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Single-Tooth Restoration with a full-Ceramic Implant Solution in the frontal tooth area

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- 1988: Specialist in Oral and Maxillofacial Surgery, Chemnitz
- 1988-1989: Head of the Department of Oral and Maxillofacial Surgery at the Polyclinic of the Chemnitz Hospital
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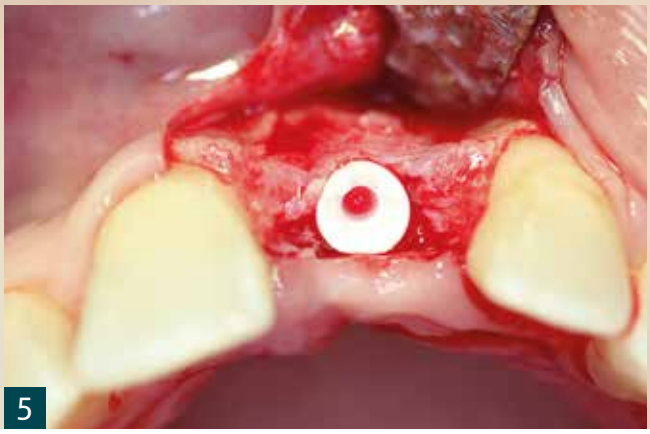


"Two-part ceramic implants of the latest generation (ZrO2) are now considered alternative treatment options to titanium implants due to their excellent biological and material properties [1-11]. The handling and workflow now meet the requirements of modern implantology [12]. The successful use of a two-part ceramic implant is demonstrated through a clinical case."

Case Presentation

A 40-year-old patient presented to our oral surgery practice with a non-salvageable tooth 21 (Fig. 1). The dental X-ray shows an approximately 7 mm large apical radiolucency with widening of the periodontal ligament space in the upper third of the root (Fig. 1). Given the clinical circumstances (high smile line, good oral hygiene), we opted for a two-part ceramic implant, Zeramex XT (Dentalpoint AG).

Surgical Phase

After the extraction of tooth 21, excision of the apical granulation tissue was performed through a semilunar incision (Fig. 2). To avoid failure of ceramic implant ossification and to preserve soft tissue structures (papillae, attached gingiva), we opted for a two-stage approach. A clasp-free Valplast prosthesis served as a provisional restoration.

After five months, the region of tooth 21 was reopened (Fig. 3). The incorporation of a two-part ceramic implant, Zeramex XT (ø 4.2x L 12 mm), was carried out (Fig. 4, 5).

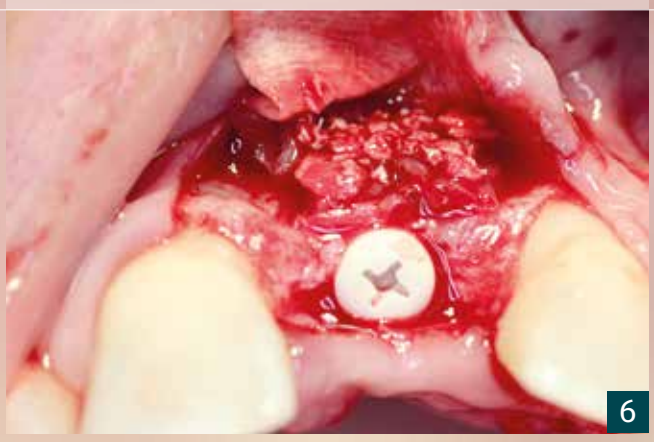
1 Clinical and radiological initial situation: Tooth 21 with apical osteolysis.

2 Presentation of the bone defect through a semilunar incision with intra-alveolar placement of the retractor.

3 Bony deficit after reopening.

4 Incorporated two-part ceramic implant Zeramex XT sagittal view...

5 ... and from an occlusal perspective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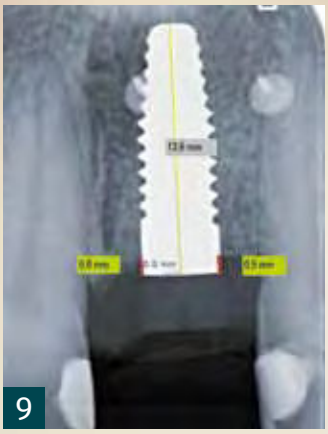
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6 Bone augmentation vestibular to region 21.

7 Subsequent coverage with a membrane.

8 Clinical condition after exposure. X-ray control

9 image after exposure.

10 Individual components: Provisional crown, provisional abutment (PEEK), and provisional screw (PEEK-CW 30).

11 Components on the model.

12 Customized prefabricated abutment made of zirconium oxide with Vicarbo screw from a sagittal perspective.

13 Occlusal view on the master model for the final restoration.

"The guidelines for implantation in the anterior tooth area and adherence to the manufacturer's drilling protocol were followed [13,14]. Besides the transversal aspect, the vertical insertion depth is crucial for prosthetic success. Due to a special thermal etching process in the collar area, the implant can be inserted supra-crestally between 1.6 to 0.6 mm, with the insertion depth determined by the gingival height and the existing bone of the adjacent teeth (Fig. 4, 5). Since the abutments protrude at least one millimeter from the implant shoulder level, the implant should be positioned approximately two to three millimeters subgingivally.

Transversal bone augmentation was performed using a mixture of autologous bone chips (retromolar lower jaw), xenogeneic bone substitute (Bio-Oss), and a membrane (Jason membrane) (Fig. 6, 7). After four months, exposure was carried out using a PEEK gingival former (Fig. 8, 9).

Prosthetic Phase

To achieve optimal contouring of the marginal gingiva in the highly aesthetic zone, a crown made of Gradia, a micro-ceramic composite, was fabricated.

The foundation for the long-term replacement was a PEEK abutment (Zeramex Provisional RB) (maximum wearing period 180 days), including a screw (maximum torque 15 Ncm) (Figure 10, 11).

After eight weeks and two modifications of the long-term provisional restoration in the basal area to optimize the emergence profile, the definitive zirconia crown (substructure Ceramill, veneering Creation) was finally attached to the individualized abutment made of ATZ ceramic (Figure 12-14). The attachment of the definitive abutment was done after precise repositioning (checked with a probe and X-ray) using the unique Vicarbo screw made of carbon-fiber-reinforced high-performance polymer, which is part of the Zeramex system. This screw is tightened to a torque of 25 Ncm. The final result can be seen in Figures 15 and 16.

The examinations at six and twelve months showed completely non-irritated soft tissue conditions. The BOI test was negative in both periods, and the Pink Esthetic Score (PES) according to Prof. Fürhauser was twelve out of a maximum of 14 points (Figure 17, 18) [15].

Also of interest was the remodeling process of the peri-implant bone structure, which was evaluated using

14 individually layered definitive ceramic crown with ceramic build-up and ceramic implant on the labial and palatal aspects.

15 Crown in situ.

16 Harmonious final result with a gummy smile.

17 Soft tissue situation after six months.

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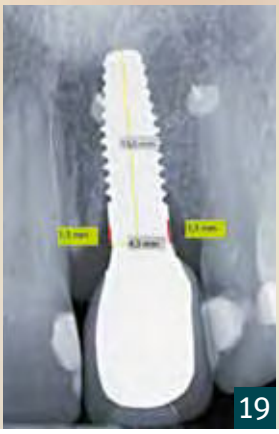

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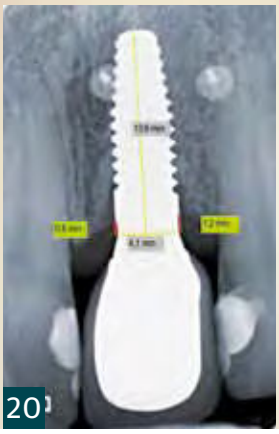

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In English: Dental radiographs (right-angle technique) and DBSWIN software (Dürr-Dental) were used. Bone resorption of 0.5 mm on the mesial side and 0.4 mm on the distal side was observed six months after exposure, while bone regeneration of 0 mm on the mesial side and 0.3 mm on the distal side was observed twelve months after exposure (Fig. 8, 19, 20). The yellow line on the X-ray images corresponds to the actual implant length (13.6 mm). The red lines represent the mesial and distal distances from the implant platform to the first bone contact.

In our patient, bone resorption in the first six months is consistent with the literature [16]. However, the literature data are based on one-piece ceramic implants, unlike our treatment. This phenomenon of bone regeneration is relatively rare in implantology and should be approached with evidence-based methods.

Long-term studies need to be conducted and secured before making a general statement. Evaluations regarding this are currently in progress.

Conclusion

Ceramic implants offer a good alternative to titanium implants. Once you've experienced the benefits of ZrO2 ceramic, you come to appreciate it and don't want to do without it anymore. In addition to the possibility of metal-free restorations, they provide a meaningful addition to the existing treatment options for many risk groups, provided the indications are carefully considered. For this relatively new but somewhat different material, the author recommends training for users. The call for training in handling new materials is also increasingly addressed in the literature [12,17].

I would like to thank Dentist Frank van Doorn (Meckenheim) and Dental Technician Jürgen Hopp (Labor Mund Zauber Meckenheim) for their kind support in the prosthetic field.

18 Condition after twelve months with a slight improvement in the mesial papilla. Results of the X-ray
19 evaluation six months after exposure.

20 Results of the X-ray evaluation twelve months after exposure.