Implant Surface Enhancement – Myth and Reality
Comparative Analysis of Currently Available Implants

Introduction

Implant surface characteristics are considered to play a mayor role in accelerating the processes which lead to osseointegration. Some manufacturers claim for a reduced healing time (6–8 or 8 weeks)\(^7\). Besides physical and chemical parameters like wettability, positive or negative surface charge and surface-free energy, the topography of dental implant surfaces can influence cell attachment und subsequent osseointegration\(^3\,\,4\). Several cell types are involved in the process of osseointegration, such as osteoblast-like cells and other anchorage-dependent cells like fibroblasts. These cells show similar morphologic behaviour and affinity to rough titanium surfaces\(^2\).

The aim of this article is to present the topographical aspects of currently available implant surfaces.

Material and Methods

Different commercially available dental implants have been investigated to compare surface roughness and reproducibility of advertised properties. Scanning electron microscopy (SEM) was used for topographical evaluation, backscattered electron imaging (BEI) was used for density and/or atomic number analysis. X-ray microanalysis (XRM) was used for elemental analysis.

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Conclusions

Some marketing claims on implant surface characteristics were critically evaluated and discussed on their clinical evidence. Embedded particles of the production process like grit particles could be observed as well as inhomogeneous structures. Nevertheless, within the range of state-of-the-art implant surfaces very high success rates have been documented. Topographical similarities of different implant surfaces could be observed. Consequently, the reduced healing times claimed for a specific surface could also be related to surfaces with similar topographies. Surface roughness values are not clearly related to topographical appearance. Further development of enhanced implant surfaces should lead to morphologic structures which are homogeneously distributed to enable an allover high level of close cell attachment. Limited data on the influence of embedded production particles on the implant surface are available. However, Paolantonio et al. have demonstrated that no statistic evidence could be provided to support the hypothesis that surface inorganic contamination could affect osseointegration of titanium dental fixtures.

Further information:
FRIADENT GmbH
P.O. Box 710111
68221 Mannheim/Germany
E-mail: info@friadent.de
www.friadent.de

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