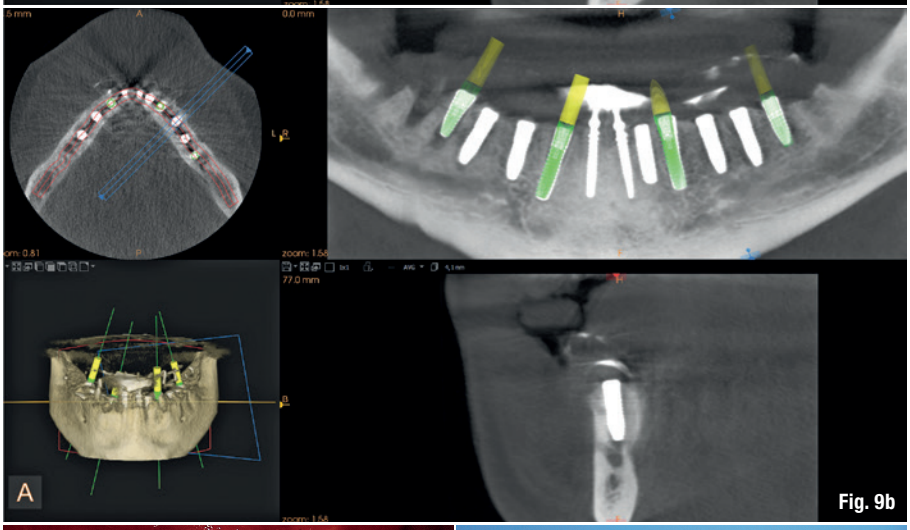
Fig. 9b

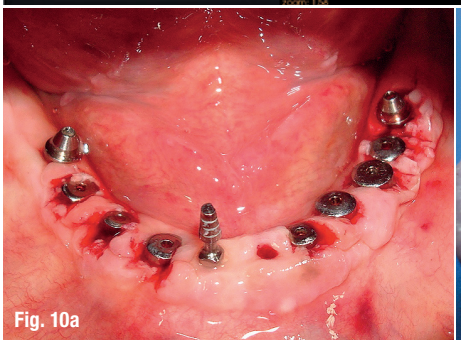
Fig. 10a

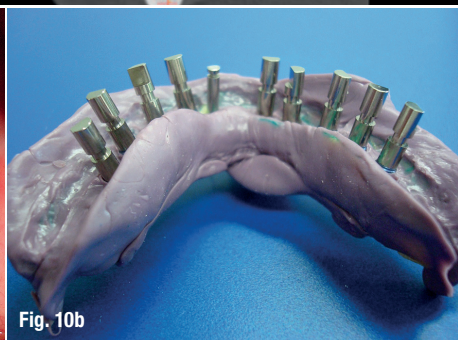
Fig. 10b

Figs. 5 & 6: Insertion of five definite implants on the left and four definite implants on the right side.
Figs. 7 & 8: Healing period.
Figs. 9a & b: Control DVT and comparison to planning software.
Figs. 10a & b: Implant uncovery and fixing of the interim prosthesis.

interim implants was planned. On Fig. 5, one can see that the implant axes and the exit points would differ significantly from the later position of the original teeth. Implantation in the axis of the existing teeth was not possible since otherwise, this would result in a lingual perforation. Nevertheless, a solution had to be found to give the patient a corresponding tongue space later. A prosthetic restoration with telescopic crowns, in this case, was not an option, since it would result in an arch being at least 5 mm smaller on each side.

During implant surgery, five definite implants on the left side and four definitive implants in the right side, as well as two auxiliary implants for immediate restoration and loading with a temporary immediate prosthesis, were inserted (Figs. 5 & 6).

Subsequently, the healing was unproblematic and the patient was bridged with the interim prosthesis for the transition period fixed on the two auxiliary implants (Figs. 7 & 8). To verify that there has been no nerve injury as the patient was under general anaesthesia during surgery, a control CBCT was made post-op, showing the respective distance to the nerve canal (Figs. 9a & b). Longer implants could not be introduced due to the aforementioned angulation problems, which would have resulted in an

even more unfavourable axial direction. An overlay with the planning software indicates that the implants were inserted into the pre-planned position and direction accurately. Again, the problem of implant-platform exit points which are situated too far lingually is illustrated.

Three months later the implants were uncovered and the interim prosthesis was fixed at the distal implants with snap attachments (acc. to Dr R. Laux) and a silicone relining was done. One auxiliary implant (41) remained (Figs. 10a & b). The auxiliary implant in position 31 had become loose after three months and was removed during the exposure of the definitive implants. The impression was taken as a closed-tray procedure. The follow-up panoramic radiograph shows the good and tension-free seating (passive fit) of the bar-designed superstructure. The remaining auxiliary implant is still very stable. The auxiliary implant will be removed at the time of insertion of the final prosthesis.

The juxtapositioning of the original model to the newly produced prosthesis with PEEK abutments shows that, according to the initial situation, enough room had been created for the tongue (Figs. 11a & b). The final images show the good fitting and seating of the prosthesis. The lingually in white colour visible, delicately designed PEEK abutments do not restrict the patient in any way.

Laboratory Part (ZTM Michael Anger)

The task here was to allow the patient enough space for his tongue. In spite of digital CBCT–planning, a different positioning of the implants and their axial inclination was not possible because of the bone range. Therefore, we have decided to apply a bar construction instead of telescopic attachments in this case, so the friction parts could be located more lateral and not in correspondence with the position of the implant platform.

Figure 12 illustrates the situation several days after the exposure of the implants and the healing progress. Here, the healing caps were used as impression copings. In these pictures, the strong lingual inclination of the implant abutments is already visible. Because of the bone volume, a different positioning without augmentation was impossible. The implant impression was made with Impregum®. The taste of this material is not very convenient for the patient and it must harden for at least seven minutes in the mouth. On the other side, the thin texture results in an exact capture of the oral situation and its high final hardness provides the best-possible fixation of the impression posts. Figure 13 depicts the implant impression after disinfection before the injection of the gingiva. All mucosal parts should be displayed flawlessly. If there are any impression errors, they can be repaired with wax. Ideally, we produce a coherent gingival mask to avoid transitions in


Fig. 11a

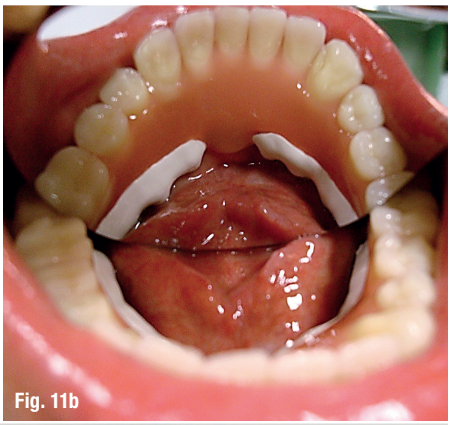
Fig. 11b

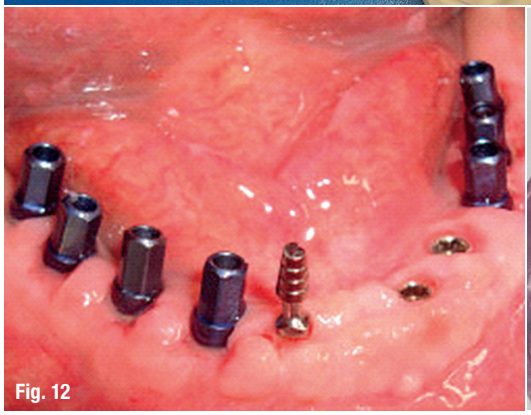
Fig. 12


Fig. 13

Figs. 11a & b: Juxtaposition of original model and prosthesis with Peek abutments.
Fig. 12: Final image.
Mouth situation after exposing the healing-caps. In the front, the last auxiliary implant is visible.
Fig. 13: Implant-impression after disinfection before the injection of the gingiva.

Fig. 14: Jacketing of the model–implants and impression-posts with gingival mask material.
Fig. 15: Gingival mask after preparation.
Fig. 16: The gingival masks and the plaster form clean transitions.
Fig. 17: The metal bar on the model with the gingival mask.
Fig. 18: The bar-body extends far into the vestibular area for static support among the teeth.
Figs. 19 & 20: The PEEK framework before completion.
Fig. 21: PEEK-frame when placed on the milled bar.

plaster silicone. Figure 14 depicts the jacketing of the model implant analogues and impression posts with gingival mask material: the implant impression after injection of the gingiva-mask. The material should be bubble free and clean when applied.

We use Shera-Gingival® for the gingival masks. This material is pressed from a mixing tip with a fine syringe and has a natural appearance. Before casting with plaster, the gingiva must be removed from the impression to eliminate all banners and undercuts, thus easy removal and more importantly—a safe repositioning is ensured. To take the gingival mask from the model, the model implants should be unscrewed before, so that the impression copings are not changed in their position. This work must be carried out very carefully and cautiously. Figure 15 shows the gingival mask after preparation. The edges are smoothened with abrasive belts and rubber. In the plaster, the implants remain safe and there are neither flags nor undercuts which would make it difficult to reposition.

The gingival masks and the plaster form clean transitions (Fig. 16). The clear edges between gypsum and gingival mask are crucial for the clean repositioning after removal of the implant mask during processing. The casting technique was applied in manufacturing the bridge with burnout-able plastic auxiliary parts. Preventing sharp edges on the PEEK-facing side is


Fig. 22a


Fig. 22b


Fig. 23


Fig. 24

Figs. 22a & b: The finished prosthesis in different views; the obliquely-lingual view shows the polished transitions between the prosthesis plastic and PEEK-framework.
Fig. 23: After being placed on the model, the edges close cleanly and tightly.
Fig. 24: The unit was conditioned with plastic before finishing and pretreated with pink opaque.

important. The metal bar on the model with the gingival mask can be seen on Figure 17. The drill just shows the position of the provisional auxiliary implant. The bar is extended far into the vestibular area to afford static support among the rows of teeth (Fig. 18).

The PEEK framework before completion is depicted on Figures 19 and 20. Figure 21 shows the PEEK-frame when placed on the milled bar.

Low Shrinkage

The secret behind the completion of PEEK-based products is making sure that the plastic is subjected to a minimum of polymerisation-shrinkage during completion. For this purpose, the author uses polymers with a more flour-like grinding, such as FuturaGen® by Mani Schütz Dental. Furthermore, the monomer is less likely to become subject to shrinkage than other monomers and does not tend to discolour. The minimal shrinkage furthermore causes a much lower stress for the implants and is therefore especially preferable for immediate loading.

Conditioning the surface PEEK

For a stable bond between PEEK and plastic, the author applies a bonding such as Dialog Bonding-Liquid®, Mani.Schütz Dental. Figure 22 shows the finished prosthesis in different views.

In an oblique lingual view, the polished transitions between the prosthesis plastic and PEEK-framework can be identified (Fig. 22a). The thin lingual coverings of this design allows enough space for the tongue and are perfectly functionally adapted. After being placed on the model, the edges close cleanly and tightly (Fig. 23). According to our instructions, the unit was conditioned with acrylic before finishing and first covered with a pink opaquer (Fig. 24). The notches in the model show the position of guides for the silicone key._

contact

Dr Rolf Vollmer
1st DGZI Vice President and Treasurer
Nassauer Str. 1
57537 Wissen, Germany
Tel.: 02742 968930
Fax: 02742 2547
info.vollmer@t-online.de

Author details

Dr Patricia Wieschollek
c/o Dr Rolf Vollmer
Nassauer Str. 1
57537 Wissen, Germany
Patricia.wieschollek@web.de

Author details

ZTM Michael Anger
Expert in Dental Prosthetics – DGZI
Drususstraße 8
53424 Remagen, Germany
info@ma-fraeszentrum.de

Author details