Journal of Biotechnology & Biomaterials

Letter to Editor Open Access

Dental Biomaterials Made of Zirconia: Implant Applications

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Letter to Editor

Zirconia is useful for dental and orthopaedic applications because of its outstanding mechanical characteristics, chemical stability, biocompatibility, and low thermal conductivity. Furthermore, the biocompatibility of zirconia has been examined in vivo, and when zirconia samples were placed into bone, no adverse reactions were reported. However, their use is divisive among dentists and academics, particularly when compared to mature titanium alloy implants. The benefits and drawbacks of zirconia as a biomaterial, such as implant materials, must be thoroughly investigated, and design, manufacturing, and clinical operation guidelines are urgently needed. The unique components, microstructure, mechanical strength, biocompatibility, and application of zirconia ceramics in biomaterials are all discussed in depth in this paper. The review focuses on how to use creative ways to create zirconia's physical and chemical properties such that the treated zirconia can give superior osteointegration after implantation.

ZrO_2 is currently commonly utilised in dentistry. Dental implants, abutments, crown prostheses, and posts all contain ZrO_2. The development of novel ceramic-based implants to improve periodontal integration and long-term solid adhesion with the surrounding tissues, such as Osseo integration, is one of the current trends in dental implants. Implant success and survival are determined by the surface properties of ZrO_2. Implant microstructure, surface composition and qualities, and design considerations are among these characteristics. ZrO_2's antibacterial properties, or the capacity of its surface to minimise plaque deposition, are key properties for improving the quality and volume of soft tissues, and it is being explored as a titanium implant alternative. Yttrium stabilised tetragonal zirconia (YTZ) possesses higher fracture toughness and bending strength than other ceramic materials, as well as superior wear resistance, corrosion resistance, high-temperature resistance, oxidation resistance, and hydrophilic characteristics. These qualities help compensate for standard ceramic materials' lack of strength and hardness. The seven factors of introducing zirconia as an implant material are as follows: The biological safety of the implants is provided by zirconium oxide.

- Increase the ontogenesis impact of zirconium oxide within the bone graft
- Increase the affinity of zirconium oxide with the surrounding soft tissues
- Methods of surface modification of zirconium oxide to promote biological safety
- A novel type of zirconium oxide moulding technology
- The potential of zirconium oxide as an implant material, as well as the drawbacks of using ZrO_2 in dentistry

ZrO_2 offers a wide range of applications, including implant, post-core, and dental crowns. High fracture resistance has been established in extensive in vitro and in vivo experiments, and it may be employed in stress-bearing regions. Bacterial invasion is further discouraged by the ZrO_2 surface's properties, such as the lack of plaque attachment to the ZrO_2 and the absence of tiny gaps between the fixtures. Metal platform repair is being replaced with ZrO_2 platform restoration, which is a potential alternative. The biosafety of ZrO_2 due to aging and wear of ZrO_2 restorations should be further evaluated to guide the safe use of ZrO_2 materials. The biocompatibility of ZrO_2 has been well-proved. The experiments of Y-TZP in vivo and in vitro show that it has good biocompatibility and has no adverse reactions to cells and tissues. The biosafety of ZrO_2 will be influenced when technology for making ZrO_2 improves and the surface of ZrO_2 is modified, which will be favourable to the use of ZrO_2 as an implant in dentistry [1-5].

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Received: 16-Mar-2022, Manuscript No. jbtbm-22-57420; **Editor assigned:** 18-Mar-2022, Pre QC No. jbtbm-22-57420 (PQ); **Reviewed:** 23-Mar-2022, QC No. jbtbm-22-57420; **Revised:** 28-Mar-2022, Manuscript No. jbtbm-22-57420 (R); **Published:** 02-April-2022, DOI: 10.4172/2155-952X.1000264

Citation: Shinya A (2022) Dental Biomaterials Made of Zirconia: Implant Applications. J Biotechnol Biomater, 12: 264.