

Comparative Evaluation of Parental Satisfaction Following Esthetic Rehabilitation of Primary Maxillary Anterior Teeth Using Composite Resin and Autopolymerizing Resin for Use in Strip Crowns

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Citation of this Article: Dr Shifali HG, Dr Madhusudan K Kaikure, Dr Sowmya B Shetty, Dr Akshita Shetty, Dr Nishma S, Dr Sowjanya Shetty, “Comparative Evaluation of Parental Satisfaction Following Esthetic Rehabilitation of Primary Maxillary Anterior Teeth Using Composite Resin and Autopolymerizing Resin for Use in Strip Crowns” IJDSCR – July – 2026, Vol. – 8, Issue - 4, Page No. 22-33.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

ABSTRACT

Background

Restoring severely decayed primary maxillary anterior teeth is challenging in pediatric dentistry. Composite strip crowns are widely used, but their technique sensitivity and esthetic durability remain concerns. Protemp 4 has been proposed as an alternative because of its handling and esthetic properties. Parental satisfaction is an important

patient-reported outcome in pediatric dental care.

Aim

The aim of the study is to evaluate and compare the parental satisfaction of composite resin and auto polymerizing resin (protemp 4) for use in strip crowns in primary incisors.

Materials and Methods

This prospective comparative study included children aged 3–6 years requiring full-coronal restoration of primary maxillary anterior teeth. Sixty teeth were allocated into two groups (n = 30 each): Group I received composite resin strip crowns (Filtek, 3M ESPE) and Group II received Protemp 4 strip crowns (3M ESPE). Parental satisfaction was assessed immediately after treatment and at 9 months using a five-point Likert scale evaluating appearance, colour, size, and overall satisfaction. Data were analyzed using descriptive statistics and the Chi-square test, with $p < 0.05$ considered significant.

Results

Both groups showed high parental satisfaction at baseline and at 9 months. However, Protemp 4 strip crowns received a higher proportion of “very satisfied” responses than composite strip crowns. Overall satisfaction remained favorable in both groups throughout follow-up.

Conclusion

Both restorative approaches achieved high parental satisfaction. Auto polymerizing resin (protemp 4) strip crowns showed a greater parental acceptance and may be a promising alternative for esthetic rehabilitation of primary maxillary anterior teeth.

Keywords

Early childhood caries; Primary anterior teeth; Composite strip crown; Protemp 4; Parental satisfaction; Pediatric dentistry.

INTRODUCTION

Early childhood caries (ECC) is one of the most prevalent chronic diseases affecting preschool children worldwide and continues to pose a significant public health challenge despite advances in preventive dentistry. The disease is characterized by the presence of one or more decayed, missing, or filled tooth surfaces in any primary tooth of a child younger than six years of age. Untreated ECC frequently affects the maxillary primary anterior teeth because of their early eruption and prolonged exposure to cariogenic feeding practices. Extensive destruction of these teeth compromises esthetics, mastication, speech development, and psychological well-being, thereby negatively influencing the child's oral health-related quality of life and social interactions. ^[1,2,3]

The rehabilitation of severely decayed primary anterior teeth has become an integral component of pediatric dental practice. In addition to restoring function, esthetic rehabilitation plays a vital role in improving children's self-esteem and social confidence while simultaneously addressing parental concerns regarding their child's appearance. Successful restoration of primary anterior teeth should therefore satisfy both clinical performance criteria and parental expectations, as parents are the primary decision-makers regarding dental treatment and future oral healthcare for their children. ^[4,5,6]

Composite resin strip crowns have long been regarded as the esthetic restoration of choice for grossly mutilated primary anterior teeth because of their excellent esthetics, conservative tooth preparation, and ability to closely mimic natural tooth morphology. Despite these advantages, their clinical success is highly dependent on operator skill, meticulous moisture control, and patient cooperation. Furthermore, composite strip crowns may exhibit marginal deterioration, discoloration, fracture, or loss of retention over time, particularly in young children where achieving optimal isolation can be challenging.^[7,8]

In recent years, bis-acryl composite resin materials have gained attention as potential alternatives for esthetic anterior restorations because of their improved mechanical properties, ease of manipulation, reduced polymerization shrinkage, enhanced polishability, and favorable color stability. Protemp™ 4 (3M ESPE), an autopolymerizing nanofilled bis-acryl composite resin initially developed for provisional restorations, has demonstrated excellent surface characteristics, adequate flexural strength, and superior handling properties. These characteristics suggest that it may serve as a promising alternative restorative material for strip crown restorations in primary anterior teeth. However, evidence regarding parental perception and acceptance of Protemp 4 restorations remains limited.^[9,10]

Therefore, the present study was undertaken to

compare parental satisfaction following esthetic rehabilitation of primary maxillary anterior teeth using composite resin strip crowns and autopolymerizing resin (Protemp™ 4) strip crowns through a standardized five-point Likert scale questionnaire.

AIM AND OBJECTIVES

➤ Aim of the Study:

The aim of the study is to evaluate and compare the parental satisfaction of composite resin and autopolymerizing resin (protemp 4) for use in strip crowns in primary incisors.

➤ Objectives of the Study:

1. To assess the parental satisfaction using 5-point Likert scale at baseline and 9 months.

MATERIALS AND METHODS

Source of Data

The present interventional study was conducted in the Department of Pediatric and Preventive Dentistry, A.J. Institute of Dental Sciences, Mangalore, following approval by the Institutional Ethical Committee. A total of 60 teeth in children aged 3-6 years were selected from the outpatient department. They were randomly divided into two equal groups (n = 30):

- **Group 1-** Strip crown with composite resin (Filtek 3M ESPE)
- **Group 2** -Strip crown with autopolymerizing resin [Protemp 4 (3M ESPE)]

INCLUSION CRITERIA:

- Primary maxillary anteriors with at least half to two-third of clinical crown is required after caries removal
- Developmental enamel defects

- Patient with caries involving two or more surfaces of upper anteriors
- Mandibular incisor must be present
- Fractured crown due to trauma
- Primary upper anterior teeth with at least two-third of root length
- Children with Frankl's behavior rating 3 and 4
- Age-group: 3–6 years
- Parents or primary caregivers capable of understanding and independently completing the five-point Likert scale questionnaire in the language provided.

EXCLUSION CRITERIA:

- Teeth with proximity to exfoliate after radiographic evaluation
- 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/Parent not signing consent

CLINICAL PROCEDURE

Group 1: Strip crowns filled with composite resin (Filtek 3M ESPE)

The incisal edge of the strip crown was placed against the incisal edge of the tooth to choose the correct size of strip crown. The crown was perforated using a sharp explorer at the mesial or distal incisal angle to create a vent, allowing the escape of any entrapped air bubbles, followed by crown preparation. The appropriate shade of composite was selected under natural light. Crown was filled approximately two-third full with resin composite material. Etching was performed for 15 seconds, followed by rinsing

for 5 seconds and drying the tooth using an air-water 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. Occlusion was evaluated and adjusted as necessary. Finishing and polishing was done.

Group 2- Strip crown filled with Protemp 4(3M ESPE)

Crown selection was done by placing the incisal edge of the strip crown against the incisal edge of the tooth. Vent holes were made at the mesial and distal incisal edges for the escape of air bubbles entrapped in the crown. Crown preparation was done. Selection of appropriate shade of Protemp 4 was done in natural light. Etching was performed for 15 seconds, followed by rinsing for 5 seconds and drying the tooth using an air-water syringe. Bonding agent was applied and then tooth will be light cured. Crown was filled approximately two-third full with protemp 4 material. Protemp 4 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 left to autopolymerize for 3-4 mins at room temperature. The celluloid shell was peeled off lingually with a scalpel or explorer. Occlusion was evaluated and adjusted as necessary. Finishing and polishing was done.

Immediately after treatment (baseline) and at the 9-month follow-up visit, parents or legal guardians

completed a structured questionnaire designed to evaluate their satisfaction with the esthetic outcome of the restorations. The questionnaire assessed four domains:

- Appearance of the restoration
- Colour of the restoration
- Size and contour of the restoration
- Overall satisfaction

Responses were recorded using a five-point Likert scale:

1 = Very dissatisfied

2 = Dissatisfied

3 = Neutral

4 = Satisfied

5 = Very satisfied

Data Analysis

The data was collected, coded and fed in SPSS (IBM version 22) for statistical analysis. The descriptive statistics included frequency and percentage. The inferential statistics included chi square test, for comparison of categorical data. The level of significance was set at 0.05 at 95% confidence interval.

RESULTS

Table 1: Table showing distribution of parental satisfaction scores at baseline

Score	Composite Strip Crowns n (%)	Protemp 4 Crowns n (%)	p-value
2	0 (0%)	0 (0%)	0.004
3	11 (36.7%)	0 (0%)	
4	14 (46.7%)	17 (56.7%)	
5	5 (16.7%)	13 (43.3%)	
Total	30 (100%)	30 (100%)	

Immediately after treatment, parental satisfaction was high in both study groups (Table 1). In the Composite Strip Crown group (n = 30), the majority of parents reported a satisfaction score of 4 (46.7%), followed by score 3 (36.7%) and score 5 (16.7%). No parent reported a satisfaction score of 2.

In the Protemp™ 4 Strip Crown group (n = 30), parental satisfaction was comparatively higher. More than half of the parents (56.7%) reported a satisfaction

satisfaction score of 4, while 43.3% reported the highest satisfaction score of 5. None of the parents reported satisfaction scores of 2 or 3.

Intergroup comparison using the Chi-square test demonstrated a statistically significant difference in parental satisfaction at baseline ($p = 0.004$), with the Protemp™ 4 group exhibiting significantly higher satisfaction than the Composite Strip Crown group

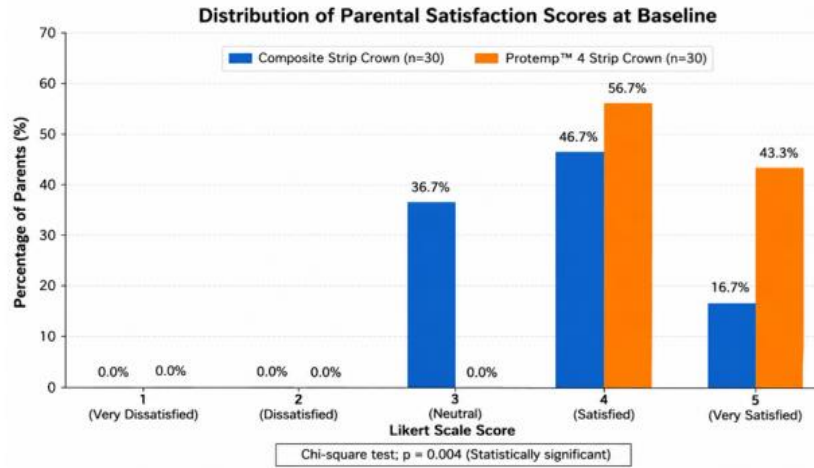


Table 2: Table showing distribution of parental satisfaction scores at 9 months

Score	Composite Strip Crowns n (%)	Prottemp 4 Crowns n (%)	p-value
2	2 (7.1%)	0 (0%)	0.041
3	8 (28.6%)	2 (7.1%)	
4	15 (53.6%)	16 (57.1%)	
5	3 (10.7%)	10 (35.7%)	
Total	28 (100%)	28 (100%)	

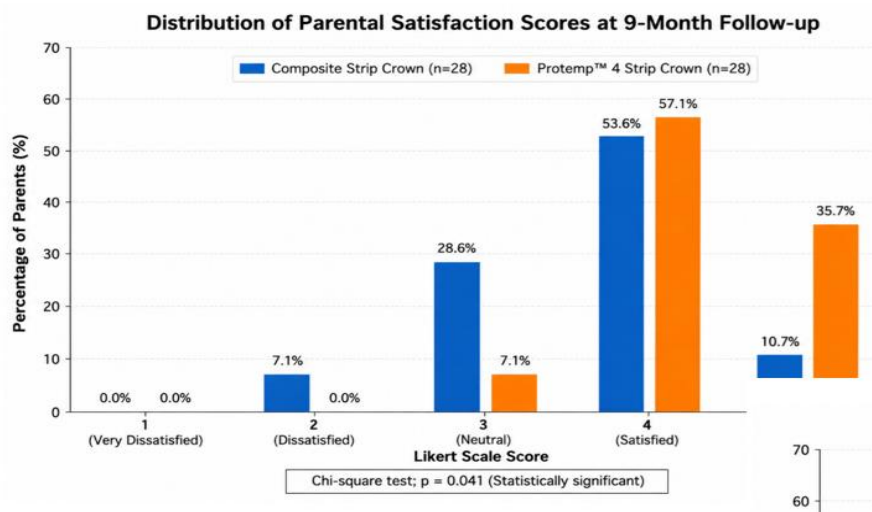
At the 9-month evaluation, parental satisfaction remained high in both treatment groups despite minor changes in score distribution .

Among the Composite Strip Crown group (n = 28), the majority of parents reported a satisfaction score of 4 (53.6%), followed by score 3 (28.6%), score 5 (10.7%), and score 2 (7.1%).

In the Prottemp™ 4 Strip Crown group (n = 28), most parents reported a satisfaction score of 4 (57.1%), while 35.7% reported the highest satisfaction score of

5. Only 7.1% of parents reported a satisfaction score of 3, and none reported dissatisfaction (score 2).

Comparison between the two groups revealed a statistically significant difference in parental satisfaction at the 9-month follow-up ($p = 0.041$), indicating significantly greater parental satisfaction among children restored with Prottemp™ 4 strip crowns than those restored with Composite Strip Crowns.



DISCUSSION

Primary anterior teeth are vital for proper speech development, chewing efficiency, and dental spacing. When severe decay occurs, modern pediatric dentistry prioritizes restorative intervention over extraction to meet the high aesthetic expectations of parents and maintain the child's functional oral health.^[11]

The clinical management of carious primary anterior teeth involves a diverse range of restorative modalities, including resin composite strip crowns, open-faced stainless-steel crowns, pre-veneered stainless-steel crowns, and zirconia crowns.^[12]

Since its introduction by Webber in 1979, the composite resin strip crown has emerged as the most prevalent clinical procedure for the restoration of primary anterior teeth. These crowns are frequently favored over alternative full-coverage coronal restorations due to their superior aesthetic integration and lifelike translucency.^[13,14]

Studies by Gill et al. (2019) and Sharma et al. (2021) suggests that strip crowns are also more susceptible to significant marginal discrepancies and progressive

color instability over time. Furthermore, the surface characteristics and marginal integrity of these restorations are associated with increased rates of plaque accumulation and subsequent gingival inflammation, highlighting potential limitations in their long-term periodontal and structural performance.^[15]

In a clinical evaluation conducted by Chen et al. (2020), resin strip crowns demonstrated a high initial success rate with a retention of 97.8% at 6 months, which gradually declined to 93.6% at 12 months and 89.2% at the 18-month follow-up.^[16]

Kupietzky et al (2003) reported on the clinical and radiographic success of 112 composite resin strip crowns in 40 children. And results showed an 88% retention rate at 18 months. And the same retrospective study sample was used after 1 year to

assess parental satisfaction with the esthetic appearance of the strip crowns. 78% of parents were satisfied with crowns. In 2005, he conducted a retrospective study with clinical and radiographic success rates on strip crowns after 3 years of follow-up and the results showed a 78% retention rate for a period of over 36 months.^[14,17]

The number of carious surfaces involved significantly affects strip crown retention. Ram and Fuks et al (2006) reported over 80% clinical success of resin-bonded composite strip crowns in children aged 22–48 months; however, teeth with four carious surfaces showed significantly higher failure rates than those with one or two surfaces involved, indicating that extensive decay negatively impacts the longevity and retention of strip crowns.^[13]

In this present study, composite resin and protemp 4 (autopolymerizing resin) was used to compare and evaluate the parental satisfaction for use in strip crowns in primary anterior teeth.

Protemp™ 4 Temporization Material (3M ESPE) is an autopolymerizing bis-acryl resin widely used for provisional restorations due to its favorable mechanical and physical properties. Akova et al. (2006) reported that Protemp 4 is hydrophobic in nature, which limits water sorption and reduces the plasticizing effect commonly seen in resin-based materials. This property contributes to improved dimensional stability, enhanced strength, and better maintenance of surface integrity over time, especially in the oral environment where moisture exposure is inevitable.^[18]

Furthermore, Amin et al. evaluated various provisional restorative materials and found that Protemp™ 4 (3M™ ESPE) exhibited the least

marginal discrepancy compared to other materials such as Luxatemp Star, Visalys Temp, and polymethyl methacrylate. This superior marginal adaptation is clinically significant, as it helps in minimizing microleakage, reducing plaque accumulation, and enhancing the longevity of the restoration. These properties collectively make Protemp 4 a reliable material for achieving good marginal integrity and overall clinical performance.^[19]

Mehrpour et al. assessed the flexural strength of different interim restorative materials, including TempSpan, Protemp 4, Unifast III, Trim, and Revotek LC, and found that Protemp 4 demonstrated the highest flexural strength among all the materials tested. This indicates its greater resistance to bending stresses and improved durability under functional load.^[20]

A major limitation of autopolymerizing resin materials is the exothermic heat generated during polymerization, which may pose a risk to the underlying pulp, especially when using the direct technique. Rajat R. Khajuria et al conducted a study to evaluate the temperature rise in the pulp chamber during the fabrication of provisional crowns using various materials and different tooth types. The findings revealed that Protemp 4 exhibited the least temperature rise compared to other materials tested, suggesting a relatively safer thermal profile. However, its specific effects on primary teeth remain unclear, as their larger pulp chambers and thinner dentin may increase susceptibility to thermal injury.^[21]

The present study evaluated parental satisfaction following esthetic rehabilitation of primary maxillary anterior teeth using composite resin strip crowns and Protemp™ 4 strip crowns. Although both restorative

materials achieved high levels of parental satisfaction, the Protemp™ 4 group demonstrated significantly higher satisfaction than the composite strip crown group both immediately after treatment ($p = 0.004$) and at the 9-month follow-up ($p = 0.041$). At baseline, 43.3% of parents in the Protemp™ 4 group awarded the highest satisfaction score (score 5) compared with only 16.7% in the composite strip crown group. In contrast, 36.7% of parents in the composite group reported a score of 3, whereas none of the parents in the Protemp™ 4 group assigned this score. These findings indicate that parents perceived the immediate esthetic outcome of Protemp™ 4 restorations more favorably.

At the 9-month follow-up, parental satisfaction remained consistently high in both groups; however, the Protemp™ 4 group continued to demonstrate superior caregiver acceptance. 35.7% of parents in the Protemp™ 4 group continued to report the highest satisfaction score compared with 10.7% in the composite strip crown group, while 7.1% of parents in the composite group reported a satisfaction score of 2, compared with 0% in the Protemp™ 4 group. The persistence of these findings suggests that Protemp™ 4 restorations were able to maintain their esthetic appeal and parental acceptance over time.

In the present study, parents in the Protemp™ 4 group reported greater satisfaction with the appearance of the restorations, suggesting that the restored teeth blended harmoniously with the adjacent dentition and produced a more natural smile. As the maxillary anterior teeth play a key role in facial esthetics, improvements in appearance are likely to have had a positive influence on caregiver perception. Similar observations have been reported by Kupietzky and

Waggoner et al, who found that parents highly appreciated the improvement in their child's smile following restoration with composite strip crowns, emphasizing that esthetic enhancement significantly influenced parental satisfaction despite occasional restoration failures.^[22]

Color is one of the most noticeable esthetic characteristics of anterior restorations and strongly influences parental perception. In the present study, parents appeared to perceive Protemp™ 4 strip crowns as having a more pleasing and stable color than composite strip crowns. This may be related to the material's favorable polish retention and resistance to discoloration, allowing the restorations to maintain their esthetic appearance throughout the follow-up period. Similar findings were reported by Vaghela et al., who evaluated parental satisfaction using a 5-point Likert scale and demonstrated significantly greater caregiver satisfaction with restorations exhibiting superior color stability and esthetic appearance.^[23]

Parents also expressed greater satisfaction regarding the size and contour of restorations in the Protemp™ 4 group. Proper anatomical form is essential for achieving a natural appearance, particularly in the esthetic zone. The favorable handling characteristics of Protemp™ 4 may facilitate better adaptation within the strip crown form, resulting in restorations with smoother surfaces and more accurate anatomical contours. Such restorations closely mimic the morphology of natural primary incisors and are therefore more likely to meet parental esthetic expectations.

The significantly higher overall satisfaction observed in the Protemp™ 4 group reflects the combined influence of appearance, color, contour, and smile

enhancement. Parents generally evaluate treatment outcomes holistically rather than focusing on individual clinical characteristics. Therefore, restorations that provide a natural appearance while maintaining esthetic quality over time are more likely to receive favorable overall ratings. These findings are consistent with those of Subramanyam and Jeevanandan, et al who assessed parental satisfaction using a 5-point Likert scale and reported high caregiver acceptance following esthetic rehabilitation of primary anterior teeth.^[24]

Comparable observations have also been reported by Verma et al., who compared strip crowns and zirconia crowns using a Likert-type parental satisfaction questionnaire. The authors reported that overall parental satisfaction was closely associated with esthetic appearance, crown morphology, and restoration durability.^[25]

Considering the collective outcomes of the present study, Protemp™ 4 strip crowns not only demonstrated greater parental satisfaction but also showed superior clinical performance with respect to gingival health, contour stability, and marginal integrity. These favorable clinical characteristics are likely to have contributed to the sustained esthetic appearance of the restorations and, consequently, to the higher caregiver satisfaction observed throughout the study. Thus, Protemp™ 4 strip crowns may be considered a promising and reliable alternative to conventional composite strip crowns for the restoration of primary maxillary anterior teeth.

The main limitations of this study are the small sample size and the relatively short follow-up period. Future studies with larger cohorts and longer

evaluation periods are recommended to validate and expand upon these findings.

VI CONCLUSION

Both restorative materials achieved high parental satisfaction; however, Protemp™ 4 strip crowns demonstrated significantly greater caregiver satisfaction than composite resin strip crowns over the 9-month follow-up period. Protemp™ 4 may therefore be considered a promising esthetic alternative for the restoration of primary maxillary anterior teeth.

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