

Clinical Performance and Parental Satisfaction with Composite Strip Crown and Prefabricated Zirconia Crown for Primary Anterior Teeth: A Randomized Clinical Trial

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ABSTRACT

Aim: To compare clinical performance and parental satisfaction with composite strip crown and prefabricated zirconia crown for primary anterior teeth.

Materials and methods: The study compares clinical evaluation and parental satisfaction of two different crowns for primary anterior teeth. A total of 102 teeth in each group selected between ages 3 and 6 years, who met the inclusion criteria, were randomly allocated into two groups for further evaluation. Group A for strip crowns (55 teeth) and group B for zirconia crowns (47 teeth). The crowns were evaluated clinically with various criteria like—color match, crown retention, gingival health, crown contour, opposing tooth wear, marginal integrity, and recurrent caries. The samples were also evaluated for parental satisfaction based on 5-point Likert scale and child liking was also recorded with Smiley face Likert scale at baseline, 3 and 9 months. Statistical analysis was done using Chi-square test ($p < 0.05$).

Results: Zirconia crowns showed better color match, crown retention, crown contour, and gingival health. Strip crowns showed more discoloration and chipping of material over a period of time. None of the samples showed opposing tooth wear, open margins, and recurrent caries in strip and zirconia crown group. Parents and children both were highly satisfied with zirconia crowns.

Conclusion: Clinically zirconia crowns showed higher success rate as compared to strip crowns and parental overall satisfaction was higher for zirconia crowns.

Clinical significance: Zirconia crowns exhibited a higher clinical performance and parental satisfaction; hence, if affordability is out weighted, zirconia crown stands better with esthetics of the child.

Keywords: Early childhood caries, Likert scale, Strip crown, Zirconia crown.

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INTRODUCTION

It has been stated that oral health reflects overall general health of a child. Today the world has become more sensitized toward oral disease and it can affect child's general health status, development, and well-being. Dental caries is highly prevalent oral health issue. Young children are frequently affected by tooth decay, only after the first tooth starts erupting in to the oral cavity, which is called as early childhood caries (ECC). AAPD defines ECC as "presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of six."¹

There are multiple factors associated with ECC. The primary risk factors are susceptible host, fermentable carbohydrate, micro-organism, and time. The secondary risk factors include-tooth maturation and defect, race, ethnicity, socioeconomic status, dental knowledge, and stress. Increase level of *Streptococcus mutans* is the peculiar feature of ECC. The other factors affecting pattern of ECC are chronology of primary tooth eruption, duration of the deleterious habit, and the muscular pattern of infant sucking.²⁻⁴

Dental esthetics is an essential part of facial esthetics. Nowadays people are more concerned about their esthetics whether it is for too young or too old. The psychological effects of oral esthetic improvement are significantly more crucial to a patient than conventional dental procedures. Loss of anterior teeth can lead to several problems like neuromuscular imbalance with decreased masticatory efficiency, speech disturbance, development of

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parafunctional habits, and psychological problems.⁵ There is noticeable effect on psychosocial development due to esthetic problems in both, childhood and adolescence.

Due to the high demand for esthetic anterior tooth restoration, a variety of dental crowns have been manufactured, including open faced stainless steel crowns, composite strip crowns, veneered stainless steel crowns, zirconia crowns, etc.⁶ Each of these restorations has its advantages and disadvantages.

Strip crown was introduced by Webber and colleagues in 1979.⁷ This crown is indicated for extensive decay and fractured anterior teeth. But they are contraindicated for severely decayed and gross loss of tooth structure and periodontal disease.⁸ Their key

benefits are easy to fit and trim, fast to remove, simply matches with adjacent natural teeth, give a polished surface, are highly esthetic and economic. But the strip crowns are technique sensitive and moisture contamination with blood/saliva can interfere with the bond and can alter the shade or color of the material.⁹

Since last a decade, zirconia is being used successfully in general dentistry.^{10,11} This material's application has been modified for pediatric dentistry to provide a more robust and appealing choice. EZ-pedo had been the first commercially available pediatric zirconia crown in the United States, debuting in 2008. Other commercially available zirconia crowns are NuSmile crowns, Kinder crowns, Signature crowns, etc.; the potential benefits of zirconia crowns are its magnificent esthetics, highly durable, and less technique sensitive than strip crowns. Zirconia crown also has some drawbacks, i.e., its cost, inability to crimp, and require overall more tooth reduction.¹²

Studies have reported varied success rate with strip and zirconia crown. But there is dearth of literature mentioning the comparison of strip and zirconia crown in relation to their clinical performance and parental satisfaction. Hence, the present study was conducted to access and compare both the clinical success and parental satisfaction with composite strip crowns and preformed pediatric zirconia crowns and to recommend better option between strip and zirconia crowns. The primary aim of this study was to compare clinical performance and the secondary aim was to compare parental satisfaction with composite strip crowns and prefabricated primary zirconia crowns for anterior teeth in 3–6-years-old children. The null hypothesis tested was that under the conditions of the study there would be no statistically significant difference for clinical success and parental satisfaction with prefabricated primary zirconia crowns and resin composite strip crowns.

MATERIALS AND METHODS

The proposed study was conducted as a randomized clinical trial with prior permission and consent was obtained from the ethical committee (No.-KSDEC/19-20/Apr/034) of the institution. A total of 102 teeth in each group were selected between ages 3 and 6 years, who met the inclusion criteria (Table 1) were randomly allocated based on computer randomization into one of the two groups for further evaluation. The duration of study was kept here as 9 months.

Sample Size

In our clinical study 66 samples were selected considering primary outcome as clinical performance of crowns and secondary outcome as parental satisfaction with strip and zirconia crowns from

following formulae, whose mean survival time was to be compared to achieve 90% power to detect an effect size (W) of 0.40 using a 1 degree of freedom, Chi-square test with a significance level (alpha) of 0.05 and considering dropout rate of 10% The following sample size formula was used.

Sample size $N = \text{Chi-square}/W^2$

where $W = 0.40$, Chi-square = 10.56, DF = 1, so final minimum sample size was 66 crowns for this study, so per group, 33 crowns (Flowchart 1 consort diagram).

- Group A—Resin composite strip crowns (55 teeth in 16 children).
- Group B—Preformed pediatric zirconia crowns (47 teeth in 15 children).

All treatments were done under local anesthesia. The following clinical procedures were done in each group.

For Strip Crown

After administration of local anesthesia isolation was done with rubber dam. The incisal edge of the crown was placed against the incisal edge of the tooth to choose the correct size of strip crown. Crown preparation was done according to manufactures instructions. Selection of appropriate shade of composite was done in natural light. Crown was filled approximately two-third full with resin composite material (Table 2). Masking agent was applied on prepared tooth if required. Etching was done for 15 seconds, followed by rinsing for 5 seconds and drying of tooth with water air syringe. Bonding agent was applied and then tooth was light cured. Resin composite filled celluloid strip crown was placed on their respective tooth and excess material was removed from the vent hole as well as from the cervical margin. Then, each strip crown was light cured individually for 40 seconds through the celluloid strip crown. Curing was done from facial, lingual, and incisal directions. The celluloid shell was peeled off lingually with a scalpel or explorer, and the rubber dam was removed. Occlusion was checked and adjusted if needed. Finishing was performed if required, using composite finishing Sof-Lex disc.

For Zirconia Crown

After selection of correct crown, administration of LA was performed. Crown preparation was done according to manufacturer's instruction. Next, crown was placed on tooth for try in. After proper placement of the crown, it was cemented with RelyX™ Lute 2 cement (Table 2) and the excess cement was cleaned with 2 × 2 moist gauze and explorer. The floss was passed proximally to remove excess cement. The patient was then asked to close the mouth in centric relation.

Table 1: Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> • Good general health • Mandibular incisor must be present • At least half to two-third of clinical crown requires after caries removal • Discolored teeth • Developmental enamel defects • Patient with ECC • Traumatized tooth • Primary anterior teeth with at least two-third of root length • Children with Frankl's behavior rating 3 and 4 • Age-group: 3–6 years 	<ul style="list-style-type: none"> • Anxious, uncooperative children • Anterior teeth that cannot be restored • Teeth with proximity to exfoliate • Children with habit of bruxism or children having deep bite • Children with special healthcare needs • Presence of tooth wear on primary mandibular lower incisors/missing primary mandibular lower incisors • Patient not signing consent

Flowchart 1: A consort diagram showing evaluation of patients

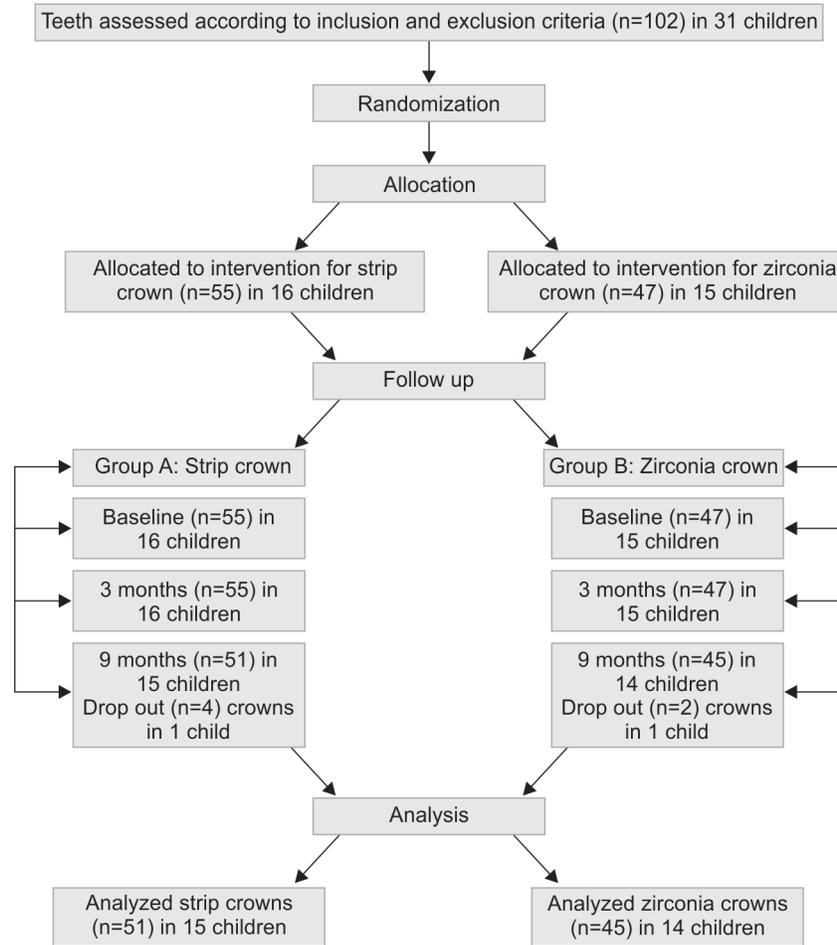


Table 2: Materials used in study

Materials
Local anesthesia—2% lignocaine HCL with adrenalin 1 in 80,000
Crown-kit (Strip Crown—3M-ESPE Dental product)
(Zirconia Crown—Signature crown 3M Lava™ Zirconia)
Luting Cement—Glass ionomer cement-RelyX™ Lute 2
Etchant—Scotchbond etchant (self-etch) 3M ESPE Dental product
Bonding agent—3M ESPE Scotchbond universal adhesive
3M ESPE Filtek Z250 XT Universal Restorative resin composite (shade—A1, A2, B1, B2)
Masking agent—3M ESPE 5508U Masking agent syringe (universal shade)

After placement of strip/zirconia crown, following instructions were given:

- Parents were asked to watch the child’s diet and avoid sticky foods like chewing gum, fruit, snacks, caramel, etc.
- Report to dentist if the crown becomes loose, chip off, or comes out. Save and carry the crown to dentist if crown comes out.
- The clinical assessment was done visually, using a mirror and an explorer at 3 and 9 months follow-up visit.

Here, one child in group A and one child in group B were failed to come for the follow-up at 9 months. Thus, they were considered as drop-outs. All parameters to assess the clinical performance are

as follows: color match, crown retention, crown contour and gingival health, opposing tooth wear, marginal integrity, and recurrent caries. Parameters were observed and evaluated at baseline, 3 and 9 months according to Modified United States Public Health Service (USPHS) criteria.

Color Match

Color match was recorded in both the groups at baseline (after 24 hours of crown placement), 3 and 9 months follow-up. The color mismatch was identified by correlating strip/zirconia crown to the color of adjacent teeth in natural light with upright position between 5 and 10 seconds only.

Crown Retention

It was recorded by clinical examination and scoring was done as followed:

- 0 = Intact
- 1 = Chipped/small but noticeable areas of loss of material
- 2 = Large loss of material
- 3 = Complete loss of crown

Gingival Index

A gingival index, based on the Loe and Silness scoring criteria (1963), was assessed for both types of groups at baseline (after 24 hours of crown placement), 3 and 9 months follow-up visit (Flowchart 1).



It was measured by gently inserting the tip of a periodontal probe into the sulcus surrounding each crowned tooth. Scoring was as followed:

- 0 = Normal (Absence of inflammation)
- 1 = Mild gingivitis (slight change in color, slight edema. No bleeding on probing)
- 2 = Moderate gingivitis (redness, edema and glazing. Bleeding on probing)
- 3 = Severe gingivitis (marked redness and edema; ulceration; tendency to spontaneous bleeding)

Crown Contour

Crown contour was recorded by same single operator and scores were given:

- 0 = Crown is cosmetic, natural looking
- 1 = Size/shape is acceptable
- 2 = Not ideal crown, not esthetic
- 3 = Distracts from appearance of the mouth

Crown Marginal Integrity

Marginal adaptation was observed at labial and palatal gingival margin with the help of an explorer. Sealed gingival margin was considered as closed margin and poor gingival margin was noted as open margin.

Opposing Tooth Wear

The wear of the antagonist tooth was recorded as follows: 0—absence of wear; 1—wear on only incisal edge.

Recurrent Caries

Clinical and visual examination was done to check the recurrent caries.

Parental satisfaction was assessed at baseline and recall examination to determine their satisfaction level with 5-point Likert scale where 1—very dissatisfied; 2—dissatisfied; 3—neutrally satisfied; 4—satisfied; 5—very satisfied. Parents were asked to rate their satisfaction regarding appearance, color, size, durability, and overall satisfaction for the crowns.

Child's perception regarding their esthetics with crown was also considered in this study. Children were asked to rank their strip and zirconia crowns based on "Smiley Face Likert Scale." Children were explained the scale in their own language and in simpler way and were asked to rank accordingly.

Statistical Analysis

The case number, the date of crown cementation, and various relevant demographic details were recorded for each participant. Results were collected by the researcher and verified by the supervisors of this study before being submitted to a statistician for analysis. The data were analyzed with IBM SPSS 2.0 for windows statistical software. Statistical analysis was done using Chi-square test ($p < 0.05$).

RESULTS

For Clinical Success of Strip and Zirconia Crowns

Clinically, statistically significant difference was seen in color match ($p = 0.001$), crown retention ($p = 0.002$), gingival index ($p = 0.003$), crown contour ($p = 0.002$) (Table 3). None of the group showed opposing tooth wear, marginal integrity, and recurrent caries.

For Parental Satisfaction

It was observed that parents were not satisfied with appearance, color, durability, and overall satisfaction with strip crowns at 9 months (Fig. 1A). Here, statistical significance was seen with color ($p = 0.042$) and restoration failure/durability ($p = 0.002$). Higher parental satisfaction was noted with zirconia crowns (Fig. 1B).

Child Rating for Strip Crowns and Zirconia Crowns

All the children liked their crown at baseline. Only one child was not satisfied with strip crown and he scored—4 at 3 months follow-up. Thirteen children (92.8%) liked their zirconia crown at 9 months, except one child who scored—3 due to the loss of crown. For strip crown group only 66.7% children were highly pleased (Fig. 1C).

DISCUSSION

In the current scenario, dentistry has already entered in the new field of awareness where young children want to look even better and their parents look upon the pediatric dentists, as they can help by providing the best solution, not only for caries management, space maintenance, broken teeth but also for esthetics management. Destruction of anterior teeth may also lead to development of parafunctional habits like tongue thrusting and speech problems, psychological problems, reduced masticatory efficiency, and loss of vertical dimension of occlusion.⁸

There are multiple options for the treatment of conditions such as ECC, enamel hypoplasia, discoloration, tooth fractures and bruxism, which causes an esthetic deficiency in children. Though many latest methods for the restoration of decayed teeth are being practiced, it is still difficult to please the patients and especially parents of children who desire superior esthetics. Available options are silicate cements, resin composite restoration with different acid etch techniques, open face stainless steel crowns, polycarbonate crowns, strip crowns, and preformed zirconia crowns.¹²

Among the above-mentioned treatment modalities for anterior esthetics, strip crown was chosen because it is simple to fit and trim, has fast and easy removal, it easily matches with natural dentition, gives a smooth shiny surface, has easy shade control with composite, are superior—esthetically, economically, and functionally. Another option chosen for this study was pediatric preformed zirconia crown, as it has superior esthetics, maximum coverage of the treated tooth, and is relatively a less technique sensitive.¹³

In this study, clinical evaluation and parental satisfaction of two different full coronal restorations for primary maxillary anterior teeth were performed. Strip crowns and Zirconia crowns were clinically evaluated based on various variables like color match, crown retention, gingival index, crown contour, opposing tooth wear, and marginal integrity and recurrent caries.

Although shade assessment is subjective in nature, all color match and shade assessment were performed by the single operator to reduce the error. Based on color match, zirconia crown showed 100% success rate whereas, among all the samples of strip crowns, 2 crowns (3.6%) showed slight shade mismatch at 3 months, and 15 crowns (29.4%) showed color mismatch at 9 months follow-up. Reason for color mismatch could be—incomplete light curing of resin composite, microleakage due to chipping/loss of material, or blood contamination during the procedure that can affect the hue of the resin composite material. Alonso et al.¹⁴ did a clinical study of direct composite full coverage crown and they have shown that in their total 89% of cases reported cervical discoloration due to

Comparison of Strip and Zirconia Crown in Primary Teeth

Table 3: Clinical success of strip and zirconia crowns

Parameters and their characteristics		Strip crown	Zirconia crown	p value
Color match				
Baseline	No noticeable difference from adjacent teeth	55 (100%)	47 (100%)	—
	Slight shade mismatch	0	0	
	Obvious shade mismatch	0	0	
3 months	No noticeable difference from adjacent teeth	53 (96.36%)	47 (100%)	0.187
	Slight shade mismatch	2 (3.6%)	0	
	Obvious shade mismatch	0	0	
9 months	No noticeable difference from adjacent teeth	36 (70.58%)	45 (100%)	0.001 (p <0.05)
	Slight shade mismatch	15 (29.4%)	0	
	Obvious shade mismatch	0	0	
Crown retention				
Baseline	Intact	55 (100%)	47 (100%)	—
	Chipped/small but noticeable area of loss of material	0	0	
	Large loss of material	0	0	
	Complete loss of crown	0	0	
3 months	Intact	55 (100%)	47 (100%)	—
	Chipped/small but noticeable area of loss of material	0	0	
	Large loss of material	0	0	
	Complete loss of crown	0	0	
9 months	Intact	41 (80.4%)	44 (97.8%)	0.002 (p <0.05)
	Chipped/small but noticeable area of loss of material	4 (7.8%)	0	
	Large loss of material	6 (11.8%)	0	
	Complete loss of crown	0	1 (2.1%)	
Gingival index				
Baseline	No inflammation	55 (100%)	47 (100%)	—
	Mild gingivitis	0	0	
	Moderate gingivitis	0	0	
	Severe gingivitis	0	0	
3 months	No inflammation	53 (96.36%)	47 (100%)	0.187
	Mild gingivitis	2 (3.6%)	0	
	Moderate gingivitis	0	0	
	Severe gingivitis	0	0	
9 months	No inflammation	42 (82.35%)	45 (100%)	0.003 (p <0.05)
	Mild gingivitis	9 (17.6%)	0	
	Moderate gingivitis	0	0	
	Severe gingivitis	0	0	
Crown contour				
Baseline	Crown is cosmetic, natural looking, size/shape is acceptable	55 (100%)	47 (100%)	—
	Not ideal, crown not esthetic	0	0	
	Detracts from appearance of the mouth	0	0	



Comparison of Strip and Zirconia Crown in Primary Teeth

3 months	Crown is cosmetic, natural looking, size/shape is acceptable,	55 (100%)	47 (100%)	—
	Not ideal, Crown not esthetic	0	0	
	Detracts from appearance of the mouth	0	0	
9 months	Crown is cosmetic, natural looking, size/shape is acceptable,	41 (80.4%)	44 (97.8%)	0.002 (p < 0.05)
	Not ideal, Crown not esthetic	0	0	
	Detracts from appearance of the mouth	10 (19.6%)	1 (2.22%)	
Opposing tooth wear				
Baseline	Yes	0	0	—
	No	55 (100%)	47 (100%)	
3 months	Yes	0	0	—
	No	55 (100%)	47 (100%)	
9 months	Yes	0	0	—
	No	51 (100%)	45 (100%)	
Marginal integrity				
Baseline	Open margin	0	0	—
	Closed margin	55 (100%)	47 (100%)	
3 months	Open margin	0	0	—
	Closed margin	55 (100%)	47 (100%)	
9 months	Open margin	0	0	—
	Closed margin	51 (100%)	45 (100%)	
Recurrent caries				
Baseline	Yes	0	0	—
	No	55 (100%)	47 (100%)	
3 months	Yes	0	0	—
	No	55 (100%)	47 (100%)	
9 months	Yes	0	0	—
	No	51 (100%)	45 (100%)	

Those bold values are statistically significant where, $p < 0.05$

chip fractures, leading to loss of adaptation and consequently microfiltration.

Based on crown retention, statistical significance was seen (0.002) with higher success rate (97.8%) in zirconia crown group as compared to strip crown (80.4%). The greater restoration failure in strip crowns in this study may be elucidated by the two main facts. (1) Success of composite materials depends highly on remaining tooth structure after caries removal and crown preparation is critical to their retention rate. (2) Procedure for strip crowns is more technique sensitive and required more patient cooperation as lack of co-operation can affect bond strength.¹⁵ Kupietzky et al.¹⁶ found 80% of success rate which was almost similar to this study. Success rate of 88% was found in the study done by Waggoner et al.¹⁷ and Ram and Fuks.¹⁸ As mentioned by Kupietzky et al.¹⁹ for the teeth which are more damaged, endodontic treatment influences the overall retention. In this study also most of the crowns were bonded to pulp treated teeth which could have accounted for this observation.

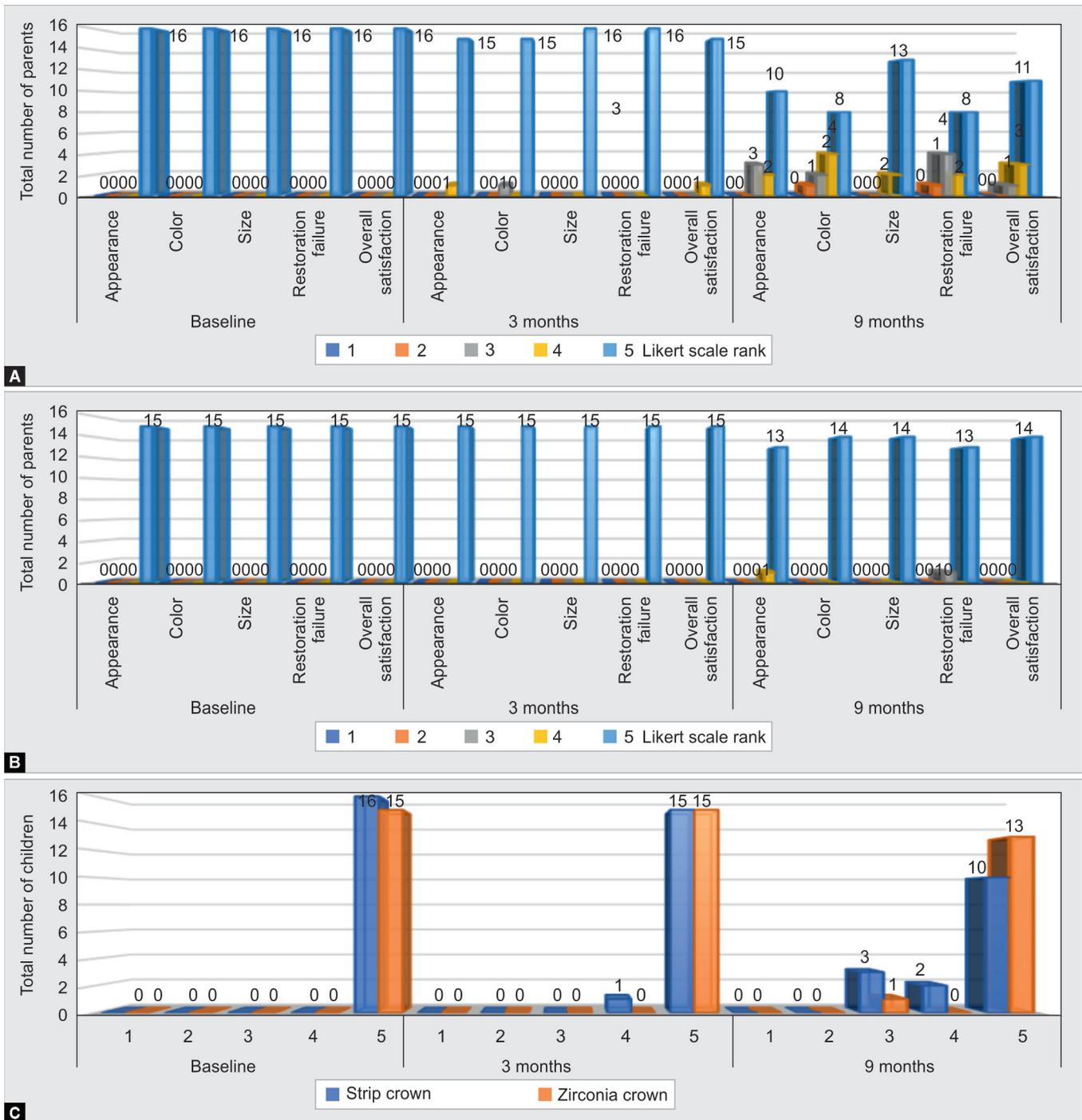
Alaki et al.²⁰ performed a study to Compare zirconia and strip crowns in primary maxillary anterior teeth and they had shown 98.3% success rate with zirconia crowns over a period of 12 months follow-up. The flexural strength of zirconia oxide materials has been reported to be in the range of 900–1,100 MPa. This is approximately twice as strong as alumina oxide ceramics and five times greater than standard glass ceramics. The fracture toughness is another

important factor which makes the zirconia crown more durable in nature.²¹

The luting cement has a great role in retention of crown over the prepared tooth. The cement provides mechanical resistance to displacement of restoration and also resists fracture when load is applied to the restoration. The luting cement helps in establishing good marginal seal and also decreases microleakage.^{22,23} Reduced microleakage has the ability to minimize clinical failures caused by recurrent caries, pulpal pathology, and root canal treatment failures. Coronal microleakage²⁴ consequently affects retention and longevity of the crown/restoration. In this study, all the zirconia crowns were luted with RMGIC Rely X Luting 2 cement which showed 97.8% of success rate over a period of 9 months follow up. Resin-modified glass ionomer cement (RMGIC) combines the advantages of resins and traditional GIC, such as adhesion and fluoride release, with enhanced physical properties that decrease the risk of cohesive failure.²⁴

In the evaluation of gingival health, zirconia crown had 100% success rate while strip crown had 82.35% success rate. All the post-op instructions to maintain oral hygiene were given to the parents. Parents were not advised to change the tooth paste and tooth brush. At every follow-up, parents were asked whether their children followed all post-op instructions or not. The one possible reason could be more plaque accumulation at cervical margin of strip crown which results in gingival inflammation. Another reason

Comparison of Strip and Zirconia Crown in Primary Teeth



Figs 1A to C: (A) Graph showing parental ranking for strip crown at baseline, 3 and 9 months; (B) Graph showing parental ranking for zirconia crown at baseline, 3 and 9 months; (C) Graph showing child ratings based on their likings for crowns placed

might be due to lack of oral hygiene measures. Because of the fact that the zirconia crown is biocompatible and has polished smooth surface, it accumulates less plaque, and as a result, there will be less gingival inflammation. A study by Waggoner et al.¹⁷ showed mild marginal gingivitis in 81 crowns (56%) and 2 crown showed moderate gingivitis out of 44 crowns. This may be due to more cervical plaque accumulation and hence more inflammation.⁸ According to Padbury et al.,²⁵ keeping the restored margins coronal to the free gingival margin is preferable and Lee et al.²⁶ stated that

subgingival positioning is the most important factor in the retention of full-coverage crowns for primary teeth.

Regarding the crown contour, statistical significance (0.002) was noted with strip and zirconia crowns. 97.8% of zirconia crowns and 80.4% of strip crowns were noted as cosmetic and natural looking with acceptable size/shape. In our study, 19.6% of strip crowns were observed as detracted from appearance of mouth at 9 months follow-up and possible reason might be restoration failure of the strip crowns. Loss of material from restored strip crowns could render them

unesthetic. Hence the crown contour was not acceptable. According to Kupietzky et al.,²⁷ 34% failure rate in crown contour was found, with 3% cases showing nonesthetic crown.

While evaluating opposing tooth wear, marginal integrity, and recurrent caries, 100% success rate was seen between both the groups. Possible reason in our study could be short duration of follow-up (9 months) which might have influenced the result; however if the time frame had been longer, a possibility of different outcome might be seen. Alaki et al.²⁰ found that there was loss of enamel surface in 11.7% of natural teeth opposing zirconia crowns. DeLong et al.²⁸ mentioned that wear between enamel and dental restorations is a significant factor that should always be included in the selection of restorative materials in clinical practice. Denial²⁹ 36 reported that 14% of teeth showed open margin with EZ-Pedo zirconia crowns in 24 months interval. A study done by Alaki et al.²⁰ reported that teeth restored with composite resin strip crowns developed recurrent caries in 6.7% teeth in the 12-months follow-up visit. One reason could be inadequate preventive treatment which can lead to recurrent caries. Poor oral hygiene and high cariogenic diet could be another reason. A study by Denial et al.²⁹ suggested results similar to our study that none of the crown reported recurrent caries.

Likert scale is applied as one of the most fundamental and frequently used psychometric tools in educational and social sciences research.³⁰ Likert scale was devised in order to measure "attitude" in a scientifically accepted and validated manner in 1932.^{31,32} Likert scale is largely depending upon two diversities—symmetric and asymmetric Likert scale. If the position of neutrality (neutral/do not know) lies exactly in between two extremes of strongly disagree to strongly agree, it provides independence to a participant to choose any response in a balanced and symmetric way in either direction. This construction is known as symmetric scale. On the other hand, asymmetric Likert scale offers less choices on one side of neutrality (average) as compared to other side.^{33–35} So, here in our study 5-point symmetric Likert scale was chosen. Parents were asked to pay attention on parameters like appearance, color, size, restoration durability of crowns as well as their overall satisfaction at baseline, 3 and 9 months follow-up period.

This study showed mean Likert scale in strip crown was less (4.54) as compared to zirconia crowns (4.95). Parents were dissatisfied due to gradual discoloration of some of strip crowns and its durability at 9 months follow-up. Here, the result is supported by Salami et al.¹⁵ who concluded in their study that parental overall satisfaction was higher for zirconia primary crowns followed by strip crowns and least for PVSSC crowns. Parents were least satisfied with durability of strip crowns in their study.

Child's liking and perception also matter when esthetic comes. Therefore, here in our study, child's liking and disliking were recorded with "Smiley Face Likert Scale." According to Haddad et al.,³⁶ Laerhoven et al.,³⁷ and Millen et al.,³⁸ children prefer Likert scales over similar simple response items, for example, Visual Analogue Scales. When used with children, a pictorial Likert scale is often used with image as anchor points.³⁹ Hence, Smiley Face Likert scale was used. The most commonly used images are smiley faces (range from 1 to 5) where one being very unhappy and five being very happy. Children were very happy with strip crowns and zirconia crowns at baseline and 3 months follow-up. At 9 months follow-up, 92.8% of children were very much happy with zirconia crowns, whereas only 66.7% children scored 5 with strip crown. The main reason given by children for lower score of strip crowns

was discoloration and chipping off over a period of time. Hence, zirconia crowns were more opted by children for optimize their esthetics. It was observed that children of studied age were capable of appreciating their esthetics.

LIMITATIONS IN STUDY

- This study was map out for 12 months. However, due to pandemic (COVID) long follow-up was not possible thus 9 months follow-up was chosen here. A long-term follow-up is required for more detailed clinical observation.
- A larger sample size would provide more adequate results.
- A radiographical evaluation would have provided better comparison in clinical point of view.

CONCLUSION

The teeth restored with zirconia crowns showed better match with adjacent tooth color, retention, contour, and gingival health as compared to strip crowns at 9 months. More tooth reduction is required for zirconia crown as compared to strip crown. Hence, they are better recommended for pulp treated tooth. Zirconia crowns have a considerable advantage over strip crown due to their durability. Parents are more satisfied with zirconia crowns as compared to strip crowns. Here, children liked zirconia crowns more as compared to strip crowns. Both strip and zirconia crowns can be used to restore primary anterior teeth, but zirconia crowns showed better success rate clinically as well as higher parental and child satisfaction.

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