White ceramized implants and abutments to optimize the aesthetic outcome and improvement of hard and soft tissue management: an in vitro-study

Introduction

Dental implant restoration has become a routine procedure with high success rates. The dental prosthesis consists of three parts: implant, abutment and crown. The transition zone of the implant and the abutment as a connecting element from the gingiva to the crown may be visible when replacing incisors or cuspid teeth. This may display an aesthetic disadvantage. Ceramization through a novel plasma electrolytic oxidation (PEO) technique of the transition zone which then mimics natural tooth color may be a solution for this problem. This study describes the production of the novel surface as well as its cytocompatibility and cellular attachment in vitro. Fig. 1 and fig. 2 depict the concept and the novel surface.

Material and Methods

After abutment manufacture, a whitish transition zone was created by PEO. SEM/EDX and profilometry analysis were performed and the surface cytocompatibility was assessed according to DIN ISO 10993-5/-12. Fibroblast adhesion was determined using a live/dead staining assay. Indentation and scratch tests were performed to determine the surface hardness. Fig. 3 outlines the procedures used for cytocompatibility assessment.

Results

The visible abutment transition zone was successfully ceramized. The ceramic layer presented as a porous-rough whitish surface under the microscope which did not stain after repeated immersion tests in heparinized blood. Cytocompatibility and fibroblast adhesion were excellent (equivalent to the negative control, see fig. 4 and fig. 5). Mechanical analysis revealed satisfying parameters regarding hardness and resistance of the surface.

Conclusion

The white ceramic layer improves the aesthetic appearance of abutments in the anterior teeth region. In vitro, the ceramic layer shows no discoloration and excellent cytocompatibility and fibroblast adhesion.

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