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CERAMIC IMPLANT MATERIALS , COMPOSITES AS BIOMATERIALS

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Benefits of ceramic implants

Perhaps the most distinctive yet simple difference between titanium and ceramic implants is the color. As a white material, the esthetic properties of ceramics are self-evident, especially in patients with a thin or delicate soft tissue biotype or in cases of soft tissue recession. Zirconia implants also lead to less mucosal discoloration than titanium. For patients who are very concerned about the potential visibility of titanium, especially in the anterior region, a ceramic implant may be a reassuring solution.



Soft-tissue-friendly and less plaque:

Looking deeper into the biology behind ceramic implants, several studies have shown that soft tissue attachment, low or weak inflammatory responses, and osseointegration are similar to those observed in titanium implants. Low affinity for attracting and retaining plaque has also been demonstrated as well as less bacterial adhesion than titanium.

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Challenges with ceramic implants

Fewer clinical indications:

At present, the clinical indications are limited compared to titanium implants. The current use of ceramic implants as a solution for tooth loss is mainly for single tooth replacement and bridge cases. There may be additional limitations in surgical and loading protocols.

Predominantly one-piece cement-retained systems:

Zirconia and titanium have very different material characteristics, so ceramic implants can't simply replicate titanium implants. Until recently, zirconia has been mainly used as one-piece, cement-retained systems, which present several drawbacks in terms of the rigidity and stability of a cemented restoration. One-piece implants are less flexible than those with two parts secured by torqued screws. This limited flexibility also creates problems during placement of the implant, in the design of the restoration, and in the types of forces that may be exerted.

Cost of ceramic implants:

The complex industrial process of manufacturing zirconia implants can impact the price. When selecting a ceramic implant, it is advisable to question the manufacturing method. With this brittle material, manufacturing flaws – even minute imperfections – in the production and surface treatment of a zirconia implant may compromise strength. Manufacturers should take great care with the materials for being clinically successful.

WHAT IS A COMPOSITE MATERIAL?

A materials system composed of two or more physically distinct phases whose combination produces aggregate properties that are different from those of its constituents.

OR

Two or more chemically distinct materials which when combined have improved properties over the individual materials. Composites could be natural or synthetic.

Classification:

Hybrid materials can be classified based on the possible interactions connecting the inorganic and organic species.

Class I

Hybrid materials are those that show weak interactions between the two phases, such as van der Waals, hydrogen bonding or weak electrostatic interactions.

Class II

Hybrid materials are those that show chemical strong chemical interactions between the components such as covalent bonds.