Primary Children's Hospital

Prefabricated Zirconia Crown Survival Rates Without Direct Pulpal Therapy

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Purpose

To evaluate the success rate of pediatric anterior prefabricated zirconia crowns placed without direct, prophylactic pulpal treatment in primary teeth (direct pulp cap, pulpotomy, and pulpectomy).

Background

Pulpectomies and pulpotomies are often provided with pediatric prefabricated zirconia crowns due to concerns of irritating the pulp with the "aggressive" nature of a zirconia crown preparation, even in teeth that present without previous concern for pulpitis or infection. This concern has some evidence in the permanent dentition. In a recent retrospective chart review of 2,177 cases of patients receiving large restorations such as crowns on their permanent teeth, 8.77% developed pulpal disease (Ptak,2023). Such a study has not been performed with primary teeth, but primary teeth are known to have significantly thinner enamel and dentin layers while simultaneously having respectively larger pulps and pulpal chambers compared to their permanent successors (Tafti, 2023). This could make them more susceptible to iatrogenic pulpal injury during crown preparations.

However, as early as the 1980's, evidence began to grow in support of indirect pulp therapy over direct pulp therapies such as pulpectomies or pulpotomies. One study on primary incisors found success rates of 77.7% for incisor pulpectomies, 85.7% for incisor pulpotomies, and 92.3% for indirect pulp therapy (Coll, 1988). However, the evidence supporting indirect pulp therapy only continued to expand, leading the American Academy of Pediatric Dentistry to formally advocate for indirect pulp therapy as "best practice" in 2024 for primary teeth with normal pulps or reversible pulpitis (AAPD, 2024). Still, these studies primarily focused on resin restorations or stainless-steel crowns, not prefabricated zirconia crowns, and little research exists on best practices for pulpal therapy with prefabricated zirconia crowns.

To date, only one recent study has examined the effects of direct pulp therapy versus indirect pulp therapy on primary teeth treated with prefabricated zirconia crowns. A retrospective cohort study compared the survival rate of prefabricated zirconia crowns with and without pulpotomies in primary maxillary anterior teeth (Alrashdi, 2024). Among the 81 teeth studied, the investigators found no statistically significant differences between the teeth that received pulpotomies and teeth that did not. Overall, the success rate for both groups after 24 months averaged at 91.4%.

Background Cont.

However, the teeth that received pulpotomies in this study did so solely after pulpal exposures occurred with caries removal; the pulpotomies were not provided as a prophylactic measure to prevent pulpal irritation to a previously asymptomatic tooth.

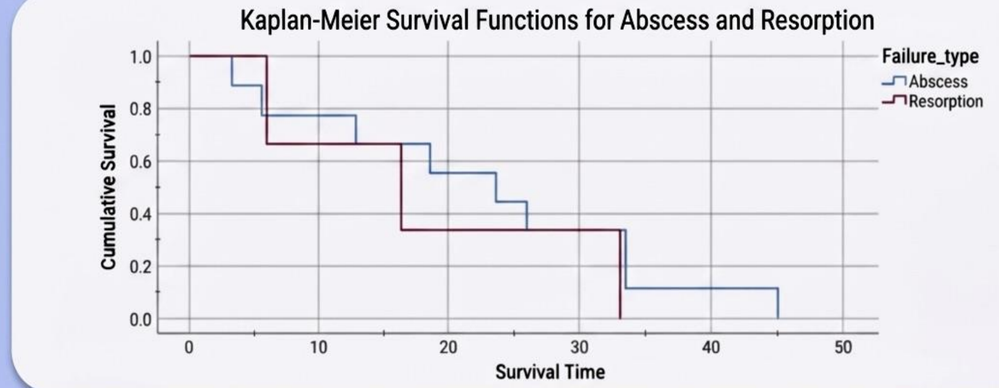
This study aims to provide further insight into the pulpal health and success of pediatric prefabricated zirconia crowns placed without concurrent, prophylactic direct pulpal therapy.

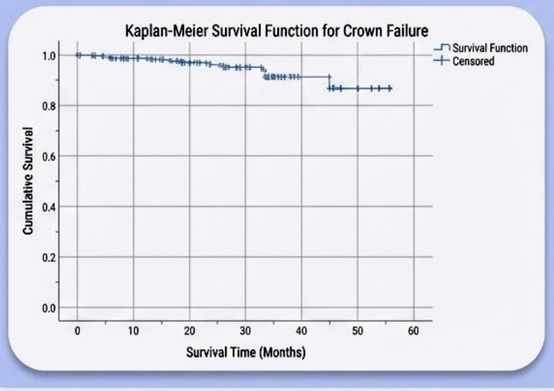
Methods

A retrospective chart review was conducted using the electronic medical record of the Primary Children's Hospital dental residency program. Patients who received anterior prefabricated zirconia crowns on primary teeth without concurrent pulpotomy or pulpectomy within the past three years and who returned for subsequent follow-up visits were included. Pulpal failure was defined by clinical or radiographic evidence of necrosis, pulpitis, abscess, pain, or pathologic resorption. Non-pulpal failures, including crown debonding or fracture, were recorded but excluded from primary outcome analysis. Survival analysis was performed using the Kaplan–Meier method to estimate crown survival over time. Time-to-event was defined as the interval, in months, from crown placement to documented failure. Crowns without failure were treated as censored observations at the time of the last recorded follow-up visit.

Results

142 patients received pediatric anterior prefabricated zirconia crowns without direct pulpal treatment, with a total of 394 crowns treated. Of the 394 crowns, 232 were examined at follow up appointments. Of the 232, 12 experienced pulpal failures (5.1%). Among these 12 pulpal failures were: 2 failures in which the crowns were never properly seated and 1 failure in which the crown was lost but did not abscess for nearly 16 months. Even so, the Kaplan Meier Survival Analysis showed that over 80% of the crowns remained successful at 55 months and that resorption failures may occur faster than abscess failures. There were not enough failures to reliably test the significance between abscess and resorption survival functions. Interestingly, multiple crowns debonded without their respective teeth experiencing pulpal failures, including both teeth that received new crowns and teeth that did not.





Patient Follow-up & Status Summary

Office on the web Follow-up	Frame		Status 0 censored	1 failure	Total
0 No		Count	148	0	148
		% within	100.0%	0.0%	100.0%
1 Yes		Count	234	12	246
		% within	95.1%	4.9%	100.0%
Total		Count	382	12	394
		% within Follow_up	97.0%	3.0%	100.0%

Conclusions

When primary anterior teeth have normal pulps or reversible pulpitis, prefabricated anterior zirconia crowns can be provided without direct, prophylactic pulpal treatments and experience high success rates up to 55 months. This is despite the significant reduction in tooth structure required for such crowns' preparation. This finding allows pediatric dentists and residents to take a more conservative approach to such restorations, simultaneously lowering patient costs, maintaining the vitality of the primary tooth, shortening procedure (and often general anesthesia) times, and avoiding the failure risks involved in providing additional procedures.