A Better Choice for Primary Anterior Tooth Restoration Between Strip Crowns and Zirconia Crowns: A Narrative Review

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Abstract

Pediatric dentists very commonly encounter patients with carious primary maxillary anterior teeth demanding esthetic treatment. Meeting this need of the patient and their parents is the greatest challenge to the clinician, considering the tender age of the patient and limited cooperation available during the treatment. Strip crowns were popularly used conventional esthetic restorative option to treat such teeth with a good degree of acceptance from patients and their parents. However, they are technique sensitive and have other disadvantages. The process of overcoming these drawbacks introduced zirconia crowns to the primary anterior esthetic armamentarium. This review discusses the comparison between strip crowns and zirconia crowns for primary anterior tooth restoration. The PubMed database was accessed to search for relevant articles using key terms: (primary anterior teeth) AND (strip crown) and (primary anterior teeth) AND (zirconia crowns).

Key words: Primary anterior teeth, Esthetics, Strip crowns, Zirconia crowns

Introduction

Early childhood caries (ECC) is highly prevalent global disease that specifically affects children with deciduous dentition.1 High sugar intake commonly associated with improper feeding habits and poor oral hygiene are the clearly stated causes for ECC, which typically results in smooth surface caries affecting the maxillary anterior.2,3,4 Severe loss of coronal tooth structure of maxillary anterior of pre-school children affects the speech and esthetics demanding their immediate restoration. Restoration of these teeth to near normal form and function becomes a great challenge for a paediatric dentist, vowing to the reported high failure rates.5

One of the popular esthetic treatment options, that is widely practiced for more than 3 decades is strip crown composite resin restoration.6,7 Strip crowns are the crown forms used for restoring primary anterior teeth having large multi surface caries, however with sufficient tooth structure available following caries removal.6,8 While strip crowns were known to offer immediate supreme esthetics to carious primary anterior teeth, their questionable long-term esthetics, durability and technique sensitivity were the biggest concerns.6,9

To overcome the said disadvantages of the strip crowns, primary anterior teeth esthetic dentistry saw lot of advent in terms of various full coverage crowns.5

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Among them zirconia esthetic crowns are the latest ones marketed since 2008 and are greatly accepted. These crowns are fabricated using yttrium-stabilized zirconium by milling technique or injection molding and they are autoclavable. While these crowns have mechanical properties akin to a metal crown, they can’t be adjusted via contouring or crimping or trimming thus demanding greater tooth reduction for a passive fit. Another disadvantage of zirconia crowns is that, the crown color can’t be adjusted to match the adjacent tooth color. The awareness and the knowledge of pediatric dentists seems to be lacking to use zirconia crowns as compared to strip crowns as per a web based survey conducted in 2017. At present, both strip and zirconia crowns are popularly available in the market. When there is an indicated case in which either of the above-mentioned restoration options can be used, paediatric dentist must weigh the pros and cons of each to choose one. Through our search we could find only one randomized controlled trial published till date, which compares these two widely used crowns in paediatric dentistry as primary anterior teeth restoration. This review aims at comparing different properties of strip and zirconia crowns as studied individually and quoted in the literature to help the clinician make a better decision for restoring anterior esthetics of the child.

**Methodology and Analysis**

The PubMed database was accessed to search for relevant articles using key terms. Articles published in English and full articles were included in the final analysis. The search strategy used the following keywords: (primary anterior teeth) AND (strip crown) and (primary anterior teeth) AND (zirconia crowns). Figure 1 describes the details about the articles found on search strategy and included during this review. Title, abstract and full text screening were done by three reviewers. Any sort of disagreement found was settled by discussing among three reviewers. The quality assessment of the included cross-sectional studies were based on Newcastle – Ottawa Scale with three components (selection, comparability and outcome measure). The total quality score range from 0–10 (Table 1).

**Table 1 depicting quality assessment of included cross-sectional studies based on Newcastle – Ottawa Scale**

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<thead>
<tr>
<th>Study</th>
<th>Selection</th>
<th>Comparability</th>
<th>Outcome</th>
<th>Total score</th>
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<tr>
<td>Holsinger et al. (2016)</td>
<td>***</td>
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<tr>
<td>Halawany et al. (2017)</td>
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<td>8</td>
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Analysis of one randomised controlled trial (RCT) included in the study carried low risk in terms of random sequence generation, allocation concealment and attrition rate. It carried high risk in terms of blinding, outcome assessment for blinding and selective reporting.

**Results and Discussion**

One of the greatest challenges encountered by the paediatric dentists is restoring the primary teeth to good esthetics. It’s directly related to the child/parent’s concern about the esthetic impact of restorative therapy that you suggest for an anterior tooth. While, the existing literature provides a broad idea on the various indications and choices available for primary esthetic zone restoration, the treatment decision is finally dependent on the clinician’s opinion, clinical expertise and experience. Currently, strip crowns and zirconia crowns are trending esthetic restorative options for anterior teeth with few common overlapping indications between the two.
Strip crowns are the simple clear plastic crown forms, which will be trimmed and adjusted to fit the tooth to be restored. Adequate seating of the crown form requires minimal incisal and interproximal reduction of the tooth. Following filling the crown form with composite, it will be placed on the tooth. After curing, the crown form will be cut, stripped out and hence the name strip crown. The final restoration requires minimal finishing and polishing. While isolation is critical for the success of strip crowns, Psaltis et al described an alternative simple and cost effective isolation technique for placing strip crowns using orthodontic elastomers. Kupietzky et al reported excellent overall parent satisfaction with resin composite strip crown restorations of the multi surface carious lesions of primary maxillary anterior teeth. This study also found that the durability of the crown was the parental concern and it negatively affected overall parent satisfaction than the perfect color match. Various restorative materials have been tried for filling the strip crown forms. Vignesh et al suggested Protemp 4 as a possible alternative to packable pedo shade packable composite resin to be used inside strip crown forms. Kupietzky et al have also studied elaborately the clinical performance of strip crowns. They suggested this crown form to be an esthetic and durable choice for restoring primary maxillary teeth with sufficient tooth structure. In an interventional study followed until 9 months by Duhan et al., strip crowns showed loss of retention at 9 months with no changes in anatomic form and loss of surface texture in the retained samples.

One of the said limitations of the composite strip crown is that it can’t be used when there is limited tooth structure available. However, there are case reports available in the literature which describe restoring even grossly decayed primary maxillary anterior teeth using strip crowns with good success using the support of various posts. A clinical study by Sharaf AA reported significantly improved fracture resistance of strip crowns following placement of intraradicular composite cores. Versatile strip crowns have even been tried successfully for restoring permanent maxillary anterior teeth with developmental defects.

Zirconia crowns are the latest addition to primary tooth esthetic dentistry, which has gained lot of popularity with it’s promising properties. They are referred to as “ceramic steel” as they combine the esthetics of ceramics and strength of steel. They also offer excellent biocompatibility, colour stability and durability. Literature reports comfortable function and pleasing esthetics achieved with the use of zirconia crowns and suggests them as an alternative for the restoration of primary maxillary anterior teeth. The child patient’s, as well as the parental satisfaction was high with the esthetic results obtained using zirconia crowns. The highly polished surface of zirconia crowns, repels the plaque accumulation thereby offering excellent gingival health. Yanover et al reported good marginal integrity with well adapted healthy gingiva following restoration of carious primary maxillary anterior teeth.

These are full coverage restorations, unlike strip crowns and inability to adjust them, demand greater tooth reduction and passive fit. Clark et al reported in their in vitro study that zirconia crowns require more tooth preparation in comparison to stainless steel crown for both primary anterior and posterior tooth. However, zirconia crowns can even be used to restore severely mutilated teeth and while doing so, clinicians may take the help of various posts and core build ups.

Upon reviewing the clinical performance of strip and zirconia crowns, the former has been reported to have a success rate greater than 80% on 2 years follow-up, while the later had a success rate of 100% on 6 months follow-up as reported in a systematic review by Schmoeckel et al on different interventions for early childhood caries. Alternatively, the failure rate for strip crowns ranged between 0- 51% while done chairside and under general anaesthesia, as reported by various authors.

During our search, we could find only one RCT comparing the zirconia crowns to strip crowns. This was 12 months follow up study, which showed no secondary caries and better gingival response in relation to zirconia crowns throughout the study period, however with greater wear of the opposing tooth. Alternatively, 6.7% of teeth restored using strip crowns had secondary
caries. Crown failure was seen only with 2 teeth restored with zirconia crowns and the cause for failure was trauma. With respect to the strip crowns 30% showed small but noticeable area of restoration loss and 8.3% showed larger restoration loss at the end of 12 months.

To summarize strip crown is a crown former which is indicated in restoring primary maxillary anterior teeth having 1) multisurface caries with or without endodontic treatment; 2) developmental defects or fractured due to trauma. It is contraindicated in cases where isolation can’t be achieved and in teeth with inadequate tooth structure to support the restoration. The advantages include- it involves a simple procedure, good immediate post-op esthetics, shades can be matched with the composite, cost effectiveness and the repair of the restoration is possible. The disadvantages of the same are technique sensitivity owing to poor bond strength and discoloration following contamination with blood or saliva, no long-term durability, questionable esthetics over a period and questionable marginal integrity (Figure 1).

On the other hand zirconia crowns are full coverage crowns for primary anterior and posterior teeth with 1) Multisurface caries with or without endodontic treatment; and 2) Developmental defects or fractured/discolored due to trauma. The contraindications include- the crowded dental arch, uncooperative children, the teeth with less than 2mm of supra-gingival margin and the teeth, which are to be used as abutments for space maintainer. While they have excellent long-term esthetics, good marginal integrity, good gingival health (Figure 2), better strength and retention and are not technique sensitive, the disadvantages are the crown can’t be manipulated in the form of crimping, contouring or trimming, precise and greater tooth reduction is required, color matching not possible and are expensive.

3M™ is the popular commercially available strip crown form, where as Cheng Crown, EZ Pedo, Kinder Krowns , NuSmile and Kids-e-crowns are the different brands of zirconia crowns available in the market.
Conclusions and Recommendations

Clinicians have to wisely choose between these two for a given case. This article gives an overview of the discussed crowns and may easy down the decision-making task for a paediatric dentist. The limitation of this review is that we included only one database for our search. Based on our search clinical studies comparing various aspects of these two widely used crowns in paediatric esthetic dentistry are lacking and recommended in the future.

Ethical Clearance- Taken from Institutional Ethics Committee (Manipal College of Dental Sciences, Mangalore).

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References


