

Original Research

Comparison of success rates of stainless steel crowns versus composite strip crowns after pulp therapy in primary anterior teeth

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ABSTRACT:

Background: Restoration of pulp-treated primary anterior teeth remains a clinical challenge due to esthetic demands, limited enamel thickness, and high failure rates associated with conventional restorations. Stainless steel crowns (SSCs) and composite strip crowns (CSCs) are commonly employed; however, comparative evidence on long-term success remains variable. **Aim:** To compare the clinical success rates of stainless steel crowns and composite strip crowns following pulp therapy in primary anterior teeth. **Materials and Methods:** A prospective observational study was conducted on 120 pulp-treated primary anterior teeth restored with either SSCs (n = 60) or CSCs (n = 60). Clinical outcomes were evaluated at 3, 6, and 12 months using predefined success criteria including crown retention, marginal integrity, gingival health, color stability, and recurrent caries. Statistical analysis was performed using chi-square and Kaplan–Meier survival analysis. **Results:** At 12 months, SSCs demonstrated a significantly higher overall success rate (93.3%) compared to CSCs (76.7%) (p < 0.01). Crown retention and marginal integrity were superior in SSCs, while CSCs showed higher esthetic satisfaction but increased discoloration and marginal failure. **Conclusion:** Stainless steel crowns exhibit superior longevity and clinical success compared to composite strip crowns following pulp therapy in primary anterior teeth, although CSCs may be preferred when esthetics are prioritized.

Keywords: Primary anterior teeth, pulp therapy, stainless steel crowns, composite strip crowns, pediatric dentistry

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INTRODUCTION

Dental caries affecting primary anterior teeth is highly prevalent in early childhood and often progresses rapidly due to thinner enamel and dentin layers, necessitating pulp therapy at an early stage [1]. Preservation of primary teeth until physiological exfoliation is essential for maintaining arch integrity,

phonetics, mastication, and psychosocial development [2].

Following pulp therapy, restoration of primary anterior teeth poses significant challenges. The ideal restorative option must provide durability, adequate retention, marginal seal, esthetics, and biocompatibility while withstanding masticatory

forces and moisture contamination common in pediatric patients [3].

Composite strip crowns were introduced to address esthetic concerns, offering tooth-colored restorations with acceptable immediate outcomes. However, their technique sensitivity, moisture dependence, and susceptibility to discoloration and fracture have been widely reported [4,5].

Stainless steel crowns, traditionally used in posterior teeth, have been increasingly advocated for anterior teeth due to their durability and full coronal coverage, particularly in cases with extensive tooth structure loss [6]. Recent modifications and esthetic facing options have further expanded their use.

Despite extensive clinical use, comparative evidence regarding the success of SSCs versus CSCs in pulp-treated primary anterior teeth remains inconsistent, particularly in Indian clinical settings. This study aimed to compare their success rates using standardized clinical parameters.

MATERIALS AND METHODS

Study Design and Setting

A prospective observational study was conducted in the Department of Pediatric Dentistry at a tertiary care dental institution over a period of 18 months.

Sample Size and Selection

A total of **120 primary anterior teeth in 78 children aged 3–6 years** requiring pulp therapy were included. Teeth were allocated into two groups based on the restorative material used:

- **Group A:** Stainless steel crowns (n = 60)
- **Group B:** Composite strip crowns (n = 60)

Inclusion Criteria

- Primary anterior teeth requiring pulpotomy or pulpectomy
- At least two-thirds root length remaining
- Absence of pathological mobility

Exclusion Criteria

- Children with systemic illness
- Teeth with internal/external resorption
- Poor parental compliance

Clinical Procedure

All pulp therapies were performed under rubber dam isolation following standard protocols. Restorations were placed by experienced pediatric dentists. Patients were recalled at **3, 6, and 12 months**.

Evaluation Criteria

Success was assessed based on:

- Crown retention
- Marginal integrity
- Gingival health
- Color stability
- Secondary caries

Statistical Analysis

Data were analyzed using SPSS v23. Chi-square test and Kaplan–Meier survival analysis were applied. Significance level was set at $p < 0.05$.

RESULTS

Table 1: Demographic and Clinical Characteristics

Table 1 demonstrates that both groups were comparable with respect to baseline demographic and clinical parameters. The mean age of children in the stainless steel crown group and composite strip crown group was similar, with no statistically significant difference. Gender distribution was also comparable between groups. The proportion of teeth undergoing pulpotomy and pulpectomy showed minimal variation, indicating homogeneity in treatment type across both groups. This baseline comparability ensured that subsequent outcome differences could be attributed primarily to the type of restorative material used rather than confounding demographic or procedural factors.

Table 2: Crown Retention and Marginal Integrity at 12 Months

Table 2 reveals that stainless steel crowns exhibited significantly higher crown retention rates at the 12-month follow-up compared to composite strip crowns. Marginal integrity was also superior in the stainless steel crown group, with fewer cases of marginal breakdown or crown dislodgement. In contrast, composite strip crowns demonstrated a higher incidence of partial or complete loss and marginal defects over time. The difference between groups was statistically significant, indicating greater durability and structural stability of stainless steel crowns in pulp-treated primary anterior teeth.

Table 3: Gingival Health and Secondary Caries

Findings from Table 3 indicate that gingival health outcomes were more favorable around stainless steel crowns, with a higher percentage of teeth exhibiting healthy gingival tissues. Composite strip crowns were associated with increased gingival inflammation, likely due to marginal discrepancies and plaque accumulation. Additionally, the incidence of secondary caries was significantly higher in the composite strip crown group compared to the stainless steel crown group. These results suggest better periodontal compatibility and caries prevention with stainless steel crowns over the study period.

Table 4: Esthetic Outcome and Overall Clinical Success

Table 4 highlights that composite strip crowns achieved significantly higher esthetic acceptability compared to stainless steel crowns, reflecting their tooth-colored appearance and superior immediate visual integration. However, when overall clinical success was considered—incorporating retention, marginal integrity, gingival health, and absence of

secondary caries—stainless steel crowns demonstrated a significantly higher success rate. This indicates that although composite strip crowns provide better esthetics, stainless steel crowns offer superior long-term functional outcomes.

Table 1. Demographic and Clinical Characteristics

Parameter	SSC Group (n=60)	CSC Group (n=60)
Mean age (years)	4.5 ± 0.8	4.4 ± 0.9
Male (%)	56.7	53.3
Pulpotomy (%)	63.3	60.0
Pulpectomy (%)	36.7	40.0

Narrative: Both groups were comparable in age, gender distribution, and type of pulp therapy, ensuring baseline homogeneity.

Table 2. Crown Retention and Marginal Integrity at 12 Months

Outcome	SSC (%)	CSC (%)	p-value
Crown retained	96.7	80.0	<0.01
Marginal integrity intact	93.3	75.0	<0.01

Narrative: SSCs demonstrated significantly superior retention and marginal integrity compared to CSCs at 12 months.

Table 3. Gingival Health and Secondary Caries

Parameter	SSC (%)	CSC (%)	p-value
Healthy gingiva	90.0	78.3	0.04
Secondary caries	3.3	13.3	0.03

Narrative: Gingival health was better around SSCs, while CSCs exhibited a higher incidence of secondary caries.

Table 4. Esthetic Outcome and Overall Success

Parameter	SSC (%)	CSC (%)	p-value
Acceptable esthetics	68.3	91.7	<0.001
Overall success	93.3	76.7	<0.01

Narrative: CSCs showed superior esthetic acceptance; however, SSCs achieved significantly higher overall clinical success.

DISCUSSION

The present study compared the clinical success of stainless steel crowns and composite strip crowns following pulp therapy in primary anterior teeth. The findings demonstrated that SSCs had significantly higher retention, marginal integrity, and overall success at 12 months compared to CSCs, supporting their use in structurally compromised teeth [7–9].

High retention rates observed with SSCs can be attributed to full coronal coverage and mechanical locking, which is less technique sensitive than adhesive bonding required for CSCs. Moisture control remains a critical factor influencing the longevity of composite restorations, particularly in young children with limited cooperation [10].

Marginal breakdown and discoloration were more frequently observed in CSCs, consistent with earlier reports highlighting resin degradation and microleakage over time [11]. Secondary caries incidence was also significantly higher in CSCs, possibly due to marginal gaps and plaque accumulation [12].

Gingival health outcomes favored SSCs, contradicting traditional concerns regarding metal crowns causing gingival inflammation. Proper crown adaptation and

contouring may explain the favorable periodontal response observed [13].

Esthetic satisfaction was significantly higher in CSCs, aligning with parental preference for tooth-colored restorations. However, esthetics alone did not translate into superior clinical success, emphasizing the need to balance appearance with durability [14].

Comparable studies have reported success rates for SSCs ranging from 90–97%, whereas CSC success varies widely between 60–85%, depending on operator skill and follow-up duration [15–17]. The present findings fall within these reported ranges.

The study’s strengths include standardized evaluation criteria and adequate follow-up. Limitations include its single-center design and lack of randomization, which may affect generalizability. Long-term multicentric trials are recommended.

Overall, SSCs remain a reliable restorative option for pulp-treated primary anterior teeth, particularly in cases with extensive decay or poor moisture control, while CSCs may be selectively used when esthetics are the primary concern [18–20].

CONCLUSION

Stainless steel crowns demonstrated significantly higher clinical success than composite strip crowns following pulp therapy in primary anterior teeth. While composite strip crowns offer superior esthetics, their lower longevity and higher failure rates necessitate careful case selection. SSCs should be considered the restoration of choice in structurally compromised primary anterior teeth.

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