Case Report

Complete maxillary restoration with industrially milled custom abutments

Philipp von der Osten

Abstract

There are several reasons why patients in their prime defer a dental restoration which has already been necessary for quite some time. By then, many teeth have already been lost or are not worth retaining, and the existing prostheses can no longer be used. The way in which complete maxillary restoration in such a situation can satisfy the patient's desire for a quality of life "comparable to that of natural teeth" is illustrated here by presenting a real case.

Introduction

In cases where the remaining dentition is sparse, treatment with implants presents an option worthy of consideration. Ultimately, the final result not least depends on what the patient wants. Usually the solution falls somewhere between a "maximum solution" involving complex "backward planning"and bone augmentation (possibly using material taken from the patient's pelvis) or a "minimal solution" with prosthetics supported primarily by the mucous membrane. Thus, the case described here is also an example of a "minimal solution" involving a typical problem seen regularly in dentistry.

Case history

The 56-year-old patient came to the practice and expressed the desire to restore his sense of taste and ability to chew his food again as in the past. For many years he had lived with temporary solutions because he could not find the time to complete the dental restoration. The patient had finally reached a point where he no longer wanted to put up with it – if for no other reason than his friends and acquaintances frequently mentioning it to him. The medical history made it particularly apparent that the clasped denture he had been wearing for many years was a problem (Fig. 1). He had kept postponing a final restoration with an anterior bridge, which led to the clasps causing an elongation of the canine teeth. The teeth had also shown noticeable discoloration. After examining the tooth mobility and the x-ray, the dentist overseeing treatment determined that the three remaining natural teeth were anchored solidly enough in the periodontium that they could be used as abutments in a telescopic dental prosthesis.

During the consultation the patient therefore decided on this option, which involved using four implants to provide additional support for the telescopic bridge.

However, the patient declined to undergo bone augmentation of the jaw, which should always be considered to ensure ideal positioning of the implant. Based on the decisions made during the consultation, the first step taken at the practice was the insertion of four implants in the regions of teeth 21, 12, 15 and 25[1]. An

Philipp von der Osten.
Master Dental Technician, Wiesbaden Germany.
Dentalplus Lab AG. Egerstr. 7, 65205 Wiesbaden, Germany
Tel.: +49 - (0)611 - 76 37 410 • Fax.: +49 - (0)611 - 76 37 411
www.dentalplus-lab.de

Figure 1

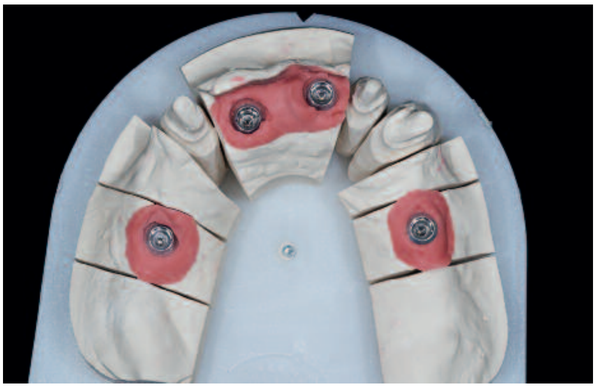

Figure 2

Figure 3

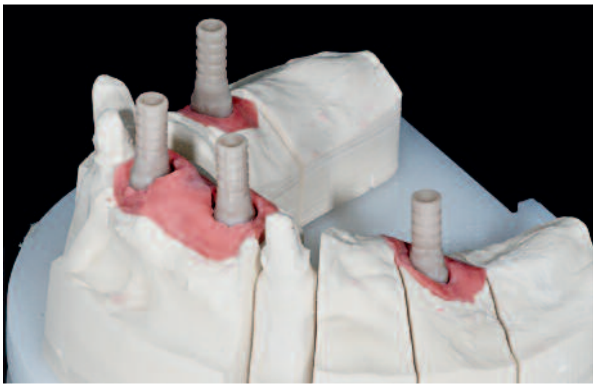

Figure 4

Figure 5

Figure 6

impression of the intraoral situation was then taken in order to prepare a prosthodontic model (Fig. 2). Customizable abutments were selected due to the large shift in the palatinal direction in relation to the dental arch. The first step in manufacturing these is to use plastic substrates (Straumann® Wax-up sleeves) as modeling aids that are attached to the laboratory analog (Figs. 3, 4), covered in light-cure acrylic (primopattern, primotec, Bad Homburg, Germany), thereby preparing the four implant superstructures (Fig. 5).

The scan was then performed and the data transferred to the Straumann production centre. Using the plastic model, the abutments were then transferred to zirconium dioxide and each element delivered to the laboratory within 78 hours (Fig. 6). Using its own CAD/CAM system, the laboratory had already prepared the primary telescoping

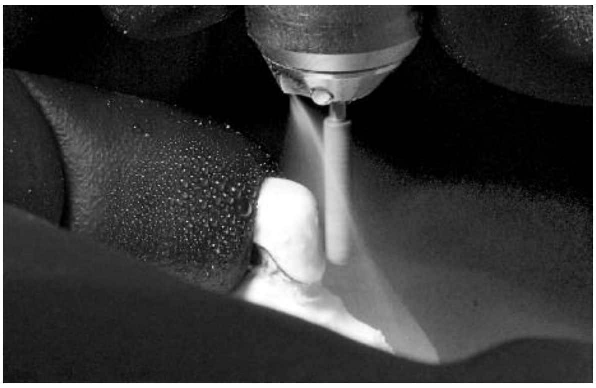
Figure 7

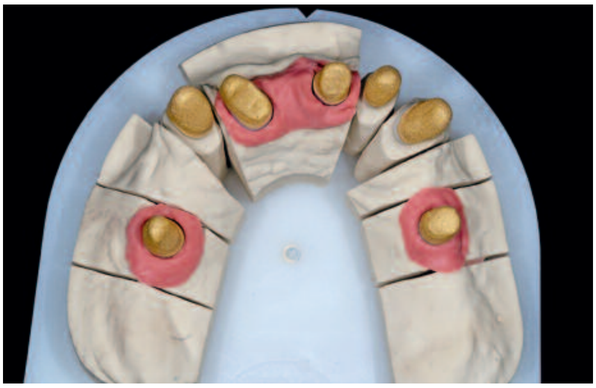
Figure 8

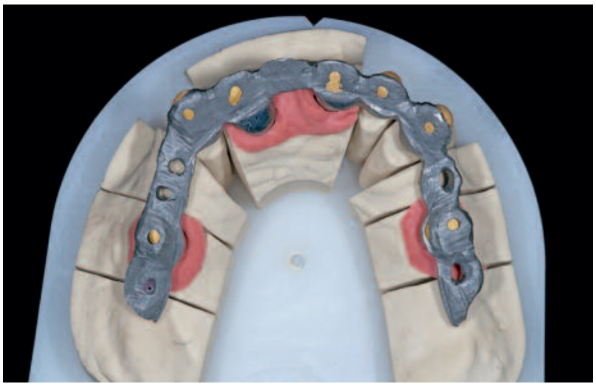
Figure 9


Figure 10


Figure 11


Figure 12

element for the natural teeth. They then underwent a gentle post-processing and polishing while being cooled with water (Fig. 7). The gold secondary caps were then galvanized (Helioform HF 600, Hafner, Pforzheim, Germany) using silver lacquer (Fig. 8). A fine gap was modeled over this, using wax as a placeholder for the adhesive. The tertiary construction was then modeled with light-cure acrylic. Using the traditional casting process, it was subsequently made out of a model casting alloy (Fig. 9). In order to build the interim prosthesis for the patient, the saw model, with the primary elements attached and including the bite registration, was scanned using the laboratory's own CAD/CAM system and then milled out of PMMA plastic (Fig. 10). The treating dentist first cemented the zirconium dioxide primary structures to the natural teeth (Fig. 11), performed a final check of the bite after curing for about four minutes and then screwed the synOcta® abutments into the implants. Each of the custom abutments was then screwed in. In a second step, the galvano caps were cemented, stressfree, to the tertiary

Figure 13

Figure 14

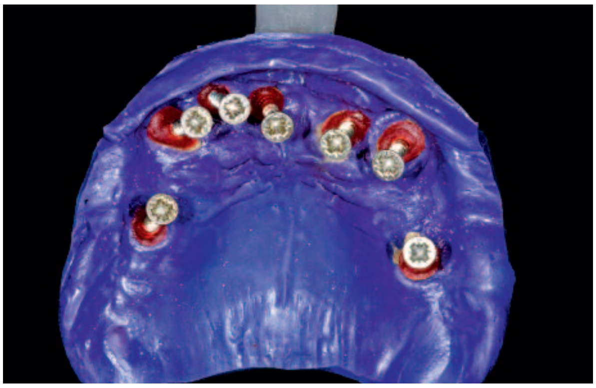

Figure 15

construction in the mouth (Figs. 12, 13). After taking the bite registration again, the construction was reshaped to fix the cemented tertiary structure in its exact position in the patient's mouth (Fig. 14). Figure 15 shows the complete prosthodontic impression for the modeling of the situation in the laboratory. The patient was able to leave the practice with his temporary PMMA plastic prosthesis ("travel prosthesis"). Next, the prosthetic teeth, including the individual gingiva sections (Gradia, GC, Leuven, Belgium), were created in the laboratory. The patient seemed satisfied with this final restoration (Figs. 16, 17). Shade 0 (MO 0). The IPS e.max® Press frameworks were veneered with the IPS e.max® Ceram veneering ceramic in the shade A2 (Fig. 8).

Discussion

The work discussed here made it possible to restore the patient's chewing function and to achieve an attractive esthetic outcome: after eliminating the discolorations on the teeth, the longstanding neglect of the patient's dental situation is no longer visible. On a psychological level, it is important for patients to have their own teeth used as a natural support for the prosthetic construction. Thanks to their white color, the primary crowns contribute to this confidence and also have a positive effect on real situations in one's day to day life.

To illustrate this once again, consider the following example: the patient walks out of the bathroom in the morning and has not put in his telescoping construction yet, but his wife does not notice see a "metal jaw effect" in his mouth, but rather the natural red and white colors.

Under ideal conditions it would probably have been

Figure 16

Figure 17

possible to design a fixed dental prosthesis instead, such as two implant-supported bridges and a tooth-supported bridge in the anterior region. Because the patient declined to undergo the bone augmentation that would have been necessary for this, this option was out of the question from the outset. However, the results achieved with this solution are pleasing and, most notably, will stand the test of time over many years. If, for example, one of the three natural pillars is lost, it can be replaced by an additional implant. The existing telescopic bridge can continue to be used with this scenario, needing only to be reground at the appropriate position. The method of tension-free intraoral cementing (Dr. Paul Weigl, University of Frankfurt) used in this case proved generally advantageous. This involves using the mouth as a second master model of sorts, in which the CAD/CAM primary constructions can be cemented into their final positions. The second step was then to cement the model-cast tertiary structure and secondary structures made of galvanic gold.

Compared to conventional methods, this method achieves a better accuracy of fit. The industrial manufacturing of the abutments with the CAD/CAM method also contributed to this outcome. The degree of precision made possible here was one of the main reasons the author decided on this production method. The technical process for preparing the abutments with the plastic (wax-up sleeve) modeling aid also played a role since the transfer into zirconium dioxide is 1:1, thus making it possible to create exactly the shape that was modeled. The synOcta® system, which involves working on the gingival level, is highly reliable because the implant can be fixed into place in eight different positions – ensuring a fit that is nearly always perfect. Thanks to the precision and high success rates for dental technicians and dentists, the costs for the off-site production of the custom abutment in the laboratory, which, at first glance, are considerable, become relative when considering the total package. In addition to the milled abutment, this also already includes a metal screw for the elevation of the gingival level and an additional screw for fixing the abutment into place.

Conclusion

The case presented here has demonstrated how, even where the dental situation has been neglected for many years, it is still possible to restore chewing function and esthetics in a way that is realistic for the patient both in terms of time and money. This is an example seen frequently in practice: despite sparse remaining dentition, the patient wants the least complicated treatment possible if, indeed, he does opt for an implant solution. This particularly means forgoing augmentative measures. This situation often places special demands on the laboratory. Even in the case of implants that have a less-than-perfect position from a prosthetics standpoint, it is imperative that a functional as well as esthetically satisfactory prosthodontic solution be realized.

The combination of custom abutments with the precision of industrial manufacture and the Weigl method for tension-free cementing that has been presented here can be recommended based on the experience of the author as a concept promising success.

Acknowledgements

The author would like to thank the dental practice Nina Hartmann in Darmstadt, Germany, for its communicative cooperation – complex cases can only be solved through dialogue.

[1] 12/15: Straumann® Soft Tissue Level Implant Standard RN 4.1 mm, 12 mm SLActive und 21/25: Straumann® Soft Tissue Level Implant Standard Plus RN 4,1 mm, 12 mm SLActive.

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