CASE REPORT 06 | 2010

IMPLANT NAVIGATION WITH THE TEMPLATE TECHNIQUE IN SEVERE BONE ATROPHY

TEAM PLANNING FOR PREDICTABLE RESULTS

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Dr Andres Stricker practices privately as an oral surgeon at the Center of dental Implantology, Periodontology, and 3D head- and neck Imaging in Konstanz. He is also involved in teaching and research at the Hospital and Clinic for Oral and Maxillofacial Surgery at Freiburg University Hospital and is a lecturer at Danube University Krems in Austria. He holds degrees in medicine and dentistry from the Albert Ludwig University in Freiburg. Various research visits followed at the University of Michigan, Harvard University, the University of Louisville, and the University of Miami. His specialist training was completed at the Hospital and Clinic for Oral and Maxillofacial Surgery in Freiburg. Dr Stricker has worked in implantology since 1997 and has authored numerous publications on topics such as distraction, immediate loading, augmentation procedures, soft-tissue management, tissue engineering, and stem cell regeneration. He has also been responsible for several developments and patents, e.g., the V-2 Distractor and many instruments in the field of implantology. He lectures at national and international conferences and courses.

Master dental technician Steffen Rothacher trained to become a dental technician from 1989 – 1992. In 2002, he passed his master's examination in Frankfurt am Main. Since then, he has been managing his own dental laboratory in Bad Saulgau. He is a certified specialist in implant dentistry and esthetic dentistry. He works as a consultant for various firms.

IMPLANTS USED

Tooth	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
Impl. type					SL		SL			SL		SL				
Impl. length					13.0		13.0			13.0		13.0				
Impl. Ø					3.8		3.8			3.8		3.8				
Impl. surface					P		P			P		P				

Impl. type: ROOT-LINE (RL) / SCREW-LINE (SL) **Impl. surface:** Promote (P) / Promote Plus (PP)

PROSTHETICS

- [X] standard
- [ ] platform switching
- [X] removable
- [ ] fixed
- [ ] crown
- [ ] bridge
- [ ] cement-retained
- [X] screw-retained
- [ ] partially edentulous
- [X] edentulous
- [ ] others

- [ ] Universal abutment
- [ ] Esthomic® abutment
- [ ] Telescope abutment
- [X] Gold-plastic abutment
- [ ] Ceramic abutment
- [ ] Individual zirconium abutment on titanium base
- [ ] Logfit® abutment
- [ ] Locator® abutment
- [ ] Ball abutment
- [ ] Bar abutment
- [ ] Vario SR abutment
- [ ] others

INFORMATION ON PATIENT AND TREATMENT

The 68-year-old female patient presented with a wish for improved retention of her removable dental prosthesis after extraction of teeth 34 and 35, that could not be preserved. The goal was a template-guided and template-navigated implant insertion created with a three-dimensional data set and planned from a prosthetic standpoint in order to enable an implant-borne telescopic restoration, that would be as minimally invasive as possible for the patient despite severe bone atrophy. Three-dimensional volume tomography (3D-VT) was prepared with the aid of a scan template. The intraoperative navigation template could then be fabricated in a lab with the aid of this virtual 3D plan. The basic aim here was an optimal implementation of the planning coordinates from the information provided by the planning scan template up to the desired implant position, which was adapted from the X-ray template into the drilling template with the aid of a special drilling bench. After a vertical crest reduction had been carried out, four CAMLOG® SCREW-LINE implants were inserted via template-guided navigation and laterally augmented on both sides. In the present case, transversal divergence led to a decision to firstly load the inserted implants temporarily for two months via the gingiva formers as part of progressive bone loading and only then insert the prosthetic appliance. Because securely fitting an implant drilling template supported only on the mucous membrane is problematic in an edentulous jaw, temporary implants were inserted as reference pins before the main implant insertion.

Pre-operative condition with remaining teeth not worth preserving

Fig. 1: Pre-operative condition with extremely loose teeth and insufficient prosthesis retention. Tooth 43 previously had to be surgically removed due to a transverse fracture.

Fig. 2: With the prosthesis anchored on one side, the remaining teeth had been severely loosened.

Fig. 3: The extremely loose teeth 33 and 34 were extracted without any trauma.

Temporary implants for secure referencing of the navigation template

Fig. 4: Immediately after that, the temporary implants were inserted as reference pins.

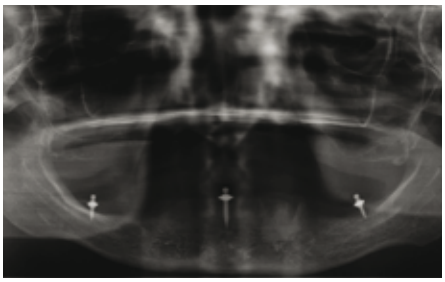

Fig. 5: Postoperative OPG after tooth extraction and insertion of temporary implants.

Fig. 6: The lab versions of the temporary implants (Mini Sky, Bredent) on the model. They are used to fix the bite plate, set-up and DVT template. With these tools, positional stability and secure retention of various templates can always be guaranteed in an edentulous jaw.

Fabrication of the scan template after a wax-up with a prosthetic focus

Fig. 7: The mandibular set-up on the model. It is used for initial orientation of the occlusal position as well as esthetics.

Fig. 8: The DVT template (Med 3D) fabricated with the set-up and with three reference points (gutta-percha pins bilaterally in Region 3 and a Lego brick) to prevent any transfer errors.

Fig. 9: The occlusal stops for fixing the position of the DVT template. Another factor to prevent movements during recording.

Navigation planning based on the DVT data set

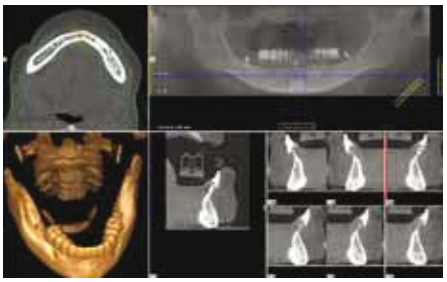

Fig. 10: Digital volume tomography (iCAT) with scan template idealized from a prosthetic standpoint. Prosthetic planning can be correlated with the anatomical situation here.

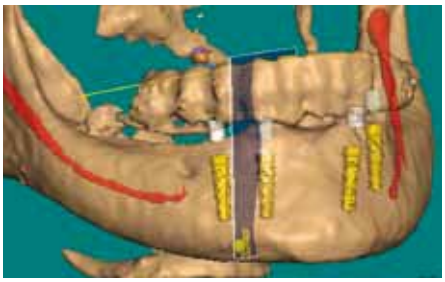

Fig. 11: The implant position is precisely planned with the virtual navigation software (Med3D).

Fig. 12: With an altered drilling template, the secure template-guided pilot hole can now be made intraoperatively with the CAMLOG® Guide System.

Template-guided preparation of the implant bed

Fig. 13: View of the navigation template, which was fabricated with virtual planning based on the scan template.

Fig. 14: Further template-guided preparation of the implant bed with the CAMLOG® Guide System.

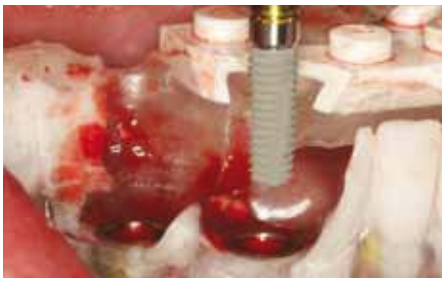

Fig. 15: Template-navigated implant insertion through the sleeve of the navigation template.

Securely guided implant insertion

Fig. 16: The insertion instrument's depth stop prevents the implant from being inserted too high or too deep.

Fig. 17: Postoperative picture before removal of the navigation template.

Fig. 18: Condition after surgical implant insertion in accordance with optimal prosthetic criteria.

Buccal crest augmentation

Fig.19: In this buccal view, it is clear that there is not enough bone thickness around the inserted implants. Augmentation must be carried out to achieve long-term stability.

Fig. 20: The augmentation is performed by adding bone chips scraped together from the surrounding area and a bovine bone replacement material (Bio-Oss®) directly onto the implant surface.

Fig. 21: For secure position stabilization of the particular material, the augmentation material is covered with a collagen membrane (Bio-Gide®).

Transgingival implant healing

Fig. 22: Condition after suture closure around the healing caps.

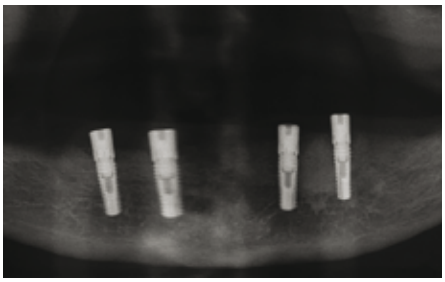

Fig. 23: Postoperative OPG.

Direct postoperative implant impression

Fig. 24: The impression posts, screwed in for an initial closed impression. A therapeutic temporary restoration was fabricated with the aid of this initial impression. It was left **in situ** until the implants could be fully loaded.

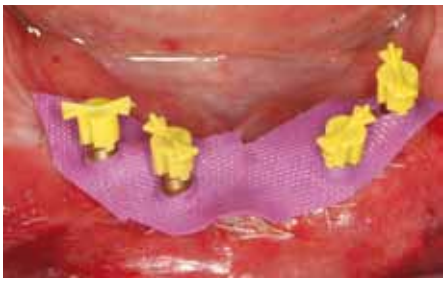

Fig. 25: For the impression taken immediately after surgery, the wound should be covered with rubberdam.

Fig. 26: The concluding set-up for planning the final restoration.

Fig. 27: Soft-tissue healing after 2 weeks.

Fig. 28: The screwed-in cones (2 degrees); these were fabricated with the aid of gold-plastic abutments. The length of the friction surfaces should not be less than 5 mm to ensure adequate friction of the electroformed secondary parts.

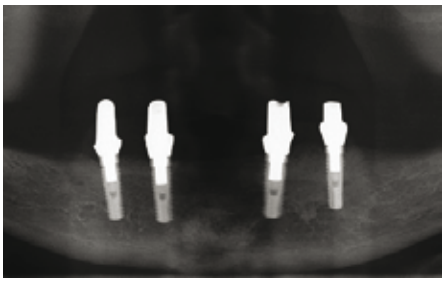

Fig. 29: X-ray check 2 weeks after implant insertion.

Fig. 30: Intraoral cementing of the electroformed caps with the tertiary structure. Any transfer errors can be eliminated with this procedure.

Insertion of the prosthetic suprastructure

Fig. 31: The mandibular cone prosthesis immediately after insertion. With consistent cementing in the mouth, there were no stresses or excessively high retention forces whatsoever on the implants.

Fig. 32: The permanently seated maxillary total denture and mandibular cone prosthesis with individually fired porcelain teeth in the anterior and custom shading of the plastic gingival base.

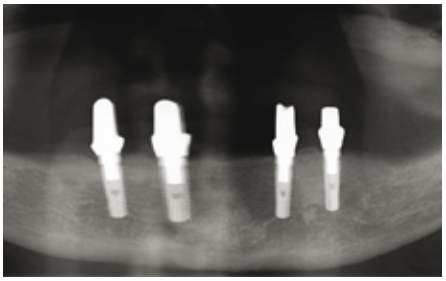

Fig. 33: X-ray check 12 months after implant insertion with stable periimplant bone.

CONCLUSIONS

These days, implant dentistry is no longer just about bone availability, but constitutes an overall concept, which aims at complete functional and esthetic restoration of a patient's lost chewing function, without losing sight of the total restoration's long-term stability. Thorough and clear-sighted planning, in other words "backward planning", is needed for this. There must be perfect cooperation between the surgeon, prosthodontist, and dental technician, and optimal on-screen prosthetic planning must be implemented intraoperatively with the aid of an implant drilling template. Nowadays, high-resolution three-dimensional diagnostic procedures using sectional images such as digital dental volume tomography (DVT) and optimized 3D planning software are available for this. Esthetically and functionally complex problems can thus be solved with maximum possible precision. With temporary implants, it is possible to predictably create precise reference points in an edentulous maxilla and mandible so that the guide template cannot be misaligned, ensuring that there will be no relevant deviations during surgical implant insertion. Thanks to this reliable planning, largely predictable results and long-term stability of implants can successfully be achieved. Virtually planned and template-guided implantation allows precise implant insertion and thus creates optimal conditions for a successful prosthetic rehabilitation with the help of a functioning network between the surgeon, prosthodontist, and dental technician.

Pre-operative condition

Fig. 34: Pre-operative condition with extremely loose teeth and insufficient prosthesis retention.

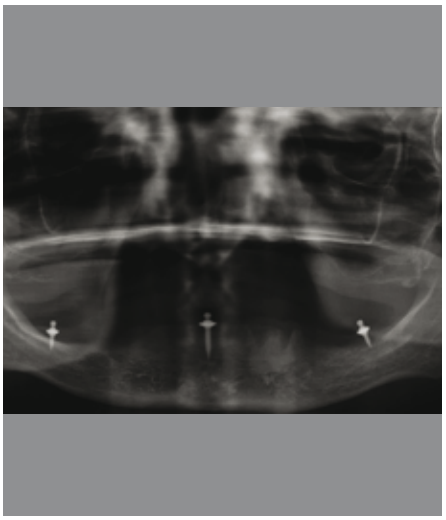

Fig. 35: Postoperative OPG after tooth extraction and insertion of temporary implants.

Situation 12 months after implant insertion

Fig. 36: View of the functionally and esthetically redesigned prosthetic restoration.

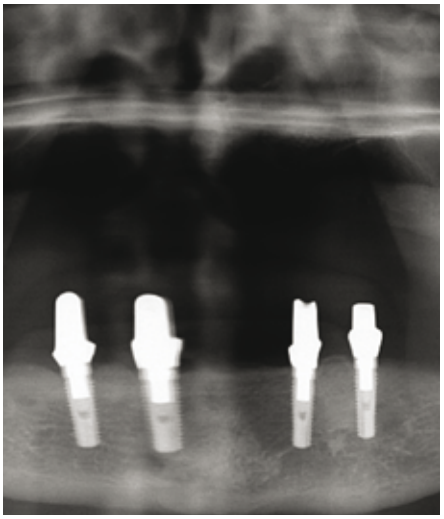

Fig. 37: X-ray check 18 months after implant insertion.

NOTES

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SUPPLIERS

Geistlich Biomaterials Wolhusen
Mini Sky,Bredent: bredentGmbH & Co.KG,Senden
Med 3D: med3D GmbH, Heidelberg
iCAT: i-Cat,Imaging Sciences,Hatfield,USA
Ergoplant Instruments: Aesculap AG Tuttlingen

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