

Comparison of Parental Satisfaction of Stainless Steel Crowns vs. Zirconia Crowns in Primary Mandibular Molars

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Abstract

Aim: To compare and evaluate the parental satisfaction of Stainless Steel Crowns (SSCs) and zirconia crowns in primary mandibular molars. **Materials & Methods:** 15 healthy paediatric children of both genders with age group ranging from 4 to 7 years were accounted for the study. The design of the present study is a split-mouth trial wherein the effectiveness of two different crowns (SSCs and Zirconia crowns) were evaluated within the same patient. Tooth preparation was done according to the manufacturers recommendations depending upon the crown each patient would receive. All crowns were cemented with Type I GIC luting cement. Patients were evaluated at 1 week and 1 month interval. **Results:** The parental satisfaction was high with both crowns. However, only 7 parents (46.6%) were satisfied with the colour of SSC, whereas 15 parents (100%) were satisfied with the colour of zirconia. **Conclusion:** Zirconia crowns can be used as an aesthetic alternative restorative option to SSC in the near future.

Keywords:

Aesthetic crown; Primary molars; Stainless steel crown

Introduction

The management of carious primary teeth has always been a challenge to the clinician. In paediatric dentistry, the strategy is to deliver efficient treatment and simultaneously reduce the time of operation.

Proper treatment of primary molars is of great importance because of the need to prevent oral infections, as well as because of the role primary molars play in proper mastication and in maintaining proper arch space for the permanent premolars.

There are various different materials that have been used over the years such as amalgam, composites, and SSCs to restore such teeth. [1] SSCs were introduced into paediatric dentistry by rocky mountain company in 1947, first described by Engel and then popularized by Humphrey.

The use of preformed paediatric SSCs in cases of severe tooth decay of at least two surfaces was advocated in the guidelines of paediatric restorative dentistry. SSCs are an invaluable restorative material in the treatment of badly broken primary teeth.

They are generally considered superior to large multi surface amalgam restorations and have a longer clinical lifespan. [2,3] Crowns are also indicated for developmental

defects of the tooth structure (e.g., hypoplasia, hypo calcification); teeth with extensive tooth surface loss due to attrition, abrasion, or erosion; fractured primary molars; and infra-occluded primary molars to maintain mesio-distal space. [4] It is also used when the downfall of further accessible restorative supplies is more probable (e.g., interproximal caries ranging farther than line angles, children with bruxism).

Moreover, next to pulpotomy or pulpectomy, SSC is used in the restoration of a primary tooth which will be exploited as an abutment to maintain space or to be used as interposed rehabilitation of severed teeth. [5] SSCs have greater success rate than that of amalgams in children under the age of 4 years.

Over the past years, diverse clinical studies by Messer et al. [6] and Einwag et al. [3] have proved the excellence of SSCs in restoring primary molars with multi-surface involvement. [7,8] SSCs tends to last long in patients with developmental or medical conditions that do not improve as they age, thus reducing the possible usage of sedatives and general anaesthetics.

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Over the past many years, SSCs that are clinically effective have been used for restoring primary teeth. But, aesthetic management of primary teeth has become essential, as parents are more involved in the clinical decision-making process and are more demanding of aesthetic restorations [9] Keeping in mind the aesthetic requirement of paediatric population, manufactures have proposed aesthetic preformed paediatric zirconia crowns for primary teeth. Zirconia is a crystalline dioxide of zirconium that has mechanical properties similar to those of metals, and its colour is similar to that of teeth. They are moulded anatomically, free of metal, completely bio-inert, and resistant to decay. Zirconia has a unique ability to resist crack propagation by being able to transform from one crystalline phase to another, and the resultant volume increase stops the crack and prevents it from propagating. [10] Zirconia has demonstrated high wear resistance, excellent biocompatibility, and superior corrosion resistant. Ready-made zirconia crowns are now available for both, primary incisors and molars. Our department is passionate about child care, we have published numerous high quality articles in this domain over the past 3 years. [11–29] With this inspiration we planned to pursue research on parental satisfaction between stainless steel crowns and the newly introduced prefabricated zirconia crowns in primary mandibular molars. Previously our team has a rich experience in working on various research projects across multiple disciplines. [30–44] Now the growing trend in this area motivated us to pursue this project.

Materials and Methods

A randomized clinical trial was carried out in the department of paediatric and preventive dentistry, Saveetha dental college following the approval from the institutional review board (IHEC/SDC-PEDO 1802/19/009) from September 2019-January 2020. The design of the present study is a split-mouth trial wherein the effectiveness of two different crowns (SSCs and Zirconia crowns) were evaluated within the same patient. The nature of the study was explained to the parents of each patient, and informed consent was obtained before the procedure.

Selection criteria

This study included a total of 15 healthy paediatric children of both genders with age groups ranging from 4 to 7 years. The inclusion criteria included the presence of at least two or more in the same group of teeth (e.g. 75 and 85 or 74 and 84) in each patient involving proximal caries or teeth which has undergone pulpectomy due to early childhood caries were included in the study. The exclusion criteria included patients with American

Society of Anaesthesiologists physical status \geq III, patients in whom endocarditis prophylaxis was required, tooth in which exfoliation was imminent, tooth with internal resorption, and tooth with acute infection.

Clinical protocol

A total of 30 carious primary teeth which fulfilled the selection criteria were considered for evaluation in 15 children. The patients with bilateral pulp therapy treated teeth were randomly divided into two groups by coin toss as test (Group A) and control (Group B) group containing 15 teeth in each group.

Group A: SSCs (3M ESPE, Minneapolis, USA)

Group B: Zirconia crowns (Kidz-e-crown, Mumbai)

A single investigator (main author) performed the complete procedure of crown placement in all 30 teeth. Moreover, the two types of crown placement were carried out in the same appointment in each patient.

Clinical procedure

Local anaesthesia was administered and a rubber dam was placed. The manufacturer's guidelines were followed to develop a step by step customized tooth preparation to ensure all crowns were fitted in a similar manner. All of the crowns were placed using a standardized crown placement protocol. [45] The crowns were luted using type I Glass Ionomer Cement (GC Corp, Japan). After placement of the crowns, parents were given a set of questionnaires to assess their satisfaction regarding the restorations done either by using two different crowns using Likert scale. Parents were asked to score the criteria such as the crown's colour, size, shape and their overall appearance on a 5 point Likert scale: 1: Very unsatisfied, 2: Unsatisfied, 3: Neutral, 4: Satisfied; and 5: Being very satisfied. [8,46] The parents evaluated their child's restoration directly and not from a photograph. Participants were recalled for follow up at 1 week and at 1 month.

Result

The results of parental satisfaction are summarized in Table 1. Parental satisfaction for both groups was equal in terms of shape, size, retention, durability, and overall satisfaction. Only 7 parents (46.6%) were satisfied with the colour of SSC, whereas 15 parents (100%) were satisfied with the colour of zirconia. The parental view did not change during the study period. All 15 patients (100%) were satisfied with the zirconia crowns, while only 7 of the patients (46.6%) were satisfied with SSC [Table 1, Figure 1].

Table 1: Descriptive distribution of parental satisfaction of group I (SSC) and group II (zirconia).

| Parental satisfaction (%) | Group I | | Group II | |
|---------------------------|---------|---------|----------|---------|
| | 1 week | 1 month | 1 week | 1 month |
| Colour | 46.6 | 46.6 | 100 | 100 |
| Shape | 100 | 100 | 100 | 100 |

| | | | | |
|----------------------|------|------|-----|-----|
| Size | 100 | 100 | 100 | 100 |
| Retention | 100 | 100 | 100 | 100 |
| Durability | 100 | 100 | 100 | 100 |
| Overall satisfaction | 46.6 | 46.6 | 100 | 100 |

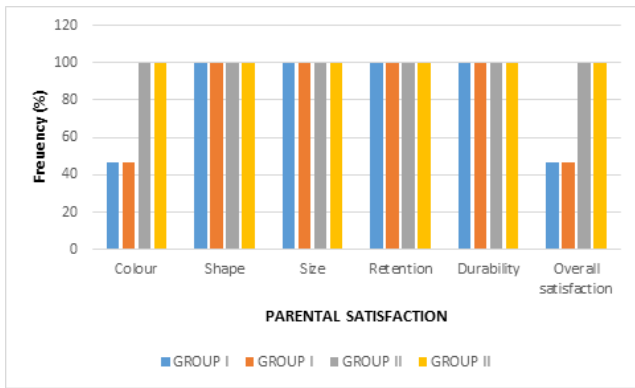


Figure 1: Frequency distribution of parental satisfaction between the two groups at one week and one-month follow-up.

Discussion

Recently, there is increasing demand for aesthetics among parents. [47] Aesthetics, durability and cost-effectiveness are the important factors taken into consideration by the parents seeking the dental treatment of their children. Children also prefer to have more aesthetic restorations. Restoration of severely decayed teeth is always a challenge to the clinician. An ideal full coronal restoration for primary teeth should be durable, easily placed, aesthetic and inexpensive [48] Placing strip crown is quite technique sensitive and desires cooperation of the child. Children who are lacking cooperative ability, it is difficult for placement of strip crowns and might affect the longevity of the restorations. [49] Contamination of the tooth with oral tissue fluids and moisture results in failure of the restoration. [50] So utmost care should be taken to prevent moisture contamination to achieve excellent retention. Many aesthetic crowns are available in the dental market. In the last few decades, aesthetic restoration was found to replace the conventional stainless steel crown which has poor aesthetic appearance. [51] Zirconia crowns are less technique sensitive and more moisture tolerant.

Kidz-e-zirconia crowns were popularized in 2014 and are labelled as “smart” crowns. They are patented research based crowns exclusively used for the restoration of primary anterior and posterior teeth. These crowns are anatomically designed, thinner, biocompatible and are durable. The smart design of the posterior crown consists of feather edge margin, sand blasted inner surface, uniform axial thickness, retentive boxes, ergonomic labelling and flat occlusal surface. It's available as regular, narrow and narrow mid-size crowns. Narrow and mid-size crowns help in space loss and adjacent crown cases with minimal preparation. Major advantage of these crowns is that they can be sterilized in an autoclave. Before autoclaving,

cleaning off the blood and saliva with alcohol is important. Repeated cycles of autoclaving won't affect the strength, material properties and colour of the crowns. Unlike other zirconia crowns, kidz-e-crown can be luted using Glass Ionomer Cement. The questionnaire was completed by the parent in the absence of the paediatric dentist. This was done to avoid the possibility of parents feeling pressured to produce more positive ratings in the presence of the dentist.

The public is becoming more conscious about aesthetics and parents are insisting on more aesthetically satisfying restorations. [4] This is in accordance with our study as only 46.6% parents were gratified with the colour of SSC compared to 100% in zirconia. Parental view of the child's restored teeth may vary with the clinician's point of view. The preoperative appearance of their child's tooth might be taken into deliberation by parents when evaluating the clinician's work. Also, the thought that extraction may be the only treatment might have led some parents to be satisfied with the aesthetics of SSC as the tooth was saved instead of being extracted. Parental view of the child's restored teeth may vary with the clinician's point of view. The preoperative appearance of their child's tooth might be taken into deliberation by parents when evaluating the clinician's work. Also, the thought that extraction may be the only treatment might have led some parents to be satisfied with the aesthetics of SSC as the tooth was saved instead of being extracted. [52] The present study showed 100% acceptance of the size and shape of SSC despite the fact that 46.6% of the parents were not satisfied with the colour of SSC. Zirconia crowns showed 100% parental satisfaction. Our results are similar to that of Leith and Connell (93%) who stated that parental acceptance of preveneered posterior crowns was high despite the fact that many crowns showed fracture of the veneer. [53] All parents in the zirconia group were satisfied with size and shape. According to Fishman et al., the children themselves have high aesthetic expectations for the treatment of posterior teeth. This could be due to the increasing influence of media, television, and exposure to a concept of “ideal beauty” from a very young age. [54] Our institution is passionate about high quality evidence based research and has excelled in various fields. [23,55-60] We hope this study adds to this rich legacy.

In the past few years, there have been many researches implying that the zirconia crowns may be a strong and aesthetically superior restoration for carious primary teeth. [9] The results of our study seem to imply that, as more aesthetic options become available, parents and children will have greater aesthetic expectations for the treatment of posterior primary teeth. Treatment recommendations vary, and outcome assessments may be an effective method for establishing what

is deemed to be good care for patients. This concept challenges the dental profession to make treatment recommendations based on clinical outcomes research. There were some limitations to the present study that were difficult to overcome, most significant being small sample size. However, all patients are being followed up. Since our study is the first of its kind with a new preformed zirconia crown, clinical studies with regular follow-up for a longer period will prove whether zirconia will be as successful as SSC for primary molars in the future.

Conclusion

Both stainless steel crowns and zirconia crowns are an excellent choice for posterior teeth full coverage restorations. However, zirconia crowns performed better in the aspect of aesthetic despite its high cost. Zirconia crowns can be considered a clinically acceptable, aesthetic alternative to SSC in primary molars.

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