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Rehabilitation of Two Patients with Individual Abutments - Case Report

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Case Report

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ABSTRACT

Statement of problem: The use of osseointegrated, dental implants as a complement and extension of the conventional dental treatment spectrum is becoming increasingly important. Apart from the purely functional side of the implant restorations aesthetic aspects are very important for the patients. The design of the emergence plays an important role. Prefabricated abutments have a rotationally symmetrical basic shape and do not correspond to the passage area of the shape of natural teeth.

Cases and methods: In this case report, the supply of two patients with individual abutments by two different methods (CAD-designed and CAM-fabricated and a prefabricated zirconium abutment, which was individualized with ceramics in the cervical area) under consideration of functional, aesthetic and hygienic aspects is presented.

Discussion: With both methods, optimal treatment results. With the CAD-/CAM-method (e.g. Atlantis VAD/Virtual Abutment Design Software) abutments are designed starting from the ideal shape of the individual crown. This saves time and therefore costs.

Conclusion: Through the case presentation is shown that simplified and accelerated by means of CAD/CAM-fabricated abutments, prosthetic workflows without compromising the aesthetics and function. Thus, a course - an aesthetic result was achieved.

INTRODUCTION

In order to obtain an optimal treatment result in the context of a comprehensive supply of implant-supported dental prosthesis, several factors must be considered. While survival rates of enossal titanium implants are no longer a relevant problem [1-4], the aesthetic requirements of patients have risen further in recent years. This applies not only to the so-called "white aesthetics", which can be optimally solved using modern veneering or full-ceramic systems, but also to the so-called "red aesthetics", which is determined by the health and contour of the gingival tissue. In addition to its function, aesthetics is an essential success criterion, which must be foreseeable to be solved by the implant dentist.

Among other things, we discuss the extent to which long-term results can be achieved by stable implant-abutment connections and corresponding peri-implant hard and soft tissue techniques. A further very important aspect is the design of the emergence profile [5-7].

The design of the transition from the round implant cross-section to the tooth-root-like individual through-flow profile is achieved by the abutment, which must be adapted as required.

Corresponding individual profiles have been produced in the past by casting on preformed abutments, which is, of course, very time-consuming and cost-intensive. A further possibility for the production of individual abutments consists in the use of CAD / CAD abutments (e.g. Atlantis VAD ™, DENTSPLY IH GmbH), a method for making individual abutments from the ideal shape of the crown.

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CASE PRESENTATION

Clinical and radiological examinations were performed in both patients before implanted. After detailed consultation, an Astra Tech Osseospeed Implant (DENTSPLY IH GmbH) was inserted in each patient. After a healing period of 2 months the patients were provided with cemented crowns, made of veneered zirconia Ceramill ZI (Amann Girrbach GmbH). An impression coping was placed and a transfer impression was made. The abutments were prepared by different methods as follows.

Case 1

A soft tissue model was made from the impression, and the desired gingival tissue was carved into the model. The tissue contour of the adjacent incisor was used as a gide to create the new emergence profile. A prefabricated zirconium abutment (DENTSPLY IH GmbH) was modified in the cervical area to create a custom abutment with natural gingival contour **(Figure 1)**. The abutment was veneered with Ceramill ZI (Amann Girrbach GmbH) and placed on the working model to fabricate a crown **(Figures 2 and 3)**.

Case 2

The Abutment was fabricated using the Atlantis Virtual Abutment Design-Software (VAD) (DENTSPLY IH GmbH). Depending on the individual anatomic situation, the system comprises different options for a customized design of the abutments emergence profile. It further offers the possibility to compensate the position of prosthetically not ideal placed implants through different angulation options for the abutments. The basis for the milling process, performed by the manufacturer with the VAD-software, was a 3D-Scan of a plaster casted model with a gingival mask made of silicon (Picodent Dental-Produktions Vertriebs GmbH) and Wax-up around the duplicate abutments in the respective implant region **(Figure 4)**. The technician himself determined the required abutment design, by transcribing the instructions firstly in a special virtual entry form, and sending the data subsequently via internet to the manufacturer. After the milling process, the finished abutment, made of zirconia, was delivered to the technician with a corresponding abutment screw **(Figure 5)**. After that, the abutment was placed on the model and the final prosthetic restauration was manufactured by the dental technician **(Figure 6)**.

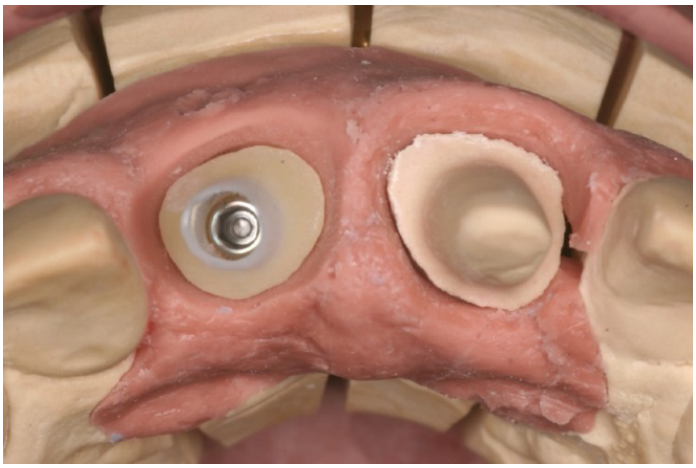

Figure 1. Die master and abutment with individual emergence profile.

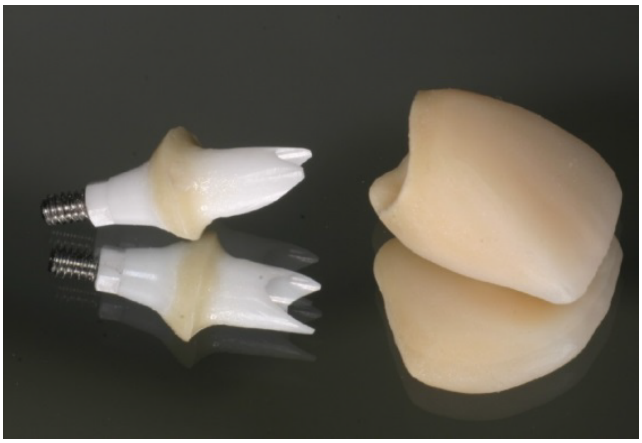

Figure 2. By Ceramill ZI veneered prefabricated abutment.

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Figure 3. Die master and crowns.

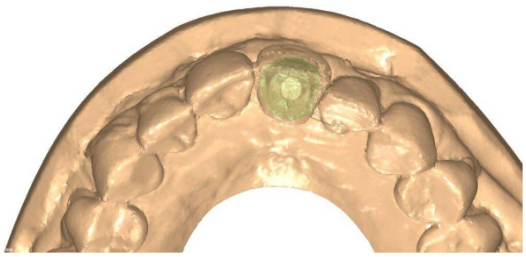

Figure 4. 3D-Scan of a plaster casted model with a gingival mask.

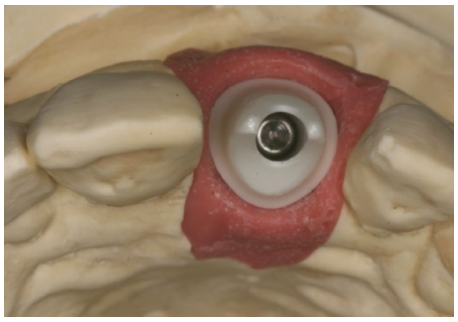

Figure 5. Die master and zirconia atlantis abutment with individual emergence profile.

Figure 6. Zirconia atlantis abutment and crown.

Clinical Parameters

Soft tissue conditions and state of the prosthetic restauration were recorded on baseline and after one year of function **(Figures 7-10)**. Soft tissue quality was determined by the parameters mesial and distal height of the papilla and coloration of the mucosa. Changes in papilla height were compared visually by photographs, taken at baseline and on the follow up examination. Changes of the papilla soft tissue level were documented.

Radiologic Parameters

Panoramic radiographies were performed on behalf of pre-implantological diagnosis before implant treatment with the Orthophos D 3297 (Sirona Dental Systems GmbH). Conventional x-rays were taken in parallel technique at three different points in time, using the Sirona SR 60/70/7L tube. The first x-ray was taken immediately after implant placement in order to control the insertion-success. The second radiologic examination was performed at the time of the onset of the final prosthetic restauration (Baseline). The third x-ray was taken one year after functional loading of the implant **(Figures 11-14)**.

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Figure 7. Clinical state after placement of abutment and crown.

Figure 8. Clinical state after one year.

Figure 9. Clinical state after placement of atlantis abutment and crown.

Figure 10. Clinical state after one year.

Figure 11. X-ray control after placement of abutments and crown.

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Figure 12. X-ray control after 1 year.

Figure 13. X-ray control after placement of atlantis abutments and crown.

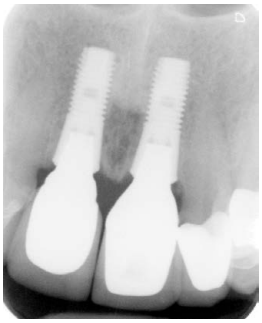

Figure 14. X-ray control after 1 year.

DISCUSSION

An individual design of the emergence profile is necessary for the success of an implant prosthetic treatment [5-7]. Individual emergence profiles have been made in the past by casting on prefabricated abutments, which is of course very time-consuming and cost-intensive. In addition, there is a risk that exposure to dark metal particles will occur during gingival recessions. In order to avoid aesthetic disadvantages, the abutment can be veneered with ceramics in the buccal area, but remaining oxide layers or porosities in the ceramic can lead to irritation of the peri-implant gingiva [8] **(Figure 8)**. For a number of years, the possibility to make individual abutments for a wide variety of implants is available with various CAD/CAM procedures (in this case, Atlantis VAD ™, DENTSPLY IH GmbH). The method allows the production of individual abutments from different materials, starting from the ideal shape of the crown. Thus, the emergence profile can be optimized by the abutment.

CAD/CAM-Systems for the fabrication of individual abutments facilitate the customized production of aesthetically formed abutments, made of different materials, like titanium, with titanium nitride anodized titanium, also designated as gold-hue titanium or zirconia [9-15]. Implant abutments generated by CAD/CAM-technology are more precise than those created by conventional casting and fit more precisely than stock abutments [16]. A radiographic and Scanning Electron Microscopy assessment revealed no differences between customized and prefabricated titanium-abutments of the DENTSPLY IH GmbH with respect to the microscopic and radiographic fit at the implant-abutment interface [17]. Individually designed Atlantis abutments (DENTSPLY IH GmbH) are available for all major implant systems, including the Astra Tech Implant System. Besides the low-cost aspects of Atlantis [11,18], there are notable benefits as a reduced patient treatment time [11,19,20] and a simplified treatment protocol [11,18].

In this case report, the supply of two patients with individual abutments by two different methods is presented. In Case 1 a prefabricated zirconium abutment was individualized with ceramics in the cervical area, while in case 2 the abutment was CAD-designed and CAM- fabricated. No technical complications in terms of fractures of the veneering material or abutment fracture or loosening of the abutment could be observed. In both cases an increase of the papilla could be observed **(Figures 8 and 10)** after one year. During the observation period soft tissue-complication, concerning a red coloring of the mucosa around the abutment,

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was observed only in Case 1 **(Figure 8)** without any radiological consequence for hard-tissue. No bone changes, on the mesial and distal aspect of the implants could be found after one year in both cases **(Figures 12 and 14)**. The aesthetic result was estimated as very good by both patients.

CONCLUSION

Abutments serve as an important link between implants and the prosthetic superstructure. They are also a very important determinant for biological, technical and aesthetic parameters. The production of individual abutments using prefabricated pieces is often difficult and costly. With the CAD/CAM method abutments are designed starting from the ideal shape of the individual crown. This saves time and therefore costs. Individual CAD/CAM-fabricated abutments are a good and a predictable treatment option, and lead to a high patient satisfaction concerning therapeutic and aesthetic results.

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