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Bundesverband der implantologisch tätigen Zahnärzte in Europa e.V.
European Association of Dental Implantologists

Guideline 2021
Update: ceramics in implant dentistry

European Consensus Conference (EuCC)
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Guideline 2021

Update on Ceramics in Implant Dentistry

16th European Consensus Conference (EuCC) 2021

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1. Methods

1.1. Purpose

This guideline aims to provide dental and orofacial implantologists with recommendations for the use of ceramics as an implant, abutment, and superstructure material in implant dentistry. It is an update of the 2007 guideline.

1.2. Introduction

This consensus paper covers one- and two-piece implants fabricated from ZrO_2 ceramics, typically placed in accordance with the indications recommended by the Consensus Conference in Implantology (German). Additionally, the use of ceramics as an abutment material or for crown and bridge superstructures is reviewed. All consensus recommendations in this paper should be considered as guidelines only. The patient's specific situation is always an important consideration and may justify a deviation from the recommendations of this consensus paper.

1.3. Background

Ceramics is widely used as material for superstructures on implants. ZrO_2 ceramic implants have now been around for almost 20 years. Even if vendors are increasingly distributing ZrO_2 ceramic implants, their usage is still limited.

1.4. Literature search

The Cochrane Library, EMBASE, DIMDI and Medline databases were used in the literature search performed by the conference host between 15 January and 15 February 2021. For the purpose of updating of the 2007 Guideline, the search was limited to references published 2006 and onwards. The search strategy included search terms such as:

zirconia implant, ceramic implant, dental implant, abutment, superstructure, ceramic, meta-analysis, review, RCT

The 872 literature references returned were then reviewed on the basis of their abstracts; non-relevant literature references were identified and excluded. The parameters for exclusion were: Case reports; studies not related to implant therapy; general, non-dental analyses; theoretical studies not related to clinical practice. For all literature references with (possibly) relevant content, the respective publication was obtained as full text.

The methodology of the BDIZ EDI Guideline as compared to the classification of guideline levels should be rated as "consensus development in informal procedure". Therefore, the selection principle was to ensure that the most recent publications for each topic area were to be included. During the ensuing discussions, further publications that had not been considered initially were added. The objective was to develop clinically relevant recommendations, taking into account the practical experience of the various European participants.

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2. Definitions

One-piece ceramic implants are made from ZrO_2 ceramics with integrated abutments for the retention of crowns, bridges and overdentures.

Two-piece ceramic implants feature a separate implant body and an abutment. The implants may be designed for transgingival or subgingival healing with an inner geometry that stabilizes the abutment by cementation or screw fixation.

Ceramic abutments are used in one piece for insertion into ceramic implants. Two-piece abutments consisting of a ceramic core that is adhesively cemented to a titanium insert are generally used for titanium implant-supported rehabilitations.
Furthermore, one-piece ceramic abutments are available for titanium implant-supported rehabilitations.

Ceramic superstructures can be fabricated as fixed dental prostheses (single-tooth restorations, short- or wide-span implant-supported bridges) using conventional processing methods or CAD/CAM technology.

3. Immunological/biological interactions

- Intolerance/allergies to titanium particles/ions from titanium implants are rare. However, there is a need for controlled and validated studies **[2, 11]**.
- Commercially available implants placed according to the manufacturers' Instructions for Use achieve osseointegration and good soft-tissue biocompatibility with high levels of clinical success **[1, 9, 13, 27, 28]**.

4. Implants

4.1. One-piece implants

- One-piece ceramic implants are available in different designs – parallel-walled or with a flare for immediate-extraction cases **[19, 27]**.
- The risk of implant fracture is low for current commercially available implants **[6, 27]**.
- Overload damage during the early healing period can be avoided by protective guards, by splinting or by eliminating functional loads on the temporary restoration **[5, 8, 10, 16]**.

4.2. Two-piece implants

- Various types of ceramic abutment connections are available, such as adhesive cementing or screw retention with or without an inner metal core **[17, 30]**.
- Fixation of abutments requires a specific protocol according to the manufacturers' Instruction for use **[31]**.
- Scientific evidence for two-piece implants is rare **[7, 15, 20]**.

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5. Abutments

- The peri-implant soft tissue on ceramic abutments appears to provide a better shade match with the soft tissue around natural teeth compared to metallic abutments **[22]**.
- In patients with a thin tissue phenotype, ceramic abutments deliver more favourable aesthetic results than titanium abutments **[32]**.
- Experimental studies show a reduced biofilm adhesion on ceramics than on titanium **[3, 26]**.
- Ultimately, however, surface topography appears to be the primary determinant in the accumulation of biofilm rather than the choice of material **[14]**.
- Abutments for titanium implants should include an implant-abutment connection made of titanium (titanium insert) **[18]**.

6. Superstructures

- Long-term data show remarkable complication rates for implant-supported single crowns and bridges **[21, 23, 25]**.
- The use of monolithic ZrO_2 ceramics for superstructures material has been little studied (only few medium- or long-term data available) **[29]**.
- Frameworks made of ZrO_2 ceramics with a ceramic veneering have a relatively high incidence of chipping. Making these restorations requires attention to specific design principles and special training **[4, 12, 29]**.
- Due to recent developments in CAD/CAM technology, a better selection of materials and more extensive knowledge, improved long-term results can be expected for ceramic superstructures **[24]**.

7. Conclusion

Ceramics are available for all aspects of implant treatment. The implant surgeon and the restorative dentist must have appropriate training to identify the best possible therapy choose for each patient.

Cologne, 23 February 2021

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