



CLINICAL AND RADIOGRAPHICAL EVALUATION OF FIBERGLASS CROWN AND STAINLESS STEEL CROWN IN PRIMARY MOLARS

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ABSTRACT

Objective: evaluation of fiberglass crown and stainless steel crown as a full crown restoration for primary molars. **Subjects and methods:** Forty molars teeth indicated for crown restoration. Bilateral crowns to first or second primary molars, one side was restored by stainless steel crowns (group A), and the other side was restored by fiberglass crowns (group B). Teeth were randomly assigned to Figaro or PMC crown groups. Modified United States Public Health Service (USPHS) criteria were used to evaluate recurrent caries marginal integration crown retention and gingival status at 48 hrs 3 and 6 months. **Results:** After six months of follow-up, the Fiberglass crown showed a significant difference in crown retention than the stainless-steel crowns (SSCs) with recurrent caries and gingival inflammation. **Conclusions:** Despite their unattractive appearance, stainless steel crowns are still the ideal restoration for compromised primary molar teeth

KEYWORDS: fiberglass crown, stainless steel crown, crown retention.

INTRODUCTION

Primary teeth play an essential role in the growth and development of children. Attempts to maintain the primary teeth until the eruption of their permanent successors⁽¹⁾. Tooth decay is still one of the most prevalent chronic conditions of childhood despite advances in preventive dentistry.² Primary teeth restoration following pulp treatment is a constant challenge to dentists owing to the scant remaining dental tissue and low structural strength.

Crowns were considered a viable alternative restorations save deeply decayed teeth⁽³⁾. Crowns for primary teeth have undergone generational

advancements, including design, materials, and cement formulations. Improvements in materials science along with innovations in manufacturing processes and dental materials have provided a variety of dental crowns available fabricated from esthetic material⁽⁴⁾.

The stainless steel crowns are always the first option for restoring badly damaged primary teeth. Humphrey introduced stainless steel crown into pediatric dentistry in 1950; they are considered one of the most successful and effective tooth restoration methods in pediatric dentistry⁽⁵⁾. They are used for extensive or multi-surface cavities,

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cervical decalcification, and developmental defects to repair primary or permanent teeth. The stainless steel crowns have many benefits over other crowns and dental restorative products⁽⁶⁾.

The metal appearance of these crowns is unpleasant for parents and children, despite several advantages. They prefer tooth-colored restorations to silver-colored fillings regardless of the position of repair⁽⁷⁾. The problem often associated with stainless steel crowns is inflammation of the underlying gingival tissue. The occurrence of gingivitis has been reported to be more significant around crowns that are poorly fitted than around crowns that are considered well adapted⁽⁸⁾.

Fiberglass crown is the newest entrant in the extra coronal restoration of grossly decayed or endodontically treated primary teeth. The choice of complete coverage restoration for primary teeth must provide an esthetic appearance and restoring function and durability. The most apparent advantage of Figaro crowns is their acceptable esthetics, relative flexibility, and adjustability. In this respect, the fiberglass crown has gained popularity due to its helpful features and esthetic value⁽⁹⁾. Hence, in this study, we used this material for posterior primary teeth restoration.

SUBJECTS AND METHODS

It is a randomized clinical trial study. Forty molars teeth indicated for crown restoration. Patients were selected from the outpatient Clinic of the Department of Pedodontics and Oral Health, Faculty of Dental Medicine, Al-Azhar University. A sample size of 20 in each group has an 80% power to detect an increase of 0.20 with a significance level (alpha) of 0.05 (two-tailed). In 80% (the control) of those experiments, the P-value will be less than 0.05 (two-tailed), so the results will be deemed "statistically significant." In the remaining 20% of the experiments, the increase will be considered "not statistically significant," as created by Graph PadStatMate 2.00.

Inclusion criteria^(10,11):

A cooperative child patient aged from 4: 8 years old, suffering no systemic disorders nor allergy from tested materials; nevertheless have almost more than one primary molar indicated for full coverage, were a subject to this study.

Exclusion criteria include the following^(10,11):

Any child patient with systemic disease, uncooperative children, intellectually disabled patients, deplorable oral hygiene (dmf < 4), Teeth with abnormal mobility is considered unfavorable subjects for this study.

Intervention:

All clinical procedures were performed by the same pediatric dental practitioner who recruited children. Total isolation was achieved using a high-volume evacuator and rubber dam. Caries removal and pulp chamber deroofting were performed with high-speed carbide bur No. 330 with a copious amount of water. A sharp spoon excavator removed the coronal pulp tissue. Pulp hemostasis was achieved using a sterile wet cotton pellet applied for 2 to 3 minutes. A clean cotton pellet moistened with 1:5 diluted formocresol (Buckley's Formocresol, Sultan Healthcare, USA) was bleached dry and placed in contact with the pulp stumps' surface for 5 minutes. A thick mix of zinc oxide-eugenol paste (zincinol, India) covered the pulp stumps then covered them with glass ionomer (Medicem, Promedica, Germany).

Forty crowns were used (twenty for fiberglass crown and twenty for PMCs) to restore forty primary molars from the patient selected for this study. For the patient selected for PMCs, the following was done occlusal reduction done following the external contours of the tooth. Simple removal by removing 1-1.5mm of tooth structure accomplished to avoid significant occlusal prematurity. The buccal and lingual reduction is made by reducing the occlusal half of the buccal and lingual surfaces above the

bulges on the gingival aspect of these surfaces. This reduction was also generally limited to a 45-degree angled bevel from the reduced occlusal surface onto the occlusal half of the buccal and lingual surfaces. Proximal preparations are completed after the occlusal and buccal-lingual reduction steps since the interproximal reduction phase was more accessible after reducing the other surfaces. Select the crown size that fits securely (snap-fit) should be chosen. A measurement of the mesiodistal of the contralateral tooth with dividers helped to pick the correct dimension^(12, 13). 3M ESPE (USA) crowns are anatomically cut and cervical contoured and need minimal adjustment.

For fiberglass crowns, there are five sizes for each primary molar, from extra-small through extra-large. After choosing the most suitable crown size, which approximates the Crown of the natural tooth before destruction, a medium-sized wheel stone used for occlusal preparation reduce 1-2 mm from

occlusal height. The circumferential length of the tooth is reduced by 1-1.5 mm with open of proximal contact using a flame diamond bur and continue for making a feather edge finish line at gingiva level. Beveling the occlusal table and check the patient occlusion in the same manner as stainless-steel, the Crown should be covering the entire surface of the prepared tooth. Tooth dried and cleaned from saliva and bleeding control gingival hemorrhage before cementation. Crown try-in was then carried out to assure proper crown seating.

Two groups Crown was cemented using medicem glass ionomer cement after a try in of the crown.

Follow up:

Follow-up appointments were made at 48 hrs. 3 and 6 months postoperatively to check for crown retention, marginal integration, secondary caries, and gingival status according to the modified United States Public Health Service (USPHS) criteria⁽¹⁴⁾.

Table (1) Clinical evaluation of Figaro crowns versus preformed metal crowns at 48 hrs, three months, and 6-months follow-ups using modified USPHS criteria:

Clinical evaluation		PMCS			Fiberglass		
		48hrs	3 M	6 M	48hrs	3 M	6 M
Crow retention	Intact crown	20 (100%)	20 (100%)	19 (95%)	20 (100%)	15 (75%)	14 (70)%
	Chipped crown	0.00	0.00	0.00	0.00	2(10%)	2(10%)
	Large loss	0.00	0.00	0.00	0.00	2(10%)	2(10%)
	Crown loss	0.00	0.00	1(5%)	0.00	1(5%)	2(10%)
Recurrent caries	No	20 (100%)	20 (100%)	20 (100%)	20 (100%)	20 (100%)	18 (90%)
	Yes	0.00	0.00	0.00	0.00	0.00	2(10%)
Marginal integrity	Closed margin	20 (100%)	20 (100%)	20 (100%)	20 (100%)	18 (90%)	18 (90%)
	Open margin	0.00	0.00	0.00	0.00	2(10%)	2(10%)
Gingival index	No inflammation	20 (100%)	20 (100%)	16 (80%)	20 (100%)	20 (100%)	16 (80%)
	Mild inflammation	0.00	0.00	2(10%)	0.00	0.00	3(85%)
	Moderate inflammation	0.00	0.00	2(10%)	0.00	0.00	1(5%)
	Sever inflammation	0.00	0.00		0.00	0.00	0



FIG (1) Clinical photo showing A: preoperative bilateral pulpotomized first primary molar. Crown placement B: after 48hrs.C: after 3months D: after six months.

Ethical consideration

The study was approved by the pedodontics scientific Committee and department council, Faculty of Dental Medicine, Boys, Cairo, and Al-Azhar University. The patient or his caregiver did Sign the informed consent.

Statistical analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. The significance of the obtained results was judged at the 5% level.

DISCUSSION

We tried to compare the new pediatric fiberglass crowns' clinical performance with the present study's PMCs. Forty molars teeth indicated for crown restoration. Patients were selected from the outpatient clinic of the Department of Pedodontics and Oral Health, Faculty of Dental Medicine, Al-Azhar University. The patient's molars were divided randomly into the following groups: Group A: consists of 20 primary molars that received stainless-steel crown. Group B: consists of 20 primary molars that received Fiberglass crown. The evaluation of each crown restoration was assessed at the baseline, which is the 48 hours of the procedure, 3 and 6 months to evaluate Fiberglass crown and stainless-steel crown in primary molars regarding Crown retention, Marginal integrity, recurrent caries, and Gingival Index.

After six months of follow-up, the Fiberglass crown showed significant failure in crown retention compared to the stainless-steel crowns (SSCs). Only 10 % of cases with Chipped Crown, 10 % of cases with Large loss, and 10 % of cases with Crown loss, and the remaining crowns were in the optimum condition (70.0 % of cases with Intact Crown), in terms of Crown retention compared to 100% intact SSCs. This finding was not following the manufacturer's claims that Fiberglass crown showed higher fracture resistance scores than SSCs.¹⁵ The present results were also inconsistent with Mohammad et al,⁽¹⁶⁾ who compared Fiberglass crown and stainless-steel crowns on primary molars; only one Fiberglass crown out of 67 showed fracture compared to none in the stainless-steel crowns after a follow-up period of 12 months. On the other hand, Mohammad et al⁽¹⁶⁾ used a custom-made Fiberglass crown, and tooth preparation demanded removing all undercuts from all surfaces, which allowed for more bulk of the material. Thus, it can be assumed that Fiberglass crown thickness may not be enough to provide a strong material that withstands the forces of mastication.

After 6 Month, Fiberglass crown-group showed an 85 % of cases with closed margin, a 15 % of cases with Open margin while all Stainless steel crown was intact. In contrast, El-Habashy and El Meligy⁽¹⁷⁾ showed excellent marginal integrity in all Fiberglass crowns, similar to Stainless-steel crowns. Open margin cases may be due to cement dissolution, crown preparation, and measurement precision. It should be noted that after 3 months, both the Fiberglass crown and Stainless-steel

Crown showed no recurrent caries. After 6 month, the Fiberglass crown-group showed 90 % of cases without recurrent caries and 10 % of cases with recurrent caries, while all Stainless steel crown without recurrent caries all cases that showed recurrent caries were secondary to a crown fracture occurring on the occlusal surface and were in patients who showed poor oral hygiene and dietary habits. The fracture encountered in the Fiberglass crown exposed part of the underlying tooth surface and created an area for micro leakage and food accumulation. Also recurrent caries appears with cases which have open margin.

Fiberglass crown-group showed a 15% of cases showed mild inflammation, and 5% of cases showed moderate inflammation suggesting that the cause of gingival inflammation was due to the resin material in the Fiber glass crown, while Stainless-steel Crown showed 10% of cases showed mild inflammation and 10% of cases showed moderate inflammation with no statistically significant difference with the steel crown group. Gingival health was assessed as "acceptable" during the follow up, with no statistically significant difference with the steel crown group.

Parents chose the Fiberglass crown on the first visit and at the 3-month follow-up visit. It is mentioned in many literature studies that have noted the parental rejection of metal crowns and their desire for white peaks^(18, 19). However, at the 6-month follow-up period, there was a significant decline in the parents' preference for the Fiberglass crown, where some parents preferred the Stainless-steel crown.

As a result, stainless steel crowns continue to be the restoration of choice for compromised primary molar teeth, although they are not aesthetically pleasing. There is a general under-use of stainless-steel crowns in pediatric dentistry. This can primarily be attributed to a lack of familiarity with the indications for their use, the procedures involved in tooth preparation, and their adaptation. The present study believes that serious consideration for

children with high caries rates should be given to full coronal coverage of primary molar teeth with stainless steel crowns.

CONCLUSION

From the results of the present study, we could draw the following conclusions:

1. The present study believes that serious consideration for children with high caries rates should be given to full coronal coverage of primary molar teeth with stainless steel crowns.
2. Further clinical studies are needed to verify the new fiberglass crown's success over increased periods of observation time.

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