



Case Report

A Case Series on Personalized Pediatric Posterior Zirconia Crowns

¹Sai Sarath Kumar, ²Gayathri Murali, ³Arun Elangovan, ⁴Dhanraj kalaivanan

¹Assitant Professor, ²Private Practitioner, ³Professor and Head of the department, ⁴Reader
, ^{1,4}Department of Pedodontics, SathyaBhama Dental College and Hospital, Chennai.

³Department of Pedodontics, Madha Dental College and Hospital, Chennai.

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ABSTRACT

Pediatric dentists must comprehend children's aesthetic perception because kids are increasingly aware of their own and other children's appearance. Many aesthetic restorations are available on the market, including open-faced stainless-steel crowns, pre-veneered stainless-steel crowns, strip crowns, and polycarbonate crowns, but each has its own drawbacks. Prefabricated zirconia crowns are a new trend among pediatric dentists for restoring carious, damaged, and malformed primary molars and anterior. Customized zirconia crowns, on the other hand, maybe able to overcome the limitations of prefabricated crowns in certain situations, particularly molars, resulting in excellent aesthetics and longevity. Our case series illustrates the use and performance of personalized zirconia crowns in a variety of challenging clinical circumstances.

Keywords: Children; zirconia crowns, esthetics, preformed crowns

Address for Correspondence:

Dr Sai Sarath Kumar

Address:

Assistant Professor, Department of Pedodontics,

Sathya Bhama Dental College and Hospital,

Tamil Nadu, Chennai- 600017.

Email ID: saisarathpedo@gmail.com

INTRODUCTION

Early childhood caries (ECC) is a rapidly progressive disease affecting the structure of primary teeth, resulting in local, systemic, psychological, aesthetic, and social difficulties as well as low quality of life¹. Aesthetic rehabilitation of such compromised primary teeth with ECC has always been a significant problem for pediatric dentists, especially when parents are concerned about the metallic appearance of stainless-steel crowns. Post pulp therapy, multisurface lesions, and interproximal preparation that extend beyond the line angle, full coverage aesthetic restorations are advised in children with high caries risk. To date, the market has seen the introduction of several full coronal aesthetic choices such as open-faced stainless-steel crowns, pre-veneered stainless-steel crowns, strip crowns, and polycarbonate crowns². However, they have shortcomings such as gingival inflammation, shade mismatch, and low survival rates due to aesthetic material fracture and poor retention due to difficulty in marginal adaption³.

Zirconia known as ceramic steel has proven its efficiency in adult dentistry. But to date, a minimal number of studies have been done in using zirconia as a restorative material (partial/ full coronal) for children. Zirconia, which is a polymorph occurs in three different forms namely monoclinic, tetragonal and cubic. The phase transforming property of zirconia facilitates the prevention of crack propagation thus aiding its durability and longevity⁴.

Prefabricated zirconia crowns have become popular among pediatric dentists who treat children for the restoration of carious, broken, and deformed primary molars. According to current research, preformed zirconia crowns are comparable to preformed metal crowns in terms of aesthetics, retention, fracture resistance, parent satisfaction, and gingival health⁵. Although prefabricated zirconia crowns are preferable in terms of clinical success, a few constraints such as the inability to flex, crimp, and contour, a more expensive armamentarium, operator expertise, and patient compliance are frequently mentioned. Because of the necessity for additional armamentarium, prefabricated zirconia crowns may be a tough alternative in certain scenarios such as space loss or the restoration of badly damaged primary molars.

To summarise, general and pediatric dentists are hesitant to utilize prefabricated zirconia crowns in posterior teeth. Nonetheless, customized zirconia crowns could overcome the limits of prefabricated crowns in certain circumstances, resulting in great aesthetics and longevity. The goal of this case study is to demonstrate how customized zirconia crowns outperform prefabricated variants in specific clinical settings.

CASE 1

A three-year-old boy reported the chief complaint of pain in his lower right back tooth region. [Fig.1 (a)]. On clinical and radiographic examination, it was diagnosed as dental caries with chronic irreversible pulpitis in 85.



Figure 1 shows:

- (a): grossly decayed lower right mandibular primary molar {85}.
- (b): right lateral view indicating the supra eruption of the opposing upper right second primary molar
- (c): occlusal view of try-in of prefabricated zirconia crown in 85
- (d): right lateral view showing occlusal discrepancy after try-in of preformed zirconia crown in 85
- (e): fabrication of personalized zirconia crown in 85
- (f) & (g): occlusal view of personalized zirconia crown in 85
- (h): optimum occlusion achieved after cementation of personalized zirconia crown in 85

Figure 1

Pulpectomy was performed in 85 under local anaesthesia on the chairside. Due to long-standing caries, there was a noticeable supra eruption of the opposing tooth on both sides which interfered with the establishment of normal occlusion as seen. [Fig.1(b)]. On the following appointment, crown preparation for prefabricated zirconia crowns (Kinder Crowns) was performed according to the manufacturer's instructions and was tried, which did not settle the occlusion, resulting in the posterior open bite depicted. [Figure 1(c), (d)] As a result, we planned for a customized zirconia crown on 85. The silicone material (Flexceed, GC Asia) was used to create the impressions. The shade was chosen using the #3D Vita Master Shade guide and then processed for crown manufacturing [Fig.1(e)]. After testing for adequate occlusion, the customized zirconia crown was tried in and the crown was luted in 85 using dual-cure resin cement (RelyX U200,3M ESPE, US). The patient was followed for six months and one year.

CASE 2

A six-year-old girl came to the department complaining of nocturnal pain in her lower left back tooth region. [Fig.1(a)]. She experienced space loss due to long-standing proximal caries involving pulp on clinical examination. Following clinical and radiographic assessment, pulpotomy was performed on the chairside under local anaesthetic in the lower left first molar. As per the parent's preference, a prefabricated zirconia crown was selected as per the manufacturer's guidance. After confirming the occlusion, the tooth was modified to receive a prefabricated zirconia crown (Kinder Crowns) and luted with dual-cure resin cement (RelyX U200,3MESPE). During the ninth month, of review dislodged crown with a fracture on the buccal aspect of 74 was noted [Fig.2 (b), (c), (d)]. Hence customized zirconia crown was planned by obtaining an impression using silicone impression material (Flexceed, GC), and a new custom fabricated zirconia crown was luted in the subsequent visit using dual-cure resin cement. [Fig.2(e), (f),(g)]. The patient was routinely checked clinically and radiographically and was checked for 1 year.

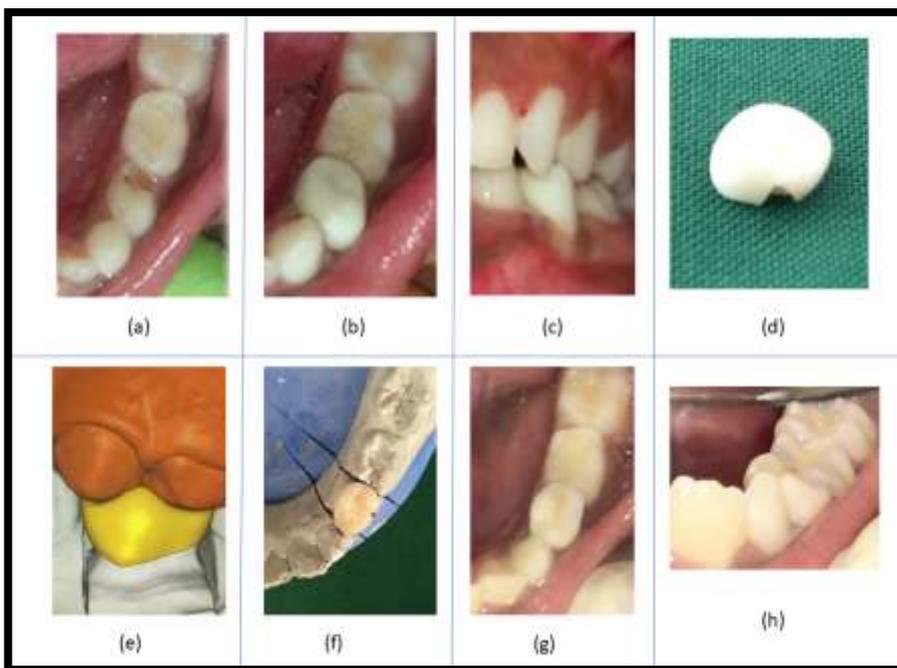


Figure 2 shows:
(a): proximal carious lesion noted in 74
(b) & (c): prefabricated zirconia crown cemented in 74
(d): buccal crack propagation and dislodged prefabricated zirconia crown during the 9th-month follow-up.
(e) & (f): fabrication of customized zirconia crown in 74
(g) & (h): occlusal view and a lateral view showing proper occlusal contouring of the customized crown

CASE 3

A three-year-old girl reported complaining of pain in her lower left back tooth region. [Fig.3(a)] On clinical examination pulp therapy was planned and customized zirconia was planned in 74 as the mesiodistal width could not be matched with the prefabricated zirconia crown (Kinder Crown).[Fig.3(b) (c)]. Customized zirconia crown was luted and performed well concerning retention, gingival health, and desired esthetics was also achieved for one year [Fig.3 (d)].

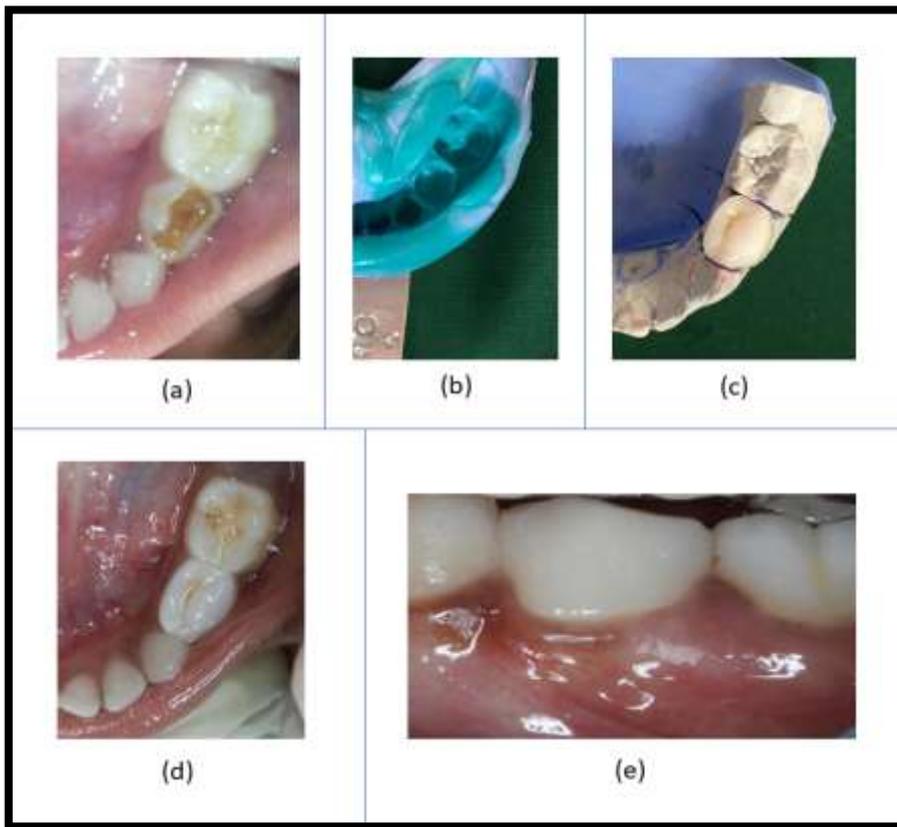


Figure 3 shows:
(a): deep carious lesion in 74
(b) & (c): fabrication of personalized zirconia crown in 74
(d): occlusal view showing perfect adaptation of the customized crown in 74
(e): excellent marginal integrity of customized zirconia crown in 74 after 1-year follow-up

DISCUSSION

Dental caries is a non-infectious, transmissible disease that produces a variety of abnormalities that influence aesthetics, self-esteem, mastication, speech, arch length maintenance, and the formation of oral habits, disrupting the overall child's health (6). Thus, restoring mutilated primary teeth is critical to preserving dentition integrity until natural exfoliation. Full coronal restorations have contributed to the achievement of the natural space maintainer's preservation. Despite the availability of a wide range of complete coronal restorations for pediatric patients, there has been a continuing search for the perfect full coronal restoration that meets both aesthetics and function.

One factor apart from esthetics that necessitates the need for esthetic metal-free full coronal restoration is the possibility of encountering patients with allergies to nickel or chromium. Literature evidence suggests that stainless steel crowns can release nickel and chromium ions into the oral fluids which may increase the chances of biocompatibility issues (6).

Preformed zirconia crowns introduced in 2010 have proved their clinical efficiency as well as esthetic superiority. They are available in various sizes and with various retention features provided by different manufacturing companies (7). Limitation of such preformed zirconia crowns is the availability of few shades and inability to trim, thus demanding excessive tooth reduction. and blood contamination issues resulting in adhesive failure (8,9). Furthermore, purchasing the entire kit to minimize problems in size selection might be fairly costly from the dentist's standpoint.

Customized crowns for pediatric patients have not been frequently sought-after treatment approaches in pediatric dentistry. However, in other domains of dentistry, this method of crown fabrication has proven to be effective. Customization of the crown not only reduces chair time) but also guarantees higher quality, as demonstrated in adult dentistry. Despite these benefits, there is insufficient data to support the personalized crown method in pediatric dentistry (10,11).

In our first patient, the supra eruption of the opposing maxillary second primary molar made preformed zirconia crown insertion unfeasible, necessitating the use of a personalized crown technique. This resulted in improved occlusion restoration and morphology of lower second primary molars. [Fig.1(h)] In the second case, due to the space discrepancy the prefabricated crown was positioned more buccally, favouring more occlusal stress, resulting in crown fracture and dislodgement. [Fig.2(d)]. This resulted in the insertion of a customized zirconia crown, which proved to be long-lasting

after a nine-month follow-up. Due to the implausible buccolingual crown width of prefabricated equivalents, we inserted a tailored zirconia crown on the lower left side in the third scenario. [Fig.3(d)] From the author's perspective, we believe that a customized zirconia crown could be a handy treatment choice in cases of occlusal disparity and space discrepancy.

Better aesthetics and occlusal morphology, minimum preparation, less contamination during cementation, and cost-effectiveness all seem to be advantages of customized crowns over prefabricated crowns. On the negative side, there is an additional impression procedure and the requirement for a second appointment.

We have documented the superiority of personalized zirconia crowns over preformed zirconia crowns in particular cases, despite the limitations of case studies. Nonetheless, there is a paucity of clinical evidence to support the use of a customized crown strategy over preformed zirconia crowns. When it comes to aesthetics and durability, both personalized and preformed zirconia crowns may be the answer. However, when the clinical context indicates that providing preformed zirconia crowns is challenging, customization is a sensible alternative. However, logical decision-making is dependent on the scenario and the operator's clinical experience.

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