



In Dental Prosthetics, Zirconia: A Review of the Relevant Literature

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Abstract

A lot of people around the world have some kind of medical implant. Dental implants are a significant part of this category and the crowns they support are essential to meeting the functional and aesthetic requirements of patients. Dental crown development is driven by materials science, and zirconium oxide (zirconia) is currently a promising non-metal alternative that is biocompatible and has excellent mechanical and aesthetic properties. Manufacturing technologies for zirconia-based ceramics are also undergoing significant development at the moment. Zirconia powder uniaxial and iso-static pressing techniques as well as the advantages of upcoming CAD/CAM technologies are discussed. Based on this review several knowledge gaps were identified most notably the need for experimental investigation of various sintering conditions and methods such as two-step sintering. The results of preliminary studies using alternative methods are promising and additional testing would help to ensure that the final product's mechanical, aesthetic and ageing properties are improved and optimized.

Keywords: Zirconia; Orthopaedic; Dentistry

Introduction

When the term "biomedical implant" is used it typically refers to a device that is used to support or replace a portion of the entire biological structure, either temporarily or permanently [1]. Millions of patients annually undergo procedures involving such implantations to improve their quality of life. In point of fact experts estimate that in industrialized nation one in 17 people carries some kind of implanted device. The beyond sixty years have seen significant headways in the space of microelectronics, biotechnology, and materials science. This has made it easier for implant technologies to develop quickly in all medical fields like orthopaedic, dentistry, ophthalmology and cardiovascular health [2].

Biomedical implants

The ARGMD classifies the majority of dental prosthetics as Class II devices because they are typically non-active but invasive and designed for long-term use. Prosthodontics is a subspecialty of dentistry that focuses on designing, manufacturing, and fitting these artificial teeth, as well as natural tooth restorations [3]. This field of dentistry holds incredible importance as there is many times a scarcely discernible difference between understanding fulfillment and disappointment because of the accuracy expected for the prostheses. However, it is common knowledge that the patients' primary complaints fall into one or more of the following categories: social, appearance, function, and comfort.

Literature Review

If a dental prosthetic is needed, the most common reason for urgency is discomfort. Sensitivity, swelling, and pain in the gums are all signs of gingivitis, which is an inflammation of the gingival complex [4]. It will begin to affect the underlying bone if it is not treated, and periodontitis a condition in which teeth become loose can develop. Conditions like the two mentioned above are common and Australia has a particularly high percentage of people with decayed or missing teeth. Because of the exposure and displacement of the tooth's soft inner tissue, known as the dental pulp, fractures of the teeth caused by events such as forceful collisions may also result in pain. As a result, it is evident that prosthodontics also aims to alleviate the patient's pain and discomfort in the structural restoration of the tooth through artificial implantation.

Gum disease and tooth loss frequently make it more difficult for patients to carry out some of their day-to-day activities, which adds to the physical pain they experience. Patients with and without anterior teeth's ability to produce various speech sounds was compared in a 2012 study. One of these studies' findings was that using partial dental prostheses helped improve speech. By filling in the spaces where teeth have fallen out and protecting the inflamed gums as the patient chews, dental prosthetics also make it easier for people with gum diseases to eat without feeling a lot of pain. These indicate that prosthodontics also enables tooth-losing patients to lead more functional lives [5].

The gums swell and pull away from the tooth when periodontal disease reaches its advanced stages and destroys the supporting bone and tissue. This results in pockets between the teeth and the gums, and the presence of bacteria in these pockets results in the release of an often potent odor into the mouth. This is especially bad if the mouth air doesn't completely seal the cavity [6]. A bad taste in the patient's mouth is another symptom of these conditions. Patients frequently experience social awkwardness and embarrassment as a result of these symptoms. For the treatment of such conditions dental implants that are installed correctly are also a proven method for restoring the patient's confidence in their social activities.

The desire to improve their appearance is the final factor that drives patients to seek prosthodontics assistance. Most people think that missing teeth, especially the more obvious canines and incisors, are ugly. The personal aesthetic perceptions of 74 patients with varying degrees of missing teeth (such as incisors, premolars, and so on) were examined in a study conducted against people who have natural teeth [7]. On a scale from 0 to 5, with 0 representing no feelings and 5 representing strong feelings, those missing incisors gave positive feelings an average

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score of 1.0. This was in contrast to the 2.6 average for those without teeth. It is reasonable to assume that these negative perceptions have only become more pronounced as a result of the increased levels of employment competitiveness and the media's increased focus on personal appearance. The most common treatment for patients whose lack of a complete dentition makes them feel unattractive is the use of dental prosthetics that are the right color, shape and size [8].

Conclusion

Evidently the use of zirconia in dental ceramics is becoming quite established, with significant advancements made in the last decade particularly with regard to 3Y-TZP. This is because it can satisfy all important factors that make a patient happy, including comfort, functionality, social aspects and appearance. Due to their increased dependability and lower machining demands, 3Y-TZP prosthetics are frequently formed and machined from partially sintered blanks, such as those produced by CeramTec. Although pressing and sintering optimization has been the subject of extensive research and experimentation, there will always be knowledge gaps for this newly developed technology. If Ceram Tec and the prosthodontics industry investigate novel and alternative sintering methods for their blanks such as two-step sintering, it will be to their advantage. Trial and error with two-step sintering has shown positive outcomes in working on mechanical properties. Because similar equipment is used for both, this method and conventional sintering do not incur significant cost increases. Further research would aim to improve key parameters like hardness, flexural strength, grain growth and size, and their superior aesthetic properties at the same time. These can be contrasted with

products fully processed from green zirconia powder and the outcomes of the prescribed sintering conditions.

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Conflict of Interest

None

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