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# Indication And Use Of Zirconia Crowns On Decidual Teeth

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### ABSTRACT

**Objective:** The objective of this work is to analyze the use of zirconia crowns in primary teeth, their advantages, evolution and acceptance within pediatric dentistry.

**Methods:** An integrative review was carried out using the SciELO, PubMed and Google Scholar databases, with the objective of analyzing the use of zirconia crowns in primary teeth, including 13 articles, following the inclusion and exclusion criteria previously determined.

**Results:** The literature shows that zirconia crowns provide a well-polished surface and less bacterial adhesion, allowing to prevent plaque accumulation and pigmentation, reducing gingival inflammation associated with rehabilitated primary teeth. Zirconia crowns have superior mechanical properties related to other types of ceramics, which gives durability and resistance to fracture and wear, in addition to a natural aesthetic to the rehabilitated tooth.

**Conclusion:** It is concluded, therefore, that pediatric dentistry has benefited a lot from this restorative revolution that uses the use of zirconia crowns in children.

**Keywords:** Preformed zirconia crowns. Zirconia. Dental ceramics.

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## INTRODUCTION

In dentistry, the use of metallo-ceramic crowns was the first option for years, however, with the advances and aesthetic requirements, new ceramic systems were developed, including Zirconia, which has a high fracture resistance when compared to other ceramics, in addition to allowing a substantial reduction in thickness.

In pediatric dentistry the maintenance of primary dentition is important for the child's well-being, however, dental caries, trauma, early loss of teeth makes the esthetics unsatisfactory. The primary dentition should be rehabilitated for several reasons, namely: aesthetic, masticatory and phonetic; but also in cases of: loss of vertical dimension, parafunctional habits (tongue habit and mouth breathing), psychological difficulties and social integration of children<sup>1,2</sup>.

The restoration of deciduous teeth differs from the restoration of permanent teeth because of their morphology, the deciduous ones have a smaller enamel thickness, the pulp chamber is more voluminous and the coronary height is less<sup>3</sup>. An ideal deciduous anterior restoration should be easy to place, lasting, aesthetically pleasing, inexpensive, retentive and resistant, since it is necessary to remain in the oral cavity until the primary teeth exfoliate.<sup>4</sup> The primary teeth can be restored using one of two options: intracoronary restorations or total coronary restorations<sup>1,5-6-7</sup>.

Zirconia crowns fall into the category of full crown restorations, are prefabricated crowns and adhere to the tooth using cement. The cementation of preformed crowns is done with glass ionomer cements, resin-modified glass ionomers and bioactive cements, which minimize microleakage<sup>8</sup>. Among ceramics, Zirconia has become the material of choice due to its biocompatibility and good mechanical properties in addition to having properties very similar to metal and the color very similar to that of the tooth.

In pediatric dentistry, prefabricated crowns are used to rehabilitate deciduous teeth in numerous

clinical situations, allowing the rehabilitation of both anterior teeth and molars whose crowns are largely destroyed and / or present pulp treatments. Crowns are essential to establish dental occlusion, stabilize the masticatory rhythm and demonstrate favorable effects on the reflexes of the mandibular muscles<sup>9</sup>.

Thus, the objective of the present work is to analyze the use of zirconia crowns in primary teeth, their advantages, evolution and acceptance within pediatric dentistry.

## METHODOLOGY

The method was an integrative literature review, which comprises the following steps: identification of the theme and formulation of the research question, elaboration of the criteria for inclusion and exclusion of articles, construction of an instrument to collect relevant data from the articles found, evaluation and analysis of the articles selected in the research, interpretation and discussion of the results obtained and presentation of the review.<sup>10</sup> The question was: What are the advantages and indications for using zirconia crowns in primary teeth? The search was carried out in the databases: SciELO, PubMed and Google Scholar, with the keywords: "preformed zirconia crowns", "pediatric dental crowns", "deciduous molar", "resistance" "pediatric dentistry", isolated or in combination with the Boolean marker "AND", in English and Portuguese. The inclusion criteria were: articles published in English and Portuguese, abstracts available in the chosen databases, availability of the texts in full, published between 2010 and 2018, not restricting the methodology used and which portrayed the use of crowns. zirconia in pediatric dentistry. As an exclusion criterion, articles that are not related to the area of dentistry and those that did not address the use in primary teeth were defined. An instrument was formulated to analyze each selected article. These were analyzed and then discussed.

## RESULTS

Zirconia crowns for primary teeth were introduced by EZ Pedo Crowns in 2010. Before using this material, traditional materials including titanium and alumina were used. Most zirconias have been evaluated as an aesthetic and reliable alternative to traditional metal-ceramic crowns and ceramic-zirconia crowns and bridges. Pediatric dentistry has benefited greatly from this restorative revolution that uses the use of zirconia crowns in children<sup>3,8</sup>.

According to Shuman (2016), the most used form of zirconia in dental crowns is the stabilized zirconia yttria (YSZ), which is made up of zirconia dioxide ceramics stable at room temperature by the addition of yttrium oxide, leading to "transformation toughening" Which allows a greater degree of flexion of all materials made of zirconia, in addition to resisting crack propagation, high hardness, resistance to chemicals and high erosion resistance<sup>3</sup>.

According to the authors Bica (2017) and Ashima (2014), zirconia crowns have properties such as aesthetics, translucency, fracture and compression resistance, biocompatibility, thermostable. In addition, they have the possibility of adapting the crown only when traveling to the dental office, can be used in the autoclave and are a great alternative for patients allergic to Ni-Cr alloys (nickel and chromium)<sup>4,11</sup>. Shuman (2016), still brings that it has very low thermal conductivity, high impact resistance, high chemical resistance (both acids and bases) and high wear resistance<sup>3</sup>.

The zirconia crowns came to fill the esthetic flaw of total coronal restorations in the primary anterior teeth, providing an alternative treatment<sup>4</sup>. The crowns available for primary anterior teeth can be subdivided into two categories: preformed and adhesive crowns. The first ones adhere to the tooth by means of a cement (polycarbonate crowns, metallic crowns with resin coating, open face and zirconia crowns). The second ones do it through an adhesive system (acetate crowns)<sup>8</sup>.

According to Holsinger (2014), Zirconia does not favor bacterial adhesion, having less

accumulation of bacterial plaque and, consequently, a reduction in gingival inflammation associated with rehabilitated primary teeth<sup>12</sup>. The author Waggoner confirms this information, citing that the fine structure of the crowns of preformed zirconia available resembles that of the natural deciduous anterior tooth, provides a highly polished surface, which prevents staining and plaque build-up<sup>8</sup>.

Tooth wear is a complex and multifactorial phenomenon that involves the interaction between biological, mechanical and chemical factors and is the result of complex movements that occur during chewing, in which the jaw moves in different directions, which, unlike traditional ceramics, zirconia crowns induce less wear on the antagonistic dentition, which is one of the advantages presented when choosing zirconia crowns<sup>3</sup>.

Furthermore, according to Shuman (2016), the use of crowns in primary dentition is an excellent alternative for extensive restorations in primary anterior teeth with caries, tooth development defects, fractured teeth, after pulp treatment, restoration of decayed teeth, patients with high risk of caries, in situations of high dental wear and as abutments for space maintainers in the dental arch, for the treatment of imperfect amelogenesis<sup>3</sup>.

The specific microstructure of zirconia causes it to present superior mechanical properties, when compared to other types of ceramics<sup>13</sup>. Zirconia is an oxide, not soluble in water, non-cytotoxic, which does not favor bacterial adhesion, has a favorable radiopacity and a low corrosion potential<sup>14</sup>. Among its properties, are: aesthetics, fracture and compression resistance, biocompatibility, possibility of adapting the crown only when traveling to the dental office, can be used in the autoclave and are an alternative for patients allergic to alloys. nickel and chromium<sup>11</sup>. In addition, it has very low thermal conductivity, high impact resistance, high chemical resistance (both to acids and bases) and high wear resistance<sup>3</sup>. In addition, zirconia is able to prevent the increase of

cracks<sup>15</sup> and is resistant to fractures, this is possible because the crystals of the tetragonal zirconia are transformed into the monoclinic form producing tension compression<sup>16</sup>. This characteristic makes it possible for this material to have a wide application of clinical success<sup>15</sup>.

Despite the wide range of advantages that zirconia presents, its use has some disadvantages, such as the fact that they cannot be modified,<sup>11</sup> so it is essential to insert and test the crown in the preparation before cementing it, in order to guarantee that the margins and occlusion have the appropriate dimensions<sup>17</sup>. This type of crown has a high cost and, when there is a fracture, the zirconia crown has to be completely replaced<sup>11</sup>. Furthermore, the biggest limitation of zirconia is its degradation at low temperatures, also known as hydrothermal degradation or aging, and consists of the transformation of the zirconia surface into the monoclinic phase, when present in humid environments with moderate temperatures, which covers the characteristics of the human body<sup>18</sup>. These lower temperatures can induce tensions in the zirconia structure, making it rigid and preventing it from following the expansion that occurs. Thus, it can cause fractures, or promote residual stress, which triggers the spread of cracks over time<sup>19</sup>.

Therefore, the use of these crowns in primary teeth has increased, however, their use is wider in anterior teeth than in molars. Since these are located in the posterior region of the oral cavity, there is no significant change in the aesthetic point of view. Therefore, its high cost and the fact that it is a deciduous tooth mean that it is not often the first option of pediatric dentists, conditioned by the wishes of parents / guardians, for the rehabilitation of primary molars in children.

## CONCLUSION

Various technological advances in dental materials and techniques for use in children have occurred in recent decades. Currently it has been found that zirconia crowns are considered a great option for the rehabilitation of

primary teeth because they have fracture resistance, biocompatibility, less plaque retention and, above all, for the aesthetics provided. In addition, they are an excellent alternative for restorations on primary anterior teeth with extensive cavities. It is concluded, therefore, that pediatric dentistry has benefited greatly from this restorative revolution that uses the use of zirconia crowns in children.

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